COAL AGE

DEVOTED TO COAL MINING AND
COKE MANUFACTURE

ISSUED WEEKLY

VOLUME I

October 14, 1911, to June 30, 1912

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COAL AGE

INDEX FOR VOLUME I

OCTOBER 14, 1911, TO JUNE 30, 1912

NOTE—Illustrated articles are denoted by an asterisk (*), book notices by a dagger (†). Titles are often abbreviated. They are indexed under their most important words, or, if no word be distinctive, under their first one (except "A," "The," etc.), or under some topical word not found in the title. Authors', geographical and other proper names are also used freely.

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COAL AGE

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Concrete Overcast in a Georges Creek Mine of Consolidation Company. A Mile from Daylight

COAL AGE

Vol. 1 NEW YORK, OCTOBER 14, 1911 No. 1

Foreword

THIS first issue of COAL AGE is the realization of a long cherished ambition to give the coal and coke industries, employing 1,000,000 men, a weekly journal devoted exclusively to their interests. The necessity for an independent, adequate organ has long been acknowledged, and we intend to fill that need.

The work, although conceived as a business venture, is supported by fraternal love and an everlasting desire for the betterment of conditions in and about our mines.

Digging coal may not be exactly what Sherman called war, but if Hades is any darker or dirtier, and if the imps down there get any blacker, then we don't want to wait until New Year's to make good resolutions.

Now, Mr. Miner—You who forsake sunlight and who toil along underground day after day to furnish coal, the life sustainer of every industry, remember, we are interested in you. No matter whether you are drilling and shoveling at the face, or whether you are building brattices or fixing track, your success is our success, and COAL AGE will be devoted to a campaign seeking your betterment.

Although, in truth, contentment is seldom measured by money, the chances are you would change places with the fellow who owns the mine you work in, and, quite likely, if happiness be thus sought, you would be loser in the swap; however, most all of us are wanting the very things we can't afford, so we might as well accept the world-standard, and concede in part that "Money is success"; therefore, it is better to be fireboss or mine foreman than digger, and if you are already fortunate enough to hold one of the former positions, it is still more desirable to be superintendent or manager.

Right here is where we enter, for if you can read English, and have enough ambition to entitle you to recognition, COAL AGE will furnish you a schooling that will make it easy to climb to better things. Do your part—bear in mind that this journal each week will represent the best efforts of a large corps of experienced engineers; study the matter presented and you will find at the year's end, the time consumed has been well employed.

Write us your needs; state your problems; you will help us and the other fellow as well as yourself. You have muscle, health and heart—great assets; however, your head will carry you further than your hands.

Mr. Mine Manager and Mr. Engineer:

You have attained your present responsibilities largely through knowledge gained from the experience of others. The greatest advances in the coal industry have resulted from a broad exchange of ideas. Without resorting to oratory or idle boasts, we want to say that the foundation has been laid to make COAL AGE the greatest of all mediums for the interchange of coal-mining information. Every detail of European practice will be brought to you so long as that field leads us in any phase of the art.

This is not a paper for miners only, nor is it intended solely for men higher up; each individual can skip all that doesn't interest him, and still have plenty to occupy his time and thought. If questions and answers and elementary discussions of basic principles, that are prepared to aid the ambitious man who has lacked educational advantages, seem trivial, and you believe will not add to your enlightenment, then for the love of the lives of the men at the face, encourage, rather than condemn us. The calm of a peaceful day will be broken for many of you, because of a lack in the learning of some man lower down.

With your co-operation, we will be instrumental in putting the industry on a higher, safer footing. Your friendship is sought, but your confidence is desired above all. We will persist in our right to be independent even at the expense of criticism and censure. Realizing that, "A friend to all is a friend to none," we expect opposition; such, however, will but add zest to our work.

Now, when we disagree, and that may be often, we earnestly ask your forbearance. Perhaps our judgment is at fault—probably we have been misinformed; whatever the cause, we want you to know there are no rights reserved us and denied you. Our pages are open and criticism is more sought for than praise.

We will be around to see you and talk with you, time and time again; no plant worth visiting will be overlooked, and if you have anything to show, whether far or near, just send us word.

We intend, therefore, to see things first-hand, just as you do, and we trust that our point of view (always, if possible) will coincide with your own.

One word more—COAL AGE is before you; there has been no extra effort made to dress up just because it is our first appearance. We know this initial issue will not measure above the average—in fact, it is quite certain that before long the size and scope of the paper will be materially enlarged.

Anthracite and Bituminous Mining

By Eli T. Conner *

A comparison of the methods used in the two fields for the mining and preparation of coal, with an account of the different modes of occurrence, conditions and market requirements. In some cases the northern anthracite field might copy the methods of the bituminous regions. This is the first of a series of articles by Mr. Conner.

The title of this article would appear to cover an enormous field of investigation and description, but it is not intended to give detailed reports but to refer briefly to the most important features of mining in the anthracite and bituminous fields of Pennsylvania and elsewhere, and to make comparisons where possible, of the methods pursued. Attention will first be given to the anthracite fields of Pennsylvania.

As is well known, mining on a commercial scale, was commenced in this region in the early part of the last century. The first known record of the organization of a coal-mining company in this field was in 1792, when the Lehigh Coal Mining Company was chartered, this being the origin of the Lehigh Coal and Navigation Company, which has been continuously in existence from that time down to the present. The first shipment of coal by this company was in 1802, when two ark loads of coal were floated down the Lehigh and Delaware rivers, to Philadelphia. Some of this coal was used for gravel walks on account of lack of knowledge as to the proper method of burning it. In the northern anthracite field, which will be the first discussed, in this series of articles, the Delaware & Hudson Canal Company was organized in 1823, and mining was commenced at Carbondale.

The northern anthracite coalfield extends from Forest City, in Susquehanna county, to Shickshinny, in Luzerne county, a distance of about 55 miles. The maximum width of this basin is 6 miles. The geological features of the northern anthracite field differ from the other anthracite fields in that the measures are comparatively flat; consequently it must be treated independently, and this article will be devoted exclusively to that region.

In order to illustrate the position of the various beds of coal underlying the Lackawanna and Wyoming valleys, I have incorporated four cross-sections, which are typical of the northern anthracite field, and give some idea of the methods adopted for the development of this wonderful deposit of anthracite coal. These cross-sections are taken from the Second Geological Survey of the State of Pennsylvania.

In the infancy of the business, our forefathers were confronted by many difficulties which we, of this generation, are sometimes apt to forget, when we criticize the methods they were compelled to adopt in order to develop a profitable business. I think it proper and right to make this statement, as in the progress of the article, it will be found necessary to make some criticisms which I believe are necessary for the improvement of mining methods.

As was quite natural, the earliest openings were made in what were believed to be the best, thickest and cleanest beds of coal and those which could be attacked by drift openings from the surface. For the ultimate winning of the maximum amount of coal, contained in the territory, this method was entirely proper where such beds of coal were the uppermost, but in most cases, throughout the northern anthracite field, the beds first developed were beneath others; the consequence of which is that, in many instances coal in overlying beds has been made irrecoverable.

The mining developments in the northern anthracite field and elsewhere, were first largely projected by men from England, Scotland and Wales, and most of the miners and laborers employed in these early developments came from the above-named countries, supplemented by Irish and Germans. Most of these pion-

Chipping Coal Pillar, Clark Bed, Pine Brook Colliery, Scranton, Penn.

Twenty-inch Coal Bed, Cayuga Mine, D. L. & W. Coal Company, Near Scranton, Penn.

*Mining engineer, Real Estate Trust building, Philadelphia, Penn.

eers had learned coal mining in their own countries, and naturally adopted in this country methods which had been found suitable at home. These pioneers, as I have before said, met and overcame great obstacles in the early days of the industry, and left their stamp upon the whole anthracite region. Many of the methods which were inaugurated in those early days have, with modifications, come down to the present.

Almost without exception, the room-and-pillar method of mining has, from the beginning, been followed in the anthracite field. It was found that if about one-third of the coal was left in for roof support in the form of pillars, it was sufficient, and this proportion ruled to a very large extent and has been continued down to recent times. In fact, according to my observation, it has been adhered to, in many instances, where it was entirely inapplicable. As is well known, the relative proportion of pillar coal that should be left for the support of varying thicknesses of overburden has not been definitely determined. Because each coal bed has peculiarities of its own which affect its crushing strength, and because, further, the character of the overlying measures varies greatly, no hard and fast rule can be laid down to determine the percentage of pillar coal which should be left in, but each property and even each portion of any particular tract of land, must be considered entirely by itself, to determine this point.

The room-and-pillar method of mining which has been very generally adopted in the northern anthracite field, and with very few exceptions continued to the present time, is quite well illustrated by the cuts incorporated, which are taken from the contribution of H. H. Stoek, to the 22nd. annual report of the U. S. Geological Survey.

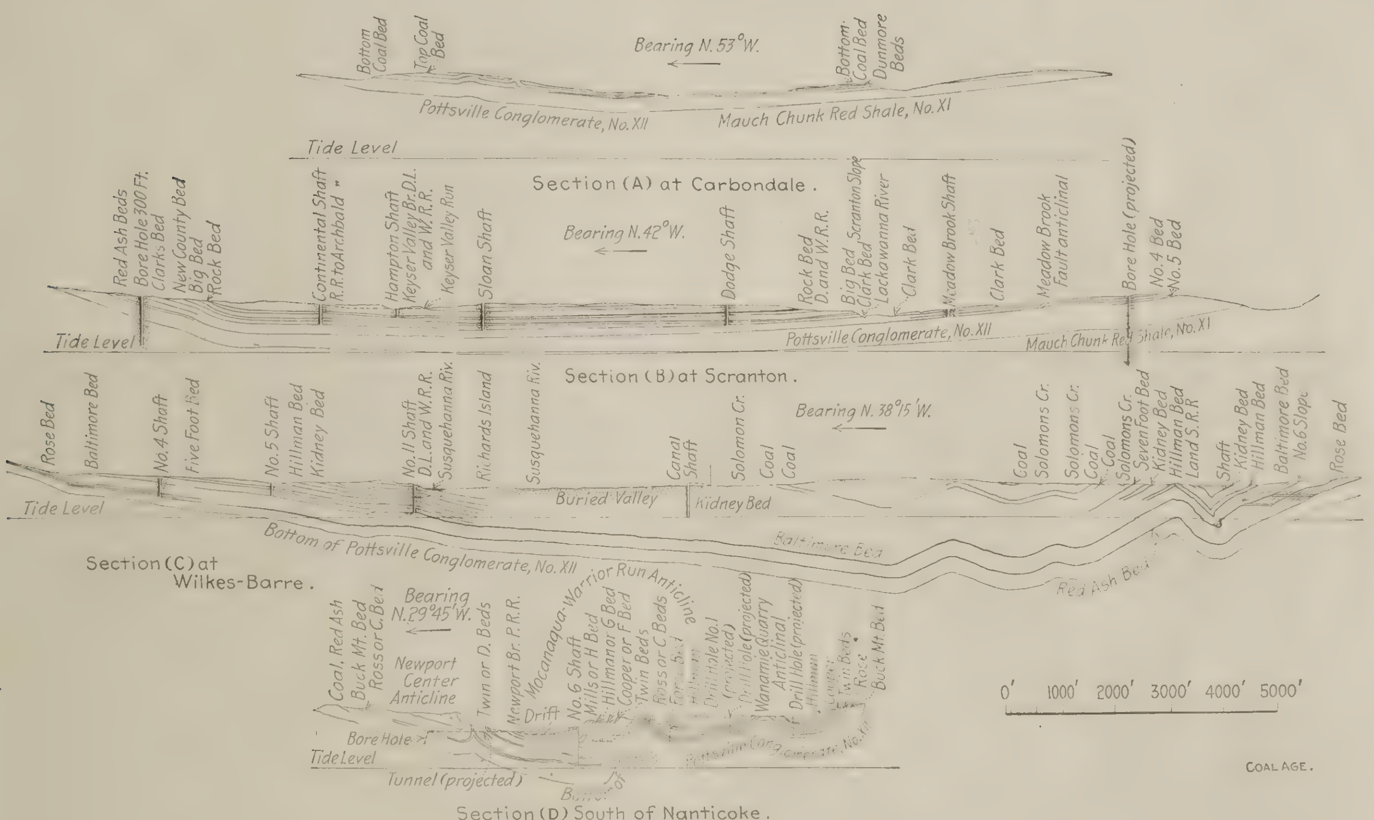
In the early mining in this field, as has been stated before, the developments were made in the middle series of coal beds, which in the vicinity of Scranton are known in descending sequence as the Diamond, Rock, Big or 14 ft., New County and Clark. These seams can be identified on the cross-sections accompanying this article, from which it will be noted that the names by which they are designated differ both east and west of Scranton. At Wilkes Barre the Big Seam is known as the Baltimore, while at Olyphant and eastward to Forest City, it is known as the Grassy Island. It very frequently happened in mining this and other beds of coal, in the earlier years of the industry, that but one or two benches of the seam were considered marketable, and consequently the other benches were either left in place, or broken up and thrown into the gobs. This resulted in the loss of a large quantity of coal much of which has not, up to the present time, been recovered. In addition to this great waste, care was not exercised to lay off the mine workings so as to bring pillars in lower beds under pillars in the bed immediately overlying. The result of this failure being extensive squeezes that have closed up large areas of the mine workings practically destroying the remaining pillar coal.

I have recently had occasion to investigate such a caved-in territory, due to the causes above mentioned, and found that 46 per cent. of the original contents of mineable coal has been almost irretrievably lost.

In recent years, more care has been exercised in the columnization of pillars, and a larger ultimate recovery can reasonably be expected.

One Reason for Unsystematic Methods

One of the principal reasons for the unsystematic methods of mining above mentioned has been that most of the early developments in this field were made by individual operators, holding the properties under comparatively short term leases, which carried burdensome minimum royalties, and thus compelled the operator, in order to retire his capital investment, and make a reasonable profit, during the term of his lease, to take only the cream of the property, oftentimes to the great detriment of the remaining mineral. During the past 20 years most of the individual operations throughout the anthracite regions have come into the possession of the 8 railway corporations, engaged in the transportation of anthracite to market. These companies have



Cross-sections of Northern Anthracite Field

generally adopted more scientific and systematic methods of mining, and consequently greatly reduced the waste from the causes mentioned.

Notwithstanding these decided improvements in methods, I am firmly of the belief that there are many places in the northern anthracite field in the thin beds of coal, by which is meant beds of 4 ft. and less in thickness, where decided economy in development and operation and in ultimate yield could be effected, by the adoption of the longwall system of mining. Strange as it may appear, when it is remembered that the anthracite fields of Pennsylvania were largely developed by men of experience from the British Isles, where longwall mining is the common and accepted practice, there have been very few instances and none of any marked success, of the introduction of this system in anthracite mining. It is true that the attempt has been made at various places, but so far as I can learn, it has never been systematically and persistently adhered to. Instead of this, to a very large extent, the methods that were adopted many years ago for mining beds of 5 ft. thick and upward, have with few modifications been continued in the thinner seams, in many cases even using the same old-style high mine car, which necessitates the removal of from 12 to 24 in. of roof or bottom rock, in *all openings*, to make hight for cars and mules. This, of course, means excessive cost of mining, and in my opinion, the system must be radically changed in the very near future, as it is only tolerated now because of the fact that at most of the going operations there is still some coal in the thicker seams which serves to "sweeten up" the average cost.

Underground Haulage

Underground transportation methods in the anthracite field have not been as completely revolutionized as has been the case in most of the bituminous regions. While it is true that most of the large anthracite companies have, in recent years, installed compressed air and electric haulage to a very considerable extent on the main roads, they still almost universally depend on animal power for handling mine cars in rooms. The use of gathering locomotives, electrically operated, has long ago passed the experimental stage, in the bituminous field, and in my opinion, would be adaptable in many of the comparatively flat seams in the northern anthracite field. Based upon experience with this method of transportation, in the bituminous field, I believe the average transportation cost in the comparatively flat workings in the anthracite field could be greatly reduced by the introduction of properly designed electric gathering locomotives.

Space will not permit of going into detail on the criticisms here made, but I am quite convinced that anthracite managers would find it beneficial to investigate more carefully methods of mining and transportation that have been found economical in thin bituminous beds of coal.

The enormous increase in the amount of coal produced by mining machines in the bituminous fields in recent years, showing the steady improvement in apparatus and methods, together with personal experience in the operation of mining machines in bituminous coal, convince me that by such modifications as local conditions may dictate, this system of mining coal could be profitably adopted at many places in the northern anthracite field. I have recently been privileged to see a mining machine of the semi-longwall type in service at one of the mines in the northern anthracite field. This machine has been in operation for several months, and has proved a mechanical success, but as its operation is still in the experimental stage, the commercial results cannot at present be quoted.

I am informed that experimental work with similar mining machines is now in progress at other operations, but the results are not in my possession. This experimental work will probably be continued, as it is in the hands of capable and farsighted managers, who will doubtless carry the experiment to the ultimate outcome, and inform themselves as to the most suitable methods as developed elsewhere.

Second Mining of Rejected Bottom Bench Coal

Diamond Bed, Bellevue Colliery, Scranton, Penn.

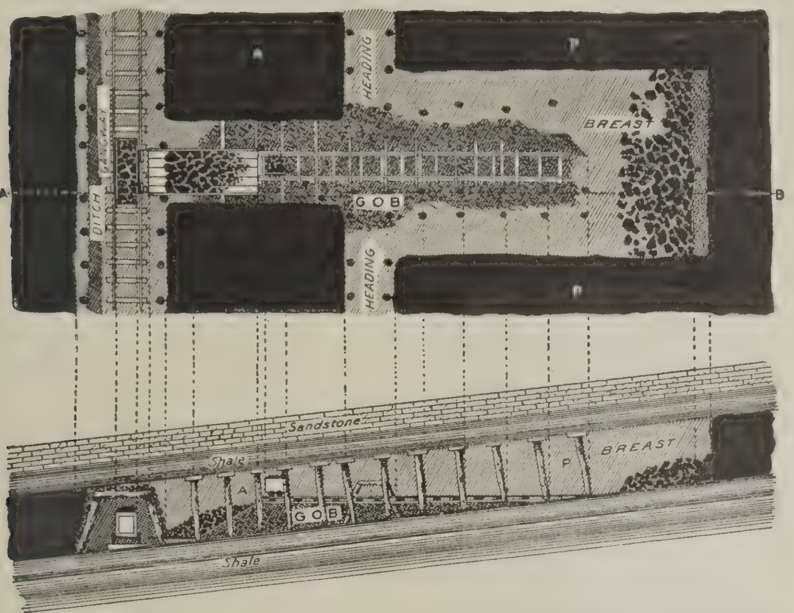
Preparation of Anthracite Coal

The preparation of anthracite coal for market is practically a manufacturing business that has been the growth of years of experience. It is a well known fact that to get the best results out of anthracite coal, in the furnace, it must be of uniform size. In the earlier days of the industry, it was believed that only large-sized coal, commercially known as lump, steamboat, broken, egg, stove and chestnut coal could be successfully burned. In consequence of which coal smaller than chestnut, which was made over 5/8-in. square mesh, was discarded and deposited on waste banks. In recent years, methods of firing have been so improved, that coal as small as that passing over 3/32-in. round mesh, can be successfully burned.

During the past 15 years a very large part of the culm banks in the anthracite

field have been rehandled and the coal smaller than chestnut marketed, until, at the present time, there is a comparatively small amount of such culm-bank material unused.

The sizes of coal larger than chestnut are commonly known as domestic sizes, and smaller than chestnut, as steam sizes. Domestic coal is sold at very much higher prices than steam coal, therefore the important matter for the manager to consider is the production of the maximum quantity of domestic sizes. Within recent years, great improvements have been made in this particular, by the proper design and arrangement of the rolls and other machinery, in the breakers, where the coal is prepared. This question of preparation of anthracite coal has been very well covered recently in a paper read before the American Institute of Mining Engineers, in June, last, at the WilkesBarre meeting, by Paul Sterling, chief mechanical engineer of the Lehigh Valley Coal Company, in which he quite fully described the new breaker recently constructed by that company, at Mineral Spring colliery. The yield of domestic sizes at that breaker is large.



Buggy Breast, Anthracite Region. On a 10- to 18-deg. Pitch

Comparing the Efficiency of Plants

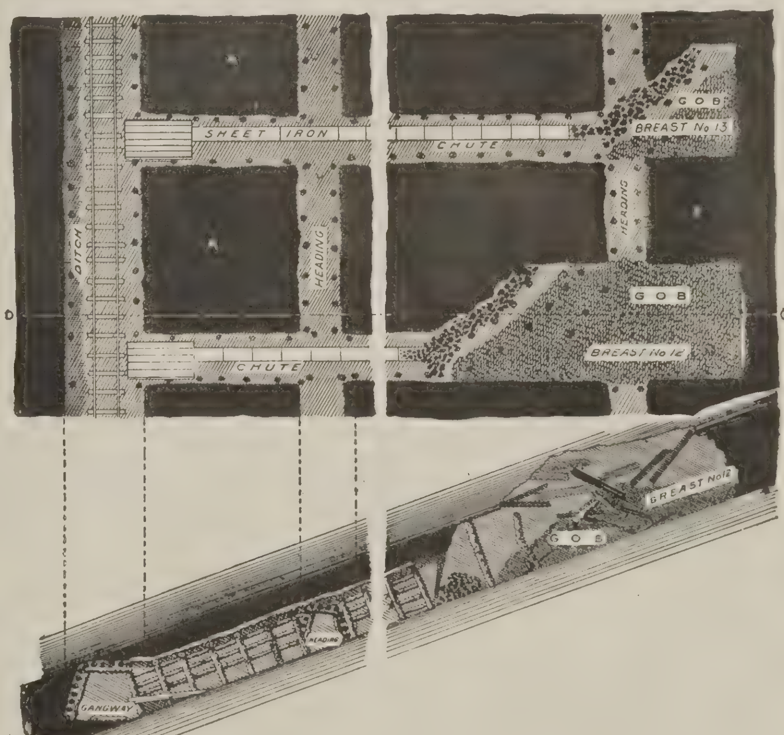
It has been the usual custom to compare the yield of anthracite-coal breakers on a basis of the percentage of domestic sizes produced. A proportion of 65 per cent. of total output of breaker in prepared sizes is regarded as good practice. This method of comparing the efficiency of plants and of their management is misleading, for it may be possible that a particular breaker is not recovering the maximum amount of small coal, viz: Coal below the size of chestnut. In such a case, the *percentage* of prepared sizes would naturally be high, and the operator would perhaps delude himself with the belief that he was accomplishing good results, when, as a matter of fact, his plant might be losing many tons of recoverable small coal.

The unreliability of the percentage method of determining results was forcibly brought to my attention some years ago, when in charge of 10 or 12 anthracite plants in the Wyoming valley, and a method of calculating and comparing percentages was devised which has since been adopted, and I believe it is the only true method of making comparisons. This was to determine at each breaker the yield in gross tons of each size per 100 cu.ft. of run-of-mine coal going into the breaker. On this basis, I have recently found breakers producing as low as 1.50 gross tons of prepared or domestic sizes, and others producing as much as 2.10 tons of prepared coal. In both of these cases, the character of the raw coal going into the breaker was about the same. The great disparity in results was entirely due to the manner in which the coal was handled in the breaker.

In comparing the final results in the production of anthracite and bituminous coal, it should always be remembered that while approximately 95 per cent. of the bituminous coal loaded into the mine car is a marketable product at practically full market value, anthracite coal, on account of the preparation necessary to make it marketable, is subjected to a loss in breakage, and degradation of sizes, which amounts to about 25 per cent. of the raw material loaded into the mine car at the face, in the northern anthracite field, and in the southern field the loss is frequently much greater.

Before leaving the northern anthracite field I think it desirable to mention more in detail the mining practices and conditions which result in great loss of high-grade fuel annually.

While it is well known in the anthracite fields, it may not be realized elsewhere that nearly all anthracite coal is mined by shooting it off the solid. This method was doubtless the best in the early days, and the results attained were reasonably good, when experienced coal miners were employed, but it is a well known fact that for the past 20 odd years, the proportion of such trained miners has steadily decreased, and their



Sheet-iron Chute Breast, Having a Pitch of from 18 to 30 Degrees

places have been taken by men from the southern and central countries of Europe, who have had no training whatever in the mining of coal. On account of these inexperienced men being unable to understand the English language, it is very difficult to educate them into competent coal miners; consequently many of them only learn how to drill holes in the coal, put in an excessive quantity of powder, and blow the coal into culm or slack, throwing large quantities of it into the gob, where it is lost. The percentage of waste by this method of mining is greater in the thin beds of coal by reason of their being generally of a harder nature than beds of greater thickness.

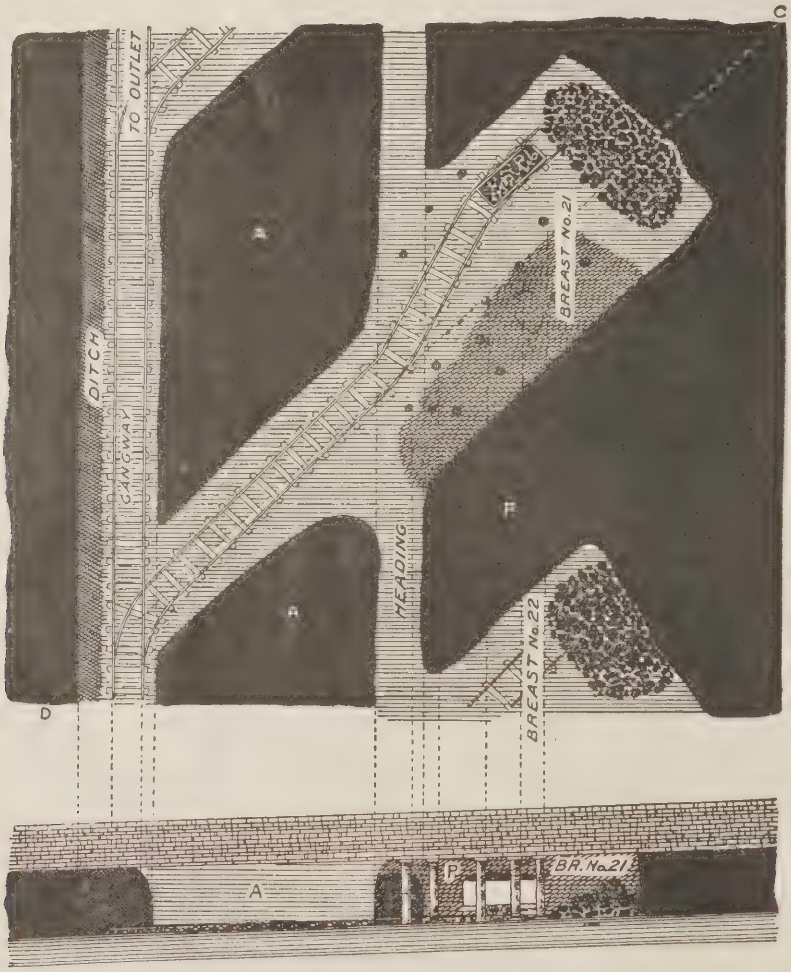
While the employment of such large numbers of inexperienced miners from the European countries mentioned (about 65 per cent. of all of the employees in the anthracite field), results in considerable waste of good coal, it must not be inferred that these men are generally incompetent, as it has been my observation that very many of them learn quickly and make most excellent miners when properly instructed by English-speaking men of ability, tact and patience. It has further been my observation that the Hungarians, Poles and other men from Central Europe who, when they come here, are generally young and vigorous, rapidly become Americanized.

A Source of Waste

Another source of very great waste of good fuel has been referred to before, but it will bear repetition. In the early days of marketing anthracite coal, it was thought that only the bright, lustrous, glassy coal could be successfully burned, and the public was educated to that belief. As is well known, nearly every bed of coal carries one or more benches of what might be termed "second-grade" fuel, commonly designated as "bone." The operator and the miner are expected to discard practically all of this material, very large quantities of which will analyze between 65 and 75 per cent. of fixed carbon. In order to compel the miner to discard this "off-color" coal, he is regularly docked if any noticeable quantity appears in his mine car when it is dumped into the breaker. Therefore, in self-protection, he must throw into the gob anything that appears to him to be doubtful. The large quantity of good coal which is thus irretrievably lost can hardly be conceived. A noticeable instance of this wastefulness, which is forced upon the coal operator by unreasonable market demands, is the treatment of a bench of coal in the Red-Ash bed, in the vicinity of Wilkes-Barre, which is known as Blue Coal. This bench varies in thickness from 18 in. to 3 ft., and as will be indicated by its designation, the only thing wrong with it is that it lacks luster. The major part of this bench of coal will analyze in fixed carbon very close to the average of the balance of the Red-Ash bed, but almost entirely on account of its appearance, it has for years been rejected.

I would recapitulate the causes of serious loss in the mining of anthracite coal in this region by reason of which over 40 per cent. of the original content in the ground is lost as follows:

1. Inadequate and improper pillar distribution.
2. Obsolete and wasteful methods of breaking down the coal.
3. Rejection of Blue Coal and good bone, and
4. Excessive and unnecessary breakage of the coal in course of preparation.



Wagon Breast, Anthracite Region, Under 10 Deg. of Pitch

Governmental Insurance

The Miner's Relief Bill of Maryland provides for the assessment of 27c. per month on each operator for each employee engaged directly in or about the mines, and a like assessment on the wages of each employee. The tax on the operator is believed sufficient to pay the dependents of an employee, who is killed, $1500. The tax on the workman is expected to pay him a dollar a day for one year, or during disablement if he is not disabled for so long a time; $750 in case of loss of both hands or both feet, or one foot and one hand or loss of sight of both eyes; $375 is paid for loss of either hand, foot or eye, together with $1 per day for 26 weeks (Sundays excepted). The benefits are secured by application to the County Commissioners. If a release is accepted, the applicant waives the right to sue the operator on account of injury or death.

Car Oiling

Where cars are oiled at the foot of a shaft or slope, care should be taken to have the waste oil drained to a tank. The oil should be of high-flash point and it should flow with freedom at the temperature at which the oiling has to be performed. These are the general requirements of good practice anywhere, but they are peculiarly pertinent below ground. Had care been taken at Pittsburgh, Kan., to follow these rules, it would not have been necessary to heat the oil by putting heated car wheels within it with unfortunate results. All of which leads to the conclusion that in winter it is impossible to safely oil cars in the intake of a shaft or slope with ordinary winter oil.

High Humidity for Mine Ventilation

By Frank Haas *

The saturation of a mine atmosphere with steam is not for the purpose of furnishing the water for wetting the mine, but is done to prevent evaporation of water naturally in the workings. In shallow mines, high humidity does not injure the men.

Humidity to the average person conveys a rather vague impression of the condition of the atmosphere. It is understood that this condition follows certain laws involving pressure and temperature and some physical characteristics of both air and water, but still the matter is considered of insignificant importance, and is left to the weather-bureau man who interprets with hazard his observation, and predicts with fair accuracy, but still imperfect results, the succeeding weather conditions.

At least so it has appeared to the mining man, and until recently, the humidity of the mine atmosphere was far from being a matter receiving his consideration. The air-compressor man has run into difficulties in the compression and transmission of air which have been charged to the humidity of the atmosphere, but so far has found no practical remedy. On the other hand, the iron metallurgists have, after a careful study of its effects, devised a method by which remarkable economies in the fuel consumption of iron manufacture are accomplished.

The mining man has, in recent years, been compelled by law to keep his mine wet in order to keep down the coal dust, which, when dry and in suspension, is considered dangerous, not only as a means of propagating, but even of starting an explosion. He has found in attempting to comply consistently with the mining laws, in so far as keeping all parts of his mine wet by the sprinkling method, that he has undertaken an impracticable proposition. A study of the atmospheric conditions of his mines will plainly show him why his efforts are futile and also show him the remedy. It is by no means an unusual condition of the atmosphere by which 15,000 or even 20,000 gal. of water may be exhausted from the average mine with normal ventilation in a day's time. It would be a difficult task indeed to transport and uniformly distribute such a quantity of water in each period of 24 hours.

Spray of Water Is Inefficient

Passing a current of air over a body of standing water will not saturate the air even though it is carried over a considerable distance. Introducing a spray of water into an air current does not accomplish the result, nor can it be accomplished in this manner unless a large number of sprays are used with a large waste of water. This method, at best, would be imperfect and if carried out to the extent of actual practical value would be quite expensive. The reason for its inefficiency is probably due to the fact that the air does not have sufficient time, in its contact with the water, to saturate itself, and the water, applied in comparatively large particles, is not maintained in the air current, but promptly drops to the floor where it remains worthless for the purpose.

The general laws governing the humidity of the atmosphere have been thoroughly worked out and the United States Weather Bureau has supplied us with tables showing the quantity of water for each per cent. of humidity for various temperatures and pressures. We have yet to learn, however, the rate at which the atmosphere becomes saturated, which involves both time and surface exposure. It is not unreasonable to suppose that the rate at which water vapor is disseminated would be proportional to the area of water exposed, although theoretically vapor tension is dependent entirely on pressure and temperature and independent of the medium.

It was with some surprise that it was found, while investigating the humidity of the atmosphere, that even during the time of heavy and continuous rain, the air was still far from saturated and the humidity well below the one hundred per cent. mark. This indicated what had previously been experienced along other lines; that it was no simple matter to raise air and hold it at the saturation point.

If the theory, held by many competent mining engineers, that a wet mine is safer against danger from a coal-dust explosion, either initial or in propagation is true, then humidity becomes a most important factor in maintaining the moist condition which the theory demands. In a previous paper[1] has been shown the large quantity of water which is extracted from a mine in winter months, and the dry conditon of the dust can be surmised under such natural conditions as are prevalent during most of the months of the year.

Saturating a Mine Atmosphere Prevents Evaporation.

The object of saturating a mine atmosphere with water vapor is not for the purpose of furnishing the water for wetting the mine, as is sometimes supposed, but for the purpose of preventing the evaporation of such water as is naturally there, or such water as has artificially been supplied. Theoretically, a place in the mine once thoroughly wetted and ventilated with a saturated atmosphere, will remain wet indefinitely. This then is the condition which should be attained.

The most favorable conditions for bringing air to the saturation point would be to have the water in the most minute particles and exposed to the air for a considerable length of time. The finer the particles, the greater surface of water exposed to the air. This is probably the most important factor, and if the particles are sufficiently small, they will be suspended in the air current and this will give the time exposure necessary. This favorable condition of water is exhibited when it is in the state of a fog, and it has been found that the saturation of air is both rapid and complete under these conditions.

To produce a fog in an atmosphere, it is necessary to lower the temperature of the air below the dew point or below the temperature at which the quantity of water vapor originally held will more than saturate it. The excess vapor will be changed to water in very finely divided particles. No practical method can be evolved from this, however, as temperature, as well as water vapor must be maintained and the outside air, when humidity is most desired, is both deficient in temperature and moisture; furthermore, the changing of the temperature of large volumes of air in a short interval of time is quite a difficult task. The simplest method is to disregard temperature and introduce an excess of moisture into the air by means of steam. The results attained are independent of its temperature, or pressure provided a sufficient quantity is introduced.

Temperature, as has been previously mentioned, is one of the important factors governing humidity. In winter time the temperature of the air entering the mine is usually lower than that normal to the workings, and even should such air be saturated when it enters the mine, it would still be greatly deficient in moisture when it reached the remoter workings. The temperature of a mine of considerable

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[1] *Bulletin* No. 425, U. S. Geol. Surv., "Explosibility of Coal Dust."

development is fairly constant throughout and fluctuates but little during the seasons of the year. The air which is forced through the mine by the ventilating system rapidly conforms to the mine temperature, rising to this temperature in winter and dropping to it in summer.

The distance from the mine mouth to a point where the temperature of the air current is equal to that of the normal mine temperature depends on the heat of the day and the velocity of the current. Under ordinary conditions, this distance will not exceed 2500 ft. It is the first 1500 or 2000 ft. of the mine air current which must be brought up to the normal temperature of the mine atmosphere and constantly saturated to 100 per cent. humidity. The temperature will take care of itself from the radiation of the side walls of the entry and the fog from the steam traveling with the air current will constantly supply the water vapor necessary for saturation by the gradual increase in temperature. If, by this means, the air current carries 100 per cent. humidity at the point where it has reached the normal mine atmosphere, the rest of the mine will be found to contain a saturated air.

The System Requires That a Blowing Fan be Used

The capacity of an air current for carrying fog in suspension is so great, that there is no question of delivering sufficient for all practical demands. In fact in practice it has been found that it was necessary to watch the excess, rather than the deficit of water. Should there be a decided excess, then the fog will continue with the air in its course through the mine. Fog in working places, in manways or haulage roads, is an objectionable feature and should be avoided. This would demand that if steam is introduced into the air current it should be in the air course, where no person is supposed to travel except for inspection or repair purposes. It would further require that a blowing fan be used; the system can be used, however, with an exhaust fan. But it would require other than the ordinary entries for the intake.

When the sprinkling of mines was first agitated as a safety precaution against dust explosions, it was opposed by many with the argument that a wet condition of a mine resulted in the disintegration of the roof with additional fatalities; the roof being the cause of the largest percentage of deaths. These arguments and statements emanated from opinions rather than facts. It is a difficult matter to analyze statistics to the extent of definitely settling a question of this kind and the problem will find supporters on both sides for some time to come. It is a fact, however, that during the time sprinkling has been widely practised in the bituminous mines of this country, no material increase has resulted in the fatalities due to roof falls, nor has there been any noticeable increase in the expense of cleaning up roof rock, which would naturally result if any additional cause for such fall should be introduced.

From a theoretical standpoint, the argument appears rather in favor of wet mines. Most mines are naturally wet and when they are not ventilated the atmosphere in them is at, or near, saturation. Adding moisture to the circulating current or adding water to an artificially dry mine would be simply restoring the natural conditions, and by maintaining such conditions the disintegration of the roof should really be lessened. It is reasonable to believe that non-uniformity of conditions, notably of temperature and humidity, would have a more harmful effect than conditions made uniform by artificial means.

High Humidity Not Injurious to Men

It has many times been stated, mostly from theoretical grounds, that a saturated mine atmosphere is detrimental to the health of the coal miner and his capacity to do work. Whatever may be the conclusions based on the results of comparatively high temperatures (85 to 92 deg.) which are encountered in some of the deeper mines of Europe, we can affirm that in the bituminous mines of West Virginia, where the temperature will average about 60 deg. F. the year round, there has been absolutely no complaint from miners either as regards health or the ability to do work. It is probable that when higher temperatures are encountered the physiological effect of depression and fatigue will result from a saturated atmosphere, and under such conditions and results the method of atmospheric saturation would not be recommended, but as no such conditions, or if any, comparatively few, exist in this country, it can, therefore, be used to great advantage as a safety precaution.

During the past year two explosions have occurred in the Fairmont region of West Virginia. The coal mined in this region is highly volatile and is considered capable of making a dangerous dust. Both of these explosions were solely from firedamp, and arose from a sudden inflow of natural gas from a defective gas well situated in the vicinity. Both explosions were violent, doing considerable damage to improvements inside the mine. The extent of the explosions was localized to the part of the mine where there was an explosive mixture of gas and did not extend, or propagate beyond it. The conditions were favorable for a disastrous dust explosion and the reason that the explosion did not extend over the entire mines, or in fact over several connected mines, was attributed to the wet conditions therein and to the fact that the air had been kept saturated for some time previous. This is perhaps the best argument that has yet come under our observation and has increased our faith in wet mines as a preventative of coal-dust explosions.

Immediate Action after a Colliery Disaster

In summarizing the immediate action a manager should take in case of a colliery explosion, or other disaster, W. E. Garforth, English authority on rescue work and the recovery of coal mines, said:

"Telephone for the mine inspectors and government engineers at once. Send a motor car if they are within distance. Communicate with all emergency officials, and members of the rescue team, not in the mine; impress on them the necessity for coolness. Send for the colliery doctor and laboring medical men. Confer with the leader of the rescue party and the chief of the ambulance corps as to the appointment of members to descend with the first exploration party.

"If the hoisting appliances are disarranged, provide means of descending into the mine. If the fan drift is damaged, arrange for its immediate temporary repair. Boards overlaid with brattice cloth, or with strips of the same, are sufficient in the early stages of exploration work. Consider the advisability of using a steam jet in the upcast shaft, or of causing a downward current of air in the downcast shaft, by means of a waterfall.

A matter of great importance is to decide whether, in case of a fire, the fan should be kept running. This problem must be solved by the manager himself, as no general rule can be given; a definite knowledge of the special conditions is necessary to a correct solution. If the fan be kept running, the smoke will be drawn through the workings and imprisoned men run a greater risk of being suffocated; on the other hand, if the fan be stopped, firedamp may accumulate in the workings, or abandoned parts of the mine may give off unexpected quantities of gas, and cause a further disaster. I may say, however, that experience in past accidents indicates that the course to be pursued seems in favor of stopping the fan for a limited period, while an exploration is attempted.

The underground development of every mine should be so planned that convenient and safe locations are provided for the erection of fire dams in case of necessity. At least 30 ft. of narrow entry is necessary for the location of a substantial dam. Recently at one mine, where a strong fire was raging, it was found necessary to build a stopping 28 ft. in length. This wall consisted of alternate sections of firebrick, concrete and dirt.

Importance of Geology in Coal Mining

By I. C. White*

Geology essential to a proper solution of many engineering problems. Construction and maintenance cost of mine workings can be reduced by due consideration of geologic indications.

Geology, though one of the youngest of the sciences, is nevertheless one of the most useful. Neither the civil nor the mining engineer is properly equipped to grasp and successfully solve the many problems that are sure to confront him unless he possesses a practical knowledge of its laws and principles. This fact we may see strikingly illustrated along the routes of any of our great railway lines, in their cuttings, fills, and tunnels. At one point the engineer has made a deep cut into soft, easily yielding shales at the foot of a steep slope, where his track will long afterward be troubled with land slides which a knowledge of the character of rocks would have enabled him to avoid at only a tithe of the ultimate expense involved. At another point his line has been constructed over loose material near the bank of a river, and his road-bed remains unsafe and unstable, and his re-alinement expense large for years to come.

Again for lack of geologic training a long and expensive tunnel may be injudiciously located, as is the famous one near Alleghany on the Chesapeake & Ohio Railway, at the line between Virginia and West Virginia, where a change in alinement of only 100 ft. southward would have avoided a Pocono sandstone ledge nearly as hard as quartzite through which the tunnel was driven for nearly a mile before the days of dynamite or power drills, at a cost of many thousands more than would have been necessary in the overlying red shale, had the engineer recognized the dip of the rocks and their difference in character.

Geology Essential to Coal Engineer

To the coal-mining engineer especially, is a knowledge of geology essential in the correct determination of the many problems connected with successful mining. He must understand how to trace and keep hold of any particular stratum as a limestone, sandstone or other coal bed which may overlie the one he intends to mine, in order to determine quickly and cheaply the "lay" or structure of the strata in the tract to be operated, before definitely locating his entries or shafts. Otherwise he will incur a constant unnecessary expense in disposing of the mine water and assembling the products of the mine. Then, too, in mountainous regions, where one cannot follow readily the crop of any particular coal bed, owing to irregular or rapid dips, and where the several beds may be held by different parties, he may open the one not owned by the operator, or he may with insufficient knowledge erroneously advise the land owner that the bed he did not sell is being mined by the operator, and thus involve both parties in long and expensive litigation to determine the identity of the coal in question. This is not a conjectural case, but one that actually occurred only recently, and was determined by the Court in favor of the defense in June, 1911, after long and expensive preparation for trial by both parties to the controversy. Had the eminent engineer who advised the plaintiff in this case been sufficiently trained in geology, he would have saved both litigants much time and expense.

This question of the identity of coal beds is one of the most important problems with which the mining engineer has to deal, and unless he has had practical training in geology, the reports that he is often called upon to make on any particular coal property may be misleading. Certain coal beds are fairly regular in thickness and quality, are subject to few "rolls," "wants," or "clay veins," and are of good quality, while other beds in the same series may be characterized by exactly opposite features.

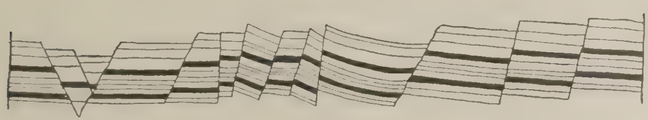
In the New Cumberland region of West Virginia, an eminent mining engineer is reputed to have mistaken the Lower Freeport or "Rogers" seam for the celebrated Pittsburg bed, and embodied this erroneous identification in a report upon a large coal property, while in southern West Virginia another distinguished engineer committed the same error in identifying the Pittsburg coal on a property along the waters of Big Coal river, where the horizon of that particular coal bed was 700 to 800 ft. higher.

In passing from one region to another widely distant in any coalfield, there is always danger of error in the identification of coal beds, especially when the intermediate regions have not been studied in detail. I fell into an error of this kind in my first (1884) study of the coals along the Great Kanawha river through accepting previous identifications by eminent geologists and mining engineers as correct, and thus confusing the greatly expanded Mercer series of coals with those of the Allegheny, until a brother geologist detected the error in a study of the fossil plants.

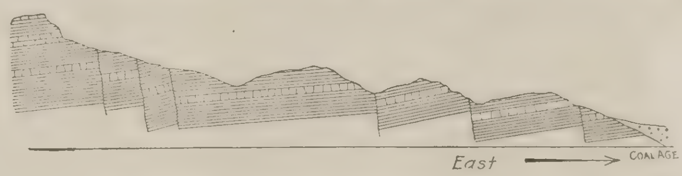
Rocks Overlying a Coal Bed

The character of the rocks overlying a coal bed will mean nothing to the ordinary engineer, but if he has geological training he will know that a coarse sandstone roof means frequent erosion or thinning away of the coal, and also long and expensive headings to be driven through hard rock, as well as a coal bed generally high in sulphur contents by invasion of sulphur-bearing waters from above. He will also know that a fireclay shale in the immediate roof of his mine will mean frequent and dangerous "falls" and much added expense in entry and mine maintenance. The character of the mine floor, too, will receive his attention, and from its peculiarities he will determine whether it will "heave" or otherwise when subjected to moisture and mine conditions after the overlying coal is removed, and it is called upon to sustain the pressure of hundreds of feet of rock material.

When operating coal beds in a region traversed by faults, a knowledge of the law of faults as illustrated in the classical case of the Yarrow Colliery by De La Beche, or that of the Pahranagat Mountain range, Nevada, by Gilbert, both of which are here republished, will prove of immense value in finding the coal after it suddenly disappears, settling practically always down the slope of the "over-hanging" wall of the fault.



Section across Yarrow Colliery



Section of Pahranagat Range, Nevada

*State geologist, Morgantown, W. Va.

Georges Creek Coalfield, Maryland

By R. Dawson Hall

A semibituminous field of great purity in Northwestern Maryland, where the application of modern methods has not only resulted in a high percentage extraction, but in economy of operation.

The Georges Creek field lies wholly within the synclinal named after that stream. The shape of the field is that of a canoe or spoon, the measures rising along the line of the strike, both northeast toward the Pennsylvania line and southwest toward Piedmont, W. Va., from a center of depression, situated at the pumping station of the Consolidation Coal Company, one-quarter of a mile east of Borden shaft.

This synclinal fold extends beyond Piedmont, W. Va., to the south, running along the northern branch of the Potomac, and this extension is situated partly in West Virginia and partly in Maryland. It exhibits in one place only, and that in insignificant degree, the "Big" or Pittsburgh bed. This lower coal area is not usually regarded as a part of the Georges Creek field, partly because of the absence of the most important beds of that region, and partly because the stream traversing the valley is no longer Georges creek, but the Potomac river. For this reason, this extension will not be treated in this report, the southern boundary line of the field to be discussed being the great bend in the river between Keyser and Bloomington, which completely cuts out all the coal measures, where it breaks through the Allegheny mountains.

To the west of the Georges Creek basin lies the big Savage mountain, and to the east lie Dans and Piney mountains, but whereas the coal-bearing formations extend up the slopes of those flanking elevations, the principal or Big bed is limited to the valley lying between them. The point of highest surface elevation along the basin is at Frostburg. Here is situated the ridge, which divides Georges creek from Jennings run. The direction of the synclinal fold is about N. 37 deg. E., being that generally found in the Appalachian field.

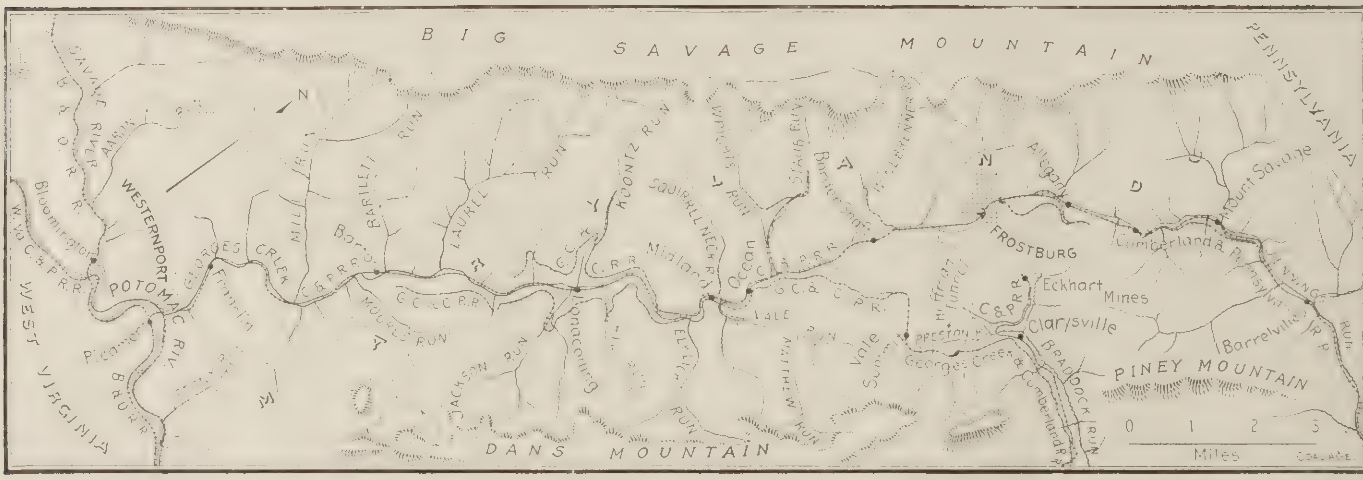
Despite the fact that the edges of the syncline are tilted up to as great an angle as 60 deg., and that the field is situated in the very heart of the Allegheny mountains, where vertical measures are frequently encountered, there are no throw-faults to make working of the measures difficult. On the whole the basin is regular and straight, though minor irregularities occur, which have made much ditching and even some tunnelling necessary in order to connect up the subsidiary basins with the central basin of the field.

Moreover, the coal is not broken, nor markedly prismatic in structure. In this it is very different from the coal in the first bituminous basin of Pennsylvania, which appears to have been more affected by Paleozoic violence. But there are other evidences which point to primeval stress. The cleats of the coal are not strongly marked, the lumps of coal shipped to market being rarely cuboidal. In some places the coal falls so easily that it is mined without shooting, and the roof is everywhere full of seams and tends to shear off shortly rather than to bend before breaking.

Cross-section of Beds

The following cross-section shows all the beds to be found in this field, with the intervals between them; these intervals are not equal throughout the region, and it must be borne in mind that as figured in the table they are merely averages. The Upper Sewickley may be situated anywhere between 95 ft. and 125 ft. above the Pittsburgh bed, the interval gradually increasing toward the south. That statement will serve alone as an indication of the inequality with which beds in this region have been deposited. In the following table, the third column shows the interval between the bed mentioned and the next bed below.

Thus the Dunkard formation contains 7½ ft. of coal; the Monongahela, 26½ to 37½ ft.; the Conemaugh, 24 to 28 ft.; the Allegheny, 21 to 30½ ft., and the Pottsville, 8 ft.; making a total thickness of from 87 to 111½ ft. It will be noted that the Conemaugh, or Lower Unproductive measures, not only contain from 24 to 28 ft. of total coal contents, but also include one bed, the Bakerstown or Barton coal, which is worked at eight separate small operations in this region. It is possible that others may be worked later, and the fecundity of those measures here, and still more further south, well justify the United States Geological Survey in its insistence in the giving of purely place names to measures, rather than names expressive of conditions, which may change their character from region to region.



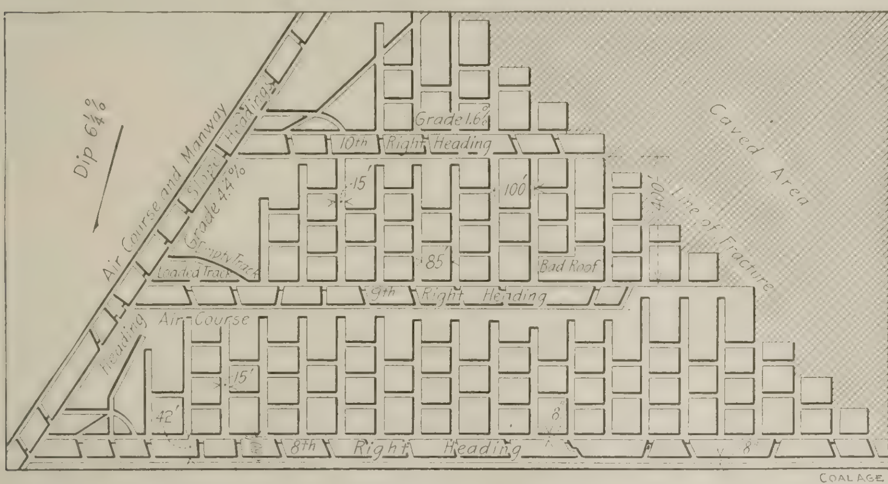
Map of Georges Creek Region, Maryland

Economic Importance of Beds

The importance of the various beds, as at present developed, is best shown by the following statement of tonnage in this field, as produced between May 1, 1910, and the same day 1911, calculated from the annual report, an advance sheet of

which was furnished me by the courtesy of John H. Donahue, State mine inspector of Maryland:

Name of Bed	Long Tons	Percentage of Total Production of Region
Pittsburg	2,921,278	72.7
U. Sewickley	535,340	13.3
L. Kittanning	317,960	7.9
Bakerstown	172,461	4.3
L. Sewickley	26,126	0.7
Clarion	23,982	0.6
Brookville	18,571	0.4
U. Freeport	500	0.1
	4,016,218	100.0



Narrow Rooms, Large Pillars and Retreating System Characterize Mining in Georges Creek Region

It will be seen what a lead the Pittsburgh bed has in this district, and this lead will continue for many years. The Big bed is by no means exhausted, but nearly all the holdings underlaid by this measure belong to the Consolidation Coal Company, and in the coming annual report that company will be shown to have mined 70 per cent. of the whole regional output from that bed. The unworked coal lies in the northern two-thirds of the field. It is 252 ft. deep in the lowest point in the region. This has proved a considerable obstacle in mining and has resulted in slower development where it had to be met. However, a long tunnel, known as the Hoffman, was commenced in 1903 and completed in 1906. Starting in Preston run, a small draft from Braddock run, at a level of 300 ft. below the Pittsburgh bed, and running two miles in a straight line, it taps the basin close to the pumping shaft, which is now only used as a manway and airway, and as a means of delivering power to the workings below. This tunnel, with the aid of subsidiary tunnels and deep ditches, will drain the whole Pittsburgh bed, and the coal deposited over it.

Pittsburgh Bed Not All Mined

The Big, or Pittsburgh bed, which in the basin is about 14 ft. thick, is not mined in its entirety. The upper part is called the "rashings," a coal high in sulphur and interstratified with bone coals and slates. It could be washed with excellent results, but this is never done. The rashings measuring from 3 ft. to 4 ft. and the draw slate below it running about 18 in. are hard to hold in place. When mining is conducted so as to leave them unsupported and to permit the air to work on the draw slate, they fall, and to retain them in place the top coal measuring from 8 in. to 30 in. is left as a protecting plate for the roof. This top coal is equal in value to the breast coal and some day an attempt will doubtless be made to save it in all new workings. Then the rashings will also have to be gobbed or removed. Fortunately the "little rock" above the rashings is a reasonably strong plate, as rocks run in this region. The composition of the Big bed as shipped is as follows:

ANALYSIS OF "BIG" SEAM

Moisture	0.74 per cent.
Volatile matter	18.69 per cent.
Fixed carbon	73.88 per cent.
Ash (including sulphur)	6.69 per cent.
Sulphur	0.81 per cent.
Calorific value	14,191 B.t.u.

It will be observed that the coal is high in fixed carbon and low both in ash and sulphur. This absence of sulphur is perhaps the reason why Georges Creek coal does not spontaneously ignite, however stored, though the causes of such ignition in coal is a much debated subject. It also gives the coal its lead as a smithing fuel, much of it being shipped in box cars and even in sacks. As much as 10 per cent. of it is used for smithing purposes. Some of the coal is sold in Europe, Central and South America, Canada and the far West. It is also used as steam coal for the U. S. Navy.

The Sewickley Beds

The Upper Tyson or Upper Sewickley seam runs as low as the big bed in sulphur and ash and would well take its place in the market though the operating companies are keeping the coal from the two seams separate, having their dumps arranged with a movable baffle plate so that the Sewickley coal may go in one car and the Pittsburgh in another. This is made easier by the hauling of full trips of cars loaded with coal from either bed and by movable display signs notifying the dumpers of the location from which the coal is derived. A method of bookkeeping enables the company to trace their

APPROXIMATE RELATIVE POSITION AND AVERAGE THICKNESS OF THE COAL BEDS OF MARYLAND

Formation	Beds	Average Thickness	Perpendicular Distance
Dunkard Formation	Jollytown	2 ft.	222 ft. 0 in.
	Washington	3½ ft.	48 ft. 6 in.
	Waynesburg "A"	2 ft.	46 ft. 4 in.
Monongahela Formation	Waynesburg or Koontz	3 ft. to 6 ft.	57 ft. 3 in.
	Uniontown	0 ft. to 1 ft.	63 ft. 4 in.
	Upper Sewickley or "Tyson"	3 ft. to 6 ft.	48 ft. 6 in.
	Lower Sewickley or "Tyson"	2 ft. 6 in.	48 ft. 10 in.
	Redstone	4 ft.	33 ft. 0 in.
	Pittsburgh or "Big Bed"	14 ft. to 18 ft.	75 ft. 8 in.
Conemaugh Formation	Little Pittsburgh or "Michaels"	2 ft.	93 ft. 0 in.
	Franklin, Little Clarksburg or "Dirty Ninefoot"	9 ft.	23 ft. 0 in.
	Lonaconing	2 ft.	86 ft. 6 in.
	Elklick	1 ft.	34 ft. 3 in.
	Friendsville	2 ft.	49 ft. 0 in.
	Maynardier	2 ft. to 3 ft.	40 ft. 6 in.
	Bakerstown, "Fourfoot" or "Threefoot"	2 ft. to 5 ft.	97 ft. 3 in.
	Brush Creek	2 ft.	87 ft. 10 in.
	Mahoning	2 ft.	48 ft. 2 in.
Allegheny Formation	Upper Freeport, "Rock Vein," "Threefoot" or "Fourfoot"	3 ft. to 6 ft.	54 ft. 7 in.
	Lower Freeport	2½ ft.	105 ft. 0 in.
	Upper Kittanning	1 ft. to 3½ ft.	45 ft. 10½ in.
	Middle and Lower Kittanning or "Sixfoot"	6 ft.	21 ft. 4 in.
	Split Six	3 ft. to 4 ft.	91 ft. 6 in.
	Clarion or "Railroad" Seam	2½ ft.	13 ft. 7½ in.
	Brookville or "Bluebaugh"	3 ft. to 6 ft.	33 ft. 1½ in.
Pottsville Formation	Upper Mercer, "Mt. Savage" or "Fireclay" bed	3 ft.	10 ft. 10 in.
	Lower Mercer	1 ft.	169 ft. 2 in.
	Quakertown	2 ft.	128 ft. 8 in.
	Upper Sharon	1 ft.	36 ft. 3 in.
	Lower Sharon	1 ft.	4 ft. 0 in.
	Mauch Chunk red shale		

mine cars so that months later any carload of coal can be traced back to the mine, the seam, the heading, and the room in which the coal was loaded and to the men who, together, loaded it. The Consolidated Coal Company used to analyze samples from every carload of Sewickley coal. But finding that the output was very regular, about ten samples are now taken in every mine every two, three or four months, so as to determine the uniformity of the coal shipped. Its excellence can be judged from the average analysis hereunder submitted:

ANALYSIS OF UPPER SEWICKLEY COAL

Moisture	0.63 per cent.
Volatile matter	19.27 per cent.
Fixed carbon	73.88 per cent.
Ash (including sulphur)	6.20 per cent.
Sulphur	0.85 per cent.
Calorific value	14,570 B.t.u

The Lower Sewickley, mined only near the pumping shaft, is markedly like the upper bed, as the average analysis of eight samples shows:

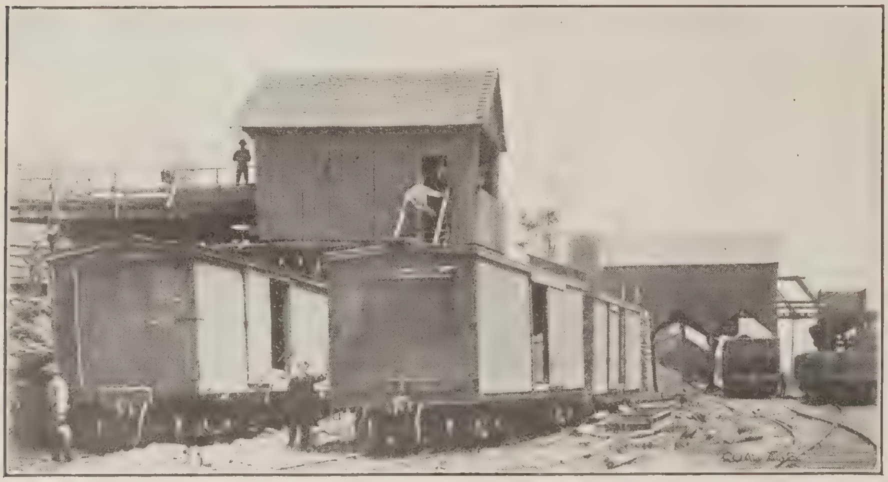
ANALYSIS OF LOWER SEWICKLEY COAL

Moisture	0.66
Volatile matter	18.94
Fixed carbon	73.56
Ash (including sulphur)	6.84
Sulphur	1.14
Calorific value	14,547 B.t.u.

The coals below the Pittsburgh bed mostly run higher in sulphur than the Tyson beds or the Pittsburgh. But for general purposes they are good, having a calorific value of over 13,000 and frequently of over 14,000 British thermal units.

Hauling and Surface Appliances

The equipment of the Georges Creek region has marked individuality. As the mines have dips running from level up to 20 per cent., heavy hoisting equipments are installed. As the coal is thick, it has been possible to introduce heavy draft horses, but mules are also used, the proportion running about one mule to every two horses. There is a disposition to favor horses and even in the Tyson bed, which is thin, the use of stocky ponies is being advocated in place of mules, which, when short, are invariably too light. The horses appear to retain their health under somewhat unfavorable circumstances. The mines are not by any means dry and it has not been possible to avoid the presence of mud in the haulage roads. The live-stock haulage is everywhere subsidiary to that of the rope but in some places electric and compressed-air haulage are used.



Box-car and Gondola Tipples, Exhibiting Simplicity of Construction

In order to put in a safe signaling system, the Consolidation Coal Company has in some places installed engines and dynamos running at an electric pressure of 110 volts. However, a stock of electric batteries is kept in charge in case the signaling dynamo should break down. The fans of the region are large and of slow-speed type, usually arranged for forcing air into the mines, set clear of the shafts or drifts they serve, but connected by fragile ducts, which on an explosion occurring would be blown to pieces, thus saving the fan. However, explosions are not to be expected; the coal is free from gas in the beds worked and there is enough water to keep the dusts from being explosive in character. Moreover, the low percentage of hydrocarbons makes the dusts less explosive.

The tipples are remarkably low and simple. They are not built for screening. No devices guard against the breakage of the coal, which seems to sell without regard to its physical condition. The preparation of the coal is all done within the mine. The excellence of this preparation is evidenced by the absence of any unsightly piles of bone coal along the railroad tracks.

Mining Methods

The Pittsburgh bed is frequently mined without shooting. Black blasting powder is used for almost all coal shots in the Big bed, whereas carbonite is used almost exclusively in the Sewickley and both dynamite and carbonite are employed to dislodge rock.

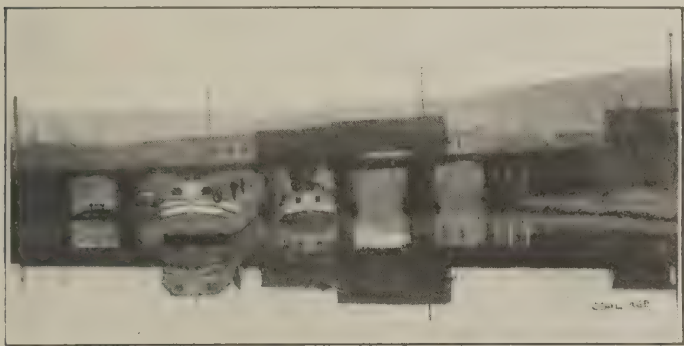
Another interesting feature is to be found in the large quantities of long props used to support the brittle roof. These are 9 or 10 ft. long and measure at least 4½ in. in diameter at the small end, and, if of soft wood, at least 5½ in.; reckoning only, of course, the diameter of the prop beneath the bark. These props are usually stacked on end. They frequently rot where they touch the ground and to protect them they are sometimes dumped indiscriminately and more rarely, laid in crossed piles to dry. They are not usually laid as in other fields after the manner of corded wood, in such a manner that air cannot circulate around them. Corded props rot freely along their full length. As the props cost from 14 to 15c. f.o.b. mine and serve for the extraction of an average of 3.3 tons, the propping of the roof consequently

View at Stable, Showing Excellent Condition of Mixed Stock

consumes no less than 4½c. of the tonnage cost of the coal. In the Tyson bed, long posts are used, being cut to size in the mine as required.

Some attempt has been made by the Consolidation Coal Company to recover salvage rate will be. Some permanent timbering has been creosoted.

There is but little machine digging; only 44 machine-pick diggers and 3 electric chain machines being installed in the whole district. They are used wholly in 100-ft. centers. Roads are laid in the crosscuts. This manner of driving the rooms, together with the absence of gas makes it possible to work several men in a single room, some working at the breast and some in the very lengthy crosscuts

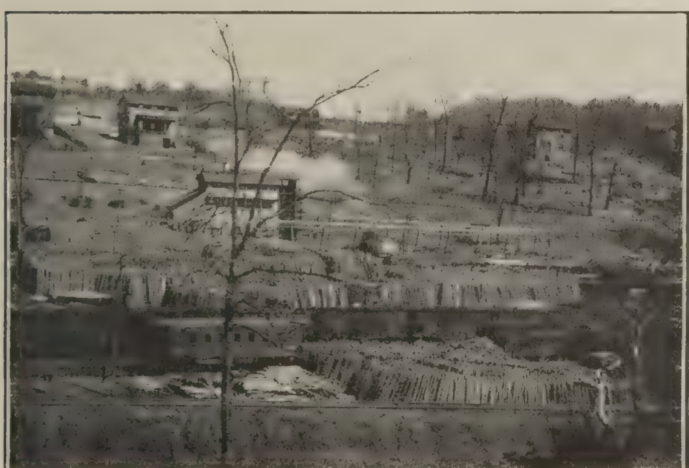


Dumping Coal from the C. & P. R. R. in Barges

Barges Loaded with Coal on Cumberland Canal

Prop Yard in Georges Creek Region

The Roof Being Fissured Demands Much Timber



Props Are, for the Most Part, Shipped In By Rail

The Timber Is Usually Stored on End to Prevent Rotting

the timber used to support chamber roofs, but it cannot be considered successful. Perhaps the proportion recovered does not exceed 8 per cent. The amount drawn from the newly opened Tyson longwall may prove quite large but it is premature to anticipate what the heading and room driving and not in "pillaring" as pillar robbing is here termed.

Rooms Are Quite Narrow

The method of mining now in use is by a series of rooms 15 ft. wide, placed at between the rooms. The nature of the normal projection can be clearly seen in the illustration. It is remarkable that in this—one of the oldest mining sections in the United States—there is the least evidence of the loose-ended wastefulness in operation found in nearly all

coalfields, especially in the older ones. The mines are models of uptodate conservation in a field worked by miners, who brought up to wasteful methods, must have resisted lining up to the more conservative methods of mining.

The Tyson bed is largely worked as subsidiary to the Big bed below, the coal being run to the Big bed track by chutes, either in the mine or outside. These chutes are arranged to have such an excessive fall that storage is provided in them. Thus the coal arrives from the chutes in the large cars used in the Big bed. About 9 per cent. of the coal mined in the Georges Creek region is transported by the South Cumberland canal, to which it is hauled by the Cumberland & Pennsylvania railroad.

Toward the southern part of the field, now almost entirely worked out, long gravity planes were used for lowering loads of coal and raising empty cars. But these have given place to long engine hoists hauling coal out of steeply inclined slopeways to tipples on the level of the outcropping measures, situated on the flanks of the field.

Miners Are a Superior Class

The coal of this field is worked entirely by miners, who are the descendants of the English, Scotch and Welsh miners who immigrated here many years past. It is entirely a nonunion field, but considering the thickness of the coal and the ease with which it is mined the rate of 63c. per long ton is eminently fair. The Consolidation Coal Company has no company houses but owns nearly all the land on which the employees live. Any employee can lease for $2 to $5 a year enough land for a home with a liberal curtilege for truck farming. This lease lasts five years. If the company does not desire to renew the contract, it pays for all improvements at its own price or at a price to be determined by arbitrators chosen by the company and the tenant and by a third arbitrator chosen by the other two. If the tenant is still not satisfied, the terms of the lease permit him to appeal to the county courts. The houses built on this leasing system are not lined up simply in serried rows of uniform plan and color, but are designed and placed to suit the whims of the many owners; they are kept clean and orderly, the tenants delighting in cultivating the pretty flower gardens with which, in nearly every case, the fronts of the houses are graced.

I desire to express my acknowledgments to H. V. Hesse, general manager, and R. A. Walter, chief engineer, of the Consolidation Coal Company, from whom much of this information was derived.

Don't use discharge pipes or water pipes of any kind for air lines if it can be avoided. The scale will block the air ports. If so used, the scale should first be loosened or blown out thoroughly.

Developing a New Field in Iowa

By Carl Scholz.*

Through the construction of a line from Des Moines to Allerton, 68 miles south, the Rock Island Railway is developing the largest unworked coal area in Iowa and what appears from the drilling to be the most compact body of clean coal that ever existed in the State. A conservative estimate indicates that at least 200,000,000 tons of coal, lying less than 400 ft. below the surface, will be available for transportation.

The only reason for delay in this development was the high cost of railroad construction. The new line, in connection with the recent purchase of the St. Paul & Des Moines Railroad by the Rock Island, will result in a considerable coal development near the southern end of the new line. This link will connect the coal mines with a very desirable market on the northern end, where Mason City, with its two cement plants and a number of tile and clay industries, is a large and steady consumer of coal.

One of the important developments in this coalfield has been started by the Consolidated Indiana Coal Company, which holds about 4500 acres of valuable coal land in this field.

Development to Be Finished Next Spring.

The construction on shaft No. 1 has been started, so that the mine development will be complete by the time the rails reach the new properties next spring.

Shaft No. 1 is located about 2 miles south of Dallas or 35 miles south of Des Moines. The mine yard will parallel the main track and will have a capacity of 75 loads and empties. Scales will be provided at both ends of the yard to weigh empties before loading; it is also the intention of the company to weigh the loaded cars before they are switched to the north or south bound track.

The tipple will be of steel, equipped with screens to make four sizes of coal. There is a storage bin of 400-tons capacity, so located as to permit the loading of the smaller sizes of coal from this bin into box cars. A separate box-car loader will be installed for the loading of lump coal.

All buildings will be of steel and fireproof construction. It is now planned to install an electric hoist which will be automatic in operation once the starting lever is put in the proper position. The acceleration, slow down and stop will be entirely automatic, including the dumping operation. While it may seem unusual to provide for electric hoisting at a mine where steam is generated, the saving in wages and fuel, the better control of dumping, and the absence of risk from over-winding justifies the installation of such a plant.

A 500-kw. generator furnishes the power for the hoist and the other motors, including power for haulage and undercutting.

Shaft Lined with Reinforced Concrete Frame

The shaft will be lined with a reinforced concrete frame of a new design on which a patent has been granted. This shaft lining, including the concreting and steel guides, costs about 15 per cent. more than the ordinary wood lining. The shaft has a depth of 175 feet.

The second outlet to the mine is a slope on a pitch of 1 to ¾. It will be timbered with steel beams and divided in the center with an air-tight partition; one side will be used as a travelingway and the other for the airway. Underground workings are planned for a capacity of 2000 tons per day.

A machine shop will be provided for the necessary repairs and a bath-house will enable employees to change their clothing before entering the mine and upon their return to daylight.

On account of the distance from any settlements, the coal company will erect a mining town for the convenience of its employees.

*President, Rock Island Coal Company, La-Salle street station, Chicago, Ill.

Mine Rollers

A rope roller which will not roll is worse than none at all. Where the grade is steep and even, a rope will not wear the ties appreciably when the rollers are omitted. On a 24-per cent. grade, it has been noted that where the grade was even, ties remained intact. But trifling deviations in grade resulted in the grooving of the ties.

If the grade is lower than or conforms to the shape which a rope suspended between the top of the hill and the first car would assume at a normal tension, the rope will not wear on the ties at all. Sometimes it would be well to so adjust a rope-grade. Such a plane would give a quick getaway, and a slackening pull at the end of the run. This, in the case of a gravity plane, is better than an even grade, especially if the change in slope is carefully calculated, so as to make the change regular, with no sudden alteration in grade at any point.

Grades in timber entries should be duly considered. If wood rollers are used, the stalling of a roller while the rope is running may cause a mine fire. The same may be caused by the rope running on a tie. The only safe plan is to arrange that the rope is evenly supported by the ties or the rollers, and iron rollers should be used in every case.

Government Regulation of Coal Prices

By John H. Jones*

It is suggested that much good would result from establishing a maximum and a minimum price at which coal can be sold, and then basing the miner's wages on the selling price. It is also advocated that a law be passed taxing all the coal mines in the United States, so as to provide for the families of miners who are killed.

When we realize that during the past 50 years, the production of coal in the United States has increased from 15,000,000 to 500,000,000 tons, we will wonder how it has been possible to make such phenomenal progress.

There is a saying in the coal business that it is either a "feast or a famine." The coal man is either a prince or a pauper, but taking everything into consideration, say for a period of 10 years, a well managed coal company is able to show a fair average earning capacity.

One bad feature of the industry is, that when there is plenty of money in the business and the prices are abnormal, many inexperienced people start mining coal. This brings about a reaction and extremely low prices.

Coal Profits Have Varied

During the past decade, the profit on a ton of coal has varied all the way from nothing to five dollars. When the prices are high, some coal companies try to make every dollar they can, and get out every pound of coal that can be produced, regardless of the safety of the men employed in the mines. When they are not making money, or, in fact, losing money, it is absolutely impossible for the operator to spend the necessary amount to make his mines as safe as they should be.

A Maximum and a Minimum Price

In view of this situation, would it not be better to have Governmental regulation in the selling price of coal, establishing a maximum and a minimum price at which it could be sold, and basing the miners' wages on the selling price? Make the minimum price of coal high enough to permit the producer of coal to use every means known to prevent accidents and conserve coal.

If it was shown to the buyer of coal that every cent, below a reasonable price paid for coal, was stained with the blood of some poor miner, and thereby robbed the widows and orphans of the proper means of sustenance, as well as the means of educating their children, I do not believe that they would try to break the price, as a certain big railroad did a few months ago by securing their coal for five cents a ton less, which means a loss to the operators of this country of more money than the total amount they receive from this company for coal.

A Law Taxing All Coal Mines

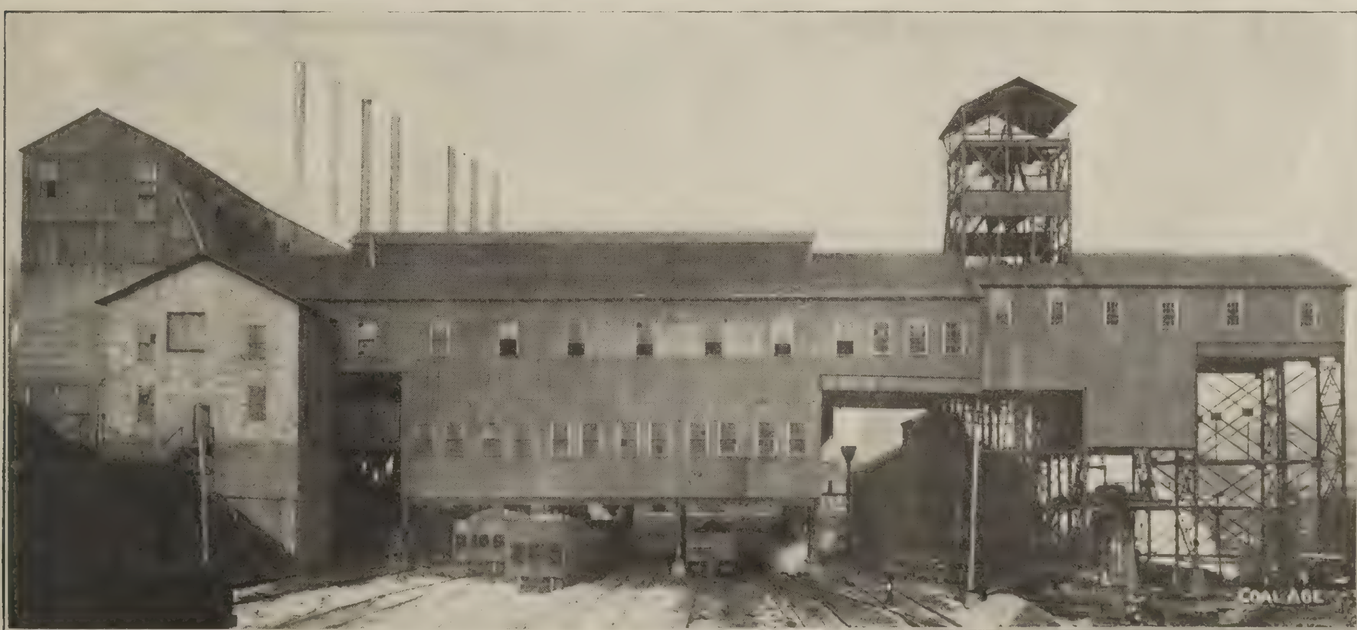
I also believe that a law should be passed, taxing all the coal mines in the United States, which money should be administered for the purpose of paying, to the miner's family, a sum equal to the wages he would receive, in case of his death in or around the mines, or to pay his regular wages, in case of an accident which would prevent him from earning a livelihood thereafter.

There is no more horrible fear, to a miner, than the fear of an accident after he goes down into the mine, and the further fear that his wife and children may be left without means of support, and that his children, in all probability, will not receive the education they should have. This is a serious question and one that should be carefully weighed by all of our legislators.

A Law for the Regulation of the Industry

A proper law for the regulation of the selling of coal, and a proper law for the administration of a fund to take care of the miner, himself, in case of an accident which would disable him, temporarily or permanently, or in case of fatal accident, care for his widow and orphans, will eliminate many of the anxieties of the business, and will do justice to the miners, the operators, and to the public generally.

*President, Pittsburg-Buffalo Coal Company, Pittsburg, Penn.



A New View of the Marianna Tipple and Washer. This Plant Is the Pride of the Pittsburg-Buffalo Coal Company and Is Probably the Most Modern Coal Installation in America. The Equipment and Preliminary Development Work at Marianna Cost More Than $1,000,000

Gas Producer Development

Near Saarbrücken, Germany, there is a gas-producer plant which is operated on mine refuse, containing only 20 per cent. of good coal and averaging over 60 per cent. ash. The fuel used is composed largely of roof slabs from a local bituminous mine.

The generators are of the type known as the Jahns "ring" producer. This producer is characterized by having several combustion chambers, which come successively into operation as gas generators after a preparatory period of gas expulsion and distillation. Furthermore, the arrangement is such that the products of distillation have to pass through large beds of highly incandescent fuel on their way to the gas main, so that the power gas contains only such tar vapors as do not decompose in contact with the glowing coal, and which can therefore be considered as permanent.

Fig. 1 shows a plan and sectional elevation of a "ring" producer having four chambers, each of which can be connected with the main at will. Each chamber is also joined at top and bottom through the passages *B* and *C*, respectively, with the vertical flue *A* at the intersection of the partition walls. The passages *B* and *C* can be opened and closed separately. One or more chambers may be in the gasification stage, and therefore connected with the main, at the same time. The remaining chambers, which are in preparation, discharge through the passages *B* into the flue *A*, and thence through the passages *C* into or under the combustion zone of the producing chambers. Circulation is aided by a steam injector in the upper part of the passage *A*, and the gas is drawn off by means of an exhauster and passed through a scrubber and sawdust cleaner. The gas obtained at the Saarbrücken plant is used under steam boilers and in gas engines. No trouble is experienced with the engines, of which there are about 1800 h.p. in use.

A Producer Burning Lignite

Another form of producer, interesting because of its possible bearing on American needs and development, is the small double-zone suction type in common use through Germany for burning brown-coal briquets. This brown coal closely corresponds to some varieties of American lignite.

A sectional view of such a plant is shown in Fig. 2. The gas is taken off from a point about midway in the hight of the producer and the fire burns from both top and bottom toward the central zone. Air for combustion is admitted through the charging hopper and also through the ash-pit, if necessary. These plants require but little attention beyond filling the hoppers; possibly less than the average producer using anthracite.

A plant of this description is located at Fürstenburg, about a mile from a large brown-coal mine. The coal, which contains approximately 55 per cent. water as it comes from the mine, is ground, dried to a moisture content of 11 to 14 per cent., and briquetted without using a binder. The entire output of the mine is used in this way and the gas obtained drives gas engines for generating electric power.

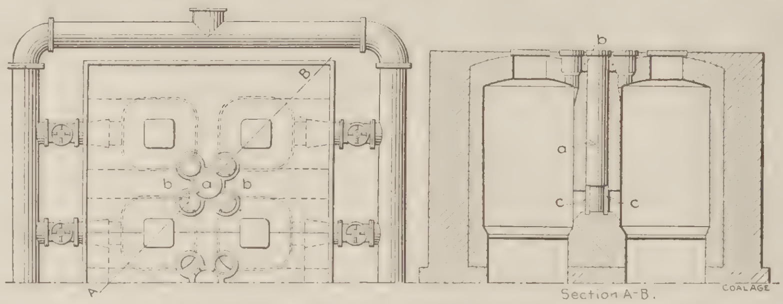


Fig. 1. Plan and Sectional Elevation of "Ring" Producer

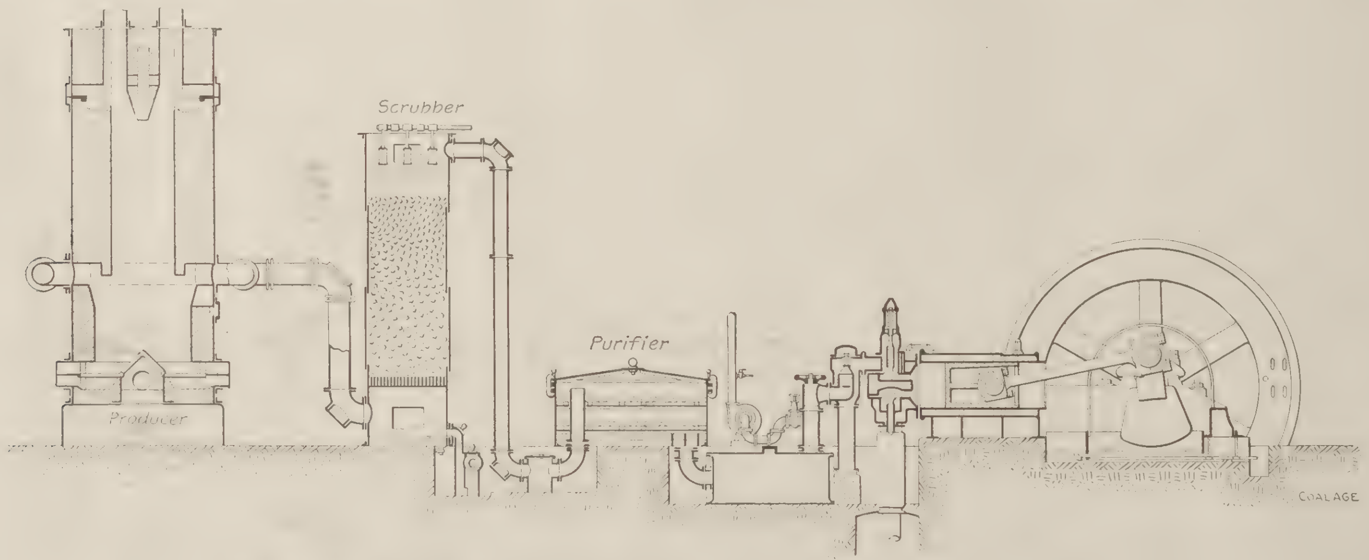


Fig. 2. Showing Sectional View of Double-zone Suction Type of Producer

NOTE—Abstract from Bulletin No. 4 of the U. S. Bureau of Mines, entitled, "Features of Producer Gas Power Plant Development in Europe," by R. H. Fernald.

Painting Mine Survey Stations

The indistinctness with which engineers' centers and bench marks are painted on the roof and ribs in coal mines, would largely be corrected were slaked lime used in place of white lead as a pigment. The lime must be well slaked or it will burn the brush. The objections to lime are the greater weight to be carried and the change of condition, which takes place as it begins to set, often changing a too liquid mixture to one that is too stiff. These are the advantages: A legible mark of an intense white which will last for years, which is scarcely dimmed by smoke, and the use of a material which can be found in almost any plant and which costs but little. Some people prefer to add salt to the water in which the lime is slaked. Whiting does not appear to be preferable to lime. If possible, it would be well to repaint the lime marks after a few minutes' time have elapsed, with the idea of making them more strong and more prominent, but this is not by any means necessary.

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CIRCULATION STATEMENT

Of this, the first issue of COAL AGE, *we will print* 5000 *copies. No copies will be sent free regularly. There will be no back numbers. The figures which will be shown here each week will represent live, net circulation.*

This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

Looking Ahead

A machine works best after some use when the individual parts fit snug. It is likewise true in the case of COAL AGE—we will give you a broader, better paper as we go along. Do not interpret this as an apology for the present or any early issue, but rather consider it a promise to provide a coal journal that will set its own standards and never be content to measure up by what others have done.

Coal men do not write as often or as much as those engaged in other industries. Our idea is to cultivate your taste along this line, and encourage you to discuss the problems that confront the industry at large. No effort spent in this work will be wasted, for it is one field where you reap in full proportion to what you sow.

There are men who pride themselves on their ability to maintain unbroken silence; they look wise and say, "I never talk!" What would happen if we all followed this same plan? Where did they get their basic information? The laws of gravity, the principles of electricity, and in fact, all science would be "Greek" to them if the great minds of the past had been so indifferent to the advancement of knowledge.

Reverting to this initial issue of COAL AGE and the numbers that are soon to follow, you will observe that practically all of the matter published has been prepared exclusively for us. The first of Mr. Conner's articles, comparing anthracite and bituminous mining methods, is on another page. No engineer in America has had a more extended experience in the two main classes of coal mining, and we are sure that all our readers who follow his remarks will be benefited.

These articles by Mr. Conner form only one series of many that have already been arranged for: Electricity in coal mining; safety precautions; mine explosions; mechanical ventilators; mining machinery; preparation of coal, and various phases of general mining practice are subjects that will be handled immediately in great detail.

Perhaps the most valuable feature of COAL AGE during this first year will be the descriptive articles dealing with operations in each of the important fields in America and Europe. Unless crowded out by something more urgent, one of these articles will appear each week. The first of the series, that published in this initial issue, describes the Georges Creek region in Maryland. This field is one of the oldest in America, and is well suited as a leader. In some instances these general articles will be prepared by members of our editorial staff; however, present arrangements indicate that the greater number of these local descriptions will be written by well known engineers identified with active practice in the particular field described.

We might fill a page here outlining our plans, but we know that you want the realization, not the anticipation. The beginning of your realization is the paper here before you. Much in the way of style and scope has been reserved for the issues immediately succeeding; we want to please you and we have our ears to the ground, listening for any suggestions that you will be kind enough to make.

Reciprocity in Coal

Canada's refusal to sustain the Laurier government in its reciprocity arrangement with the United States must be regarded as the outcome of a complex series of factors. Not only the economic side of the agreement, but also many purely political influences were at work to produce the result. The trade aspects of reciprocity were, therefore, by no means the only ones that led to its defeat. Nevertheless they had their effect, and the coal question was probably as influential as any in turning opinion against the agreement. Particularly in Nova Scotia and the Northwest did this issue figure.

The agreement with Canada provided for the admission of American bituminous coal, such as would not pass through a three-quarter-inch screen, into Canada at 45c. per ton, while Canadian coal, slack or culm, such as would pass

through a half-inch screen was to be admitted to the United States at a 15c. rate. The change proposed was certainly not extreme. The existing rate on American coal entering Canada was only 53c., while imports for last year were about 5,700,000 tons and yielded $3,000,000 of customs duties.

It was estimated that the amount of duties remitted under the arrangement would be only about $450,000. As for the Canadian coal to be admitted to the United States, the change proposed was trifling and would not have altered existing conditions of competitoin largely. Why this moderate alteration in duties on either side should have aroused opposition is not easy to understand, but reference was made to it not only in the sections of Canada which produce coal, but elsewhere.

The real cause of the difficulty appears to have been found in the belief that a change in rates would lead to an alteration in the distribution of freight. Canadian railroad managers were almost morbid in their fear that changes in the tariff would result in diverting the carrying trade from an east and west line into north and south channels, thereby giving business to American shipping on the Great Lakes and the coast as well as to American roads connecting with Canadian points, at the expense of Canadian transportation lines.

In the case of coal, as in that of other commodities, it was apparent that the consuming public of Canada was desirous that the advantages of reciprocity should be realized. The reciprocity arrangement would have tended to cut the rates for coal to some extent at quite a number of points, or at all events would have operated to restrict the control of the market by local dealers. Prices are high in Canada for nearly all consumable goods, and there were many persons who regarded the reciprocity arrangement as essentially a plan to admit cheaper articles from a country where they could be more easily produced.

This was a curious parallel to the similar point of view which existed in many parts of the United States. It is not likely that the reductions made in the agreement either on coal or other articles would have altered prices much, but Canadians saw that the natural tendency of the reciprocity undertaking would have been toward a still freer interchange under the terms of other agreements that might be negotiated later on. "Unrestricted reciprocity," which Sir Wilfred Laurier frankly said had been asked for by the United States on a list of articles including the products of mines, was feared by them as a possibility.

This fear is one that is undoubtedly likely to be warranted by future events. Influenced as it was by the extraneous factors already referred to, the Canadian election cannot be accepted as a truthful indication of Canada's attitude toward closer trade with this country. Canada needs to admit our coal and other mine products at many points along the border at lower tariff rates as much as we need to admit hers.

There is reason to believe that the defeat of reciprocity will prove to have been only a temporary check in the development of trade relations between the two countries, though the election results may defer closer commercial union for a considerable time.

Pollution of Mine Waters

The Health Laws of the State of Pennsylvania expressly exempt the waste from mines and tanneries from restrictive legislation. It has been found on bacteriological examination by the Department of Health of that State that the bacillus typhosus (the bacillus of typhoid), the bacillus anthracis (that of anthrax), and the bacillus coli (the amiable bacillus inhabiting the colon) are destroyed by infusions of mine water. It may be that the presence of hydric and ferric sulphates in the waters of the mining regions of Pennsylvania gives the inhabitants of those regions their recognized relative immunity from consumption.

It is well to recognize that the redness of mine water is not at all due to the presence of sulphuric acid, which is almost colorless. Streams are not, as is often stated, "red with sulphur." The impurity which reddens the creeks and coats the rocks and which has a characteristic ocherous color, is ferric hydrate.

The iron pyrites, in the presence of oxygen and water, break up into ferric hydrate and hydric sulphate. The former is quite harmless; the U. S. Bureau of Agriculture in a recent bulletin terming it a fertilizer. Even unneutralized by earthy oxides, the sulphuric acid is not wholly harmful. Free sulphuric acid, as also free sulphur, has been used as a fertilizing agent and has value when the soil is deficient in such elements. The presence of limestone causes the sulphuric acid to turn to calcium sulphate or gypsum, which is harmless to vegetation. So that in small quantities, as can well be seen, the sulphuric acid and ferric sulphate work no harm to the farmer and are not undesirable components of such river water as is not being used for drinking or washing purposes, and may serve in some quantities to make waters, otherwise dangerous, safe.

And indeed, sulphur is an essential constituent of albumen, to be found in the cells of all plants, and it appears to have been present as part of vegetable life from Paleozoic ages to the present. The extent to which it is so found is not well understood. It is customary in most chemical analyses to heat to desiccation and to treat the elements and compounds driven off before the analysis is taken, as water vapor. In this action, volatile sulphur passes off. Emil Wolff, who has made investigations into the sulphur contained in vegetation, has thrown considerable doubt on the accuracy of his results, by the method of analysis which he employed, because he took no account of sulphur volatilized at low temperatures.

Certain greenish weeds seem to prefer sulphuric waters as a habitat, and all vegetation seems able to sustain life, with a certain percentage of sulphuric acid in the water it imbibes. The water receives a treatment by this infusion of mine waters similar to that frequently employed in purifying plants.

There are places, it is true, where an excess of either sulphuric acid or ferric hydrate appears to have killed vegetation, and where trees have rotted as a result of the injury which has been done to them by its presence. Many trees near mines are killed, by sulphurous fumes, or by the deep burying of their roots in mine refuse. However, some have died and later rotted as a direct result of mine water. On the other hand, the fertility of the banks of the Monongahela, between Clarksburg and Fairmont, W. Va., bears witness to the fact that quite a large amount of mine water does not injure vegetation; otherwise the little grassy islands in polluted portions of the river would not be so universally apparent.

Colliery Notes and Comments

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

A mine fire in the Panther Creek Valley region, Pennsylvania, burned for over fifty years before it was successfully combated.

When an exceptionally high temperature is found at any part of a road through a gob, everything else being in order, and ventilation as usual, look at once for a gob fire.

When laying out a haulageroad see that it is driven as straight as possible. When it is necessary to change the direction, use long radii curves, also connect cross headings with easy curves.

The best and most serviceable form of air bridge is that cut in the solid. The first cost is somewhat high, but experience has shown that this form is best adapted to withstand the force of explosions. It is self-supporting, costs little for repairs and can be easily enlarged at small additional cost.

Experience has shown that one of the greatest aids to power-plant economy is the frequent and systematic analysis of the flue gases given off by the boilers. The quantity of carbon monoxide, oxygen and carbon dioxide tell accurately the quality and quantity of work being done by the boilers and the coal.

Some of the requirements for breaker machinery are: 1. Simplicity of construction, so that experts are not needed to run it. 2. Reliability. 3. Construction with interchangeable parts so that expensive duplicate machinery need not be kept on hand. 4. Rigidity of construction in order to withstand shocks.

Relative humidity means the quantity of moisture in the air as compared with the quantity held in suspension when the air is saturated. This relation is expressed as a percentage. When air is saturated the relative humidity is 100 per cent. Temperature decides the amount of moisture necessary to saturate air.

The new Mineral Spring breaker of the Lehigh Valley Coal Company, at Parsons, Penn., is built entirely of steel, concrete, corrugated iron and glass. The frame is of steel; the foundation of concrete; 1,169,000 lb. of steel were used in its construction. Another unusual feature is its large amount of window area. It has a capacity of 1500 tons of coal per day, and can be operated by 35 men.

If a gob fire is small and easily accessible, dig it out and send it to the surface in iron cars. If too large for such treatment, the gob must be sealed and the fire choked by lack of oxygen. To do this, erect brick stoppings tightly packed with sand. First, build a stopping in the return, and fit it out with a pipe and tap so that the gas may be run off if necessary. Next build the intake stopping, thus sealing the gob tightly and smothering the fire.

When tamping holes for electric firing, take great care not to cut the wire or damage its covering. Allow 8 in. of wire for each connection. Many an otherwise successful shot has been spoiled by carelessness in this direction. See that you have clean wire ends, free from covering, with which to make connections. If they do not seem bright, rub with a knife or stone, then twist firmly. Never loop the wires. Never allow uncovered joints to touch the ground.

Where the object is to obtain as pure a coal as possible, all loading in the mines should be done by hand, as this allows for the removal of most of the impurities at the working face, while chute loading sends out a dirty coal, because everything brought down by the blast is necessarily loaded out. Hand-loaded coal in clean anthracite veins sometimes sizes as high as 2.3 tons per 100 cu.ft. of mine-car capacity, while chute-loaded run-of-mine often runs as low as 1.2 tons.

Investigations made by the Bureau of Mines have shown that the relative humidity of the main-return air current of a mine is nearly always over 90 per cent., no matter what the relative humidity of the outside air may be. The average relative humidity in the returns of various coal mines was found to be 90.5 per cent. A lower humidity was found in the Rocky Mountain region where the air outside the mines is uniformly dry most of the time.

When furnaces are well adapted to the kind of coal to be burned there will be little loss of combustible gas. The efficiency of combustion of the volatile matter in coal depends on the kind of furnace used. With a poor furnace and poor firing an 18 per cent. volatile coal may give results ten or twelve per cent. higher than a 30 per cent. volatile coal. The presence of ash in coal lowers the heating capacity of the combustible by interfering with the circulation of air through the fuel and by loss of heat while fires are being cleaned.

An ordinary miner's lamp will go out in the presence of a small amount of carbon dioxide, if the oxygen of the air is reduced to as low as 17½ per cent. In cases where a mine is sealed up to extinguish a fire, if the sealing is sufficiently tight, the oxygen is soon reduced below this figure; but if the sealing is not tight, the fire may smoulder on, until the opening of the mine brings a fresh supply of oxygen and it then breaks out again. The only reliable data on which to decide the time for opening a sealed mine is that furnished by careful analyses of the mine gases.

To insure the comparatively safe robbing of pillars the following points should be observed: 1. Make all skips as short as possible. 2. Do not allow skips to meet. 3. Keep all skips regular and not too wide. 4. Take out the timbering as soon as possible after the skips are finished. 5. Use an abundance of timbering. 6. Avoid a multiplicity of small pillars or small skips finishing simultaneously. 7. Guard against heavy falls, which are apt to send accumulations of firedamp out into the roadways. 8. Use only safety lamps. 9. Employ only the most experienced and trustworthy men for the drawing of timbers.

The stone-dust method of laying dust in coal mines consists in throwing finely crushed shale dust on the ribs and timbers of passageways and scattering it over the floor. Wherever coal dust is visible, more shale is thrown on. It is also placed on boards fastened to the timbers over roadways, and on swinging canvas shelves. The dust so placed is thrown into the air at each blast and extinguishes the flame. This method is especially recommended for mines where it is not advisable to wet the roof, or in coalfields where water is scarce. The longwall field of northern Illinois, where the floor is composed of shale which is constantly rising and falling in small quantities, thus covering the coal dust, has not had an explosion in 40 years. In Colorado and New Mexico adobe dust and sand are used in place of shale.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

Motor Haulage

What weight of motor will be required to haul a trip of ten cars, carrying a load of three tons each up a grade, assuming a coefficient of friction of 0.03 and a coefficient of traction of 0.18, the tangent of the angle of inclination of the track being 0.02619?

ANTHRACITE.

The contents of 10 cars weigh $10 \times 6{,}000$ lb. $=$ 60,000 lb. The 10 empty cars are assumed to weigh 10×2000 lb. $=$ 20,000 lb. The gross weight, therefore, is 80,000 lb. Now the tangent of angle of inclination of track $=$ 0.02619; hence the angle as deduced from the tables is 1 deg. 30 min.

The frictional coefficient is always figured as a percentage of the weight of the body when on a level. When running vertically the friction will be zero because the wheels will not revolve or slide on the track. Intermediately the friction will equal the product of the weight of the body together with the frictional coefficient and the cosine of the slope.

Consequently the frictional resistance of the cars will equal $80{,}000 \times 0.03 \times$ cos. 1 deg. 30 min. Cos. 1 deg. 30 min. equals 0.99966, so that the resistance of the cars equals 2399.2 pounds.

The drawbar pull needed for the elevation of the cars without regard to friction equals the weight of the cars multiplied by sin. 1 deg. 30 min.; or equals $80{,}000 \times 0.02618$ (for sin. 1 deg. 30 min. $=$ 0.02618) $=$ 2094.40 pounds.

But if the motor weighs W lb., being on the same grade, it will have a resistance to downward motion to overcome equal to $W \times$ sin. 1 deg. 30 min. $= W \times 0.02618$ lb. Adding up resistances, we have, $2399.2 + 2094.4 + W \times 0.02618 = 4493.6 + W \times 0.02618$.

We have assumed that the tractional coefficient given is the excess coefficient of traction after allowance has been made for the friction of the motor itself, running on a level. It must be remembered that whatever journal or other friction the motor may have, is taken up by the electrical power and does not effect in any way the tractional ability of the engine so far as adhesion to the rails is concerned. The frictional coefficient of the motor conceived as a tractive engine is but small compared with the whole friction of the motor considered as a power engine and its self-resistance to its own traction is solely a track- and not a track- and journal-resistance as in the case of the cars.

To overcome these resistances there is the friction of the motor on the rails. The coefficient of resistance is reduced in proportion to the cosine of the angle of inclination and is therefore $0.18 \times 0.99966 = 0.17994$; therefore, the tractive pull will equal $0.17994W$. Hence, $0.17994W = 4493.6 + 0.02618W$.

Therefore, $0.15376W = 4493.6$, or $W = 29{,}224$ lb., about $14\frac{1}{2}$ tons.

It would seem that 15 tons would be an amply heavy motor because the tractive coefficient given is low for a sanded mine-rail, and the rolling friction of the equipment is almost twice what it should be, and it is assumed that the weight is being calculated for the maximum grade the motor will have to climb. The tractive coefficient is usually taken at 0.25.

On easy grades it is customary to assume that the frictional and tractional coefficients are unaffected by the grade and that the gravitational resistance equals the weight of the train and motor multiplied by the tangent of track inclination; the sine and tangent for small angles being nearly equal; therefore a short solution for this same problem is as follows:

The frictional resistance of motor and cars weighing in all $80{,}000 + W$, $= (80{,}000 + W) \times 0.03$ lb. The gravitational resistance $= 80{,}000 \times 0.02619$ lb. The traction $= W \times 0.18$ pounds.

Therefore, $W \times 0.18 = (80{,}000 + W) \times 0.03 + 80{,}000 \times 0.02619$.

Therefore, $W \times 0.15 = 4495.2$. $W = 29{,}968$ lb. It will be seen that the short solution for a low-grade serves every practical purpose.

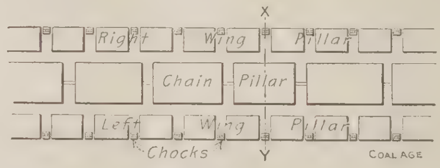
Prevention of Squeeze

If a butt-heading, from which rooms have been driven and the pillars drawn, is under squeeze and it is considered advisable to support the same with chocks, where should these be set, and why?

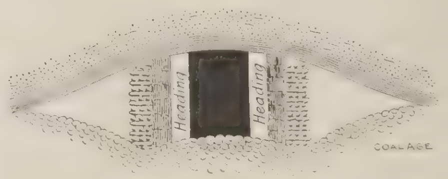
FOREMAN.

The chocks should be placed, as far as is possible, in all the necks of the rooms, over which the squeeze has traveled. They should be placed so that the outer edges of the chocks are flush with the breaking edge of the wing pillar, as in the accompanying figure. There are several reasons for this being a preferred arrangement.

1. There is more movement of the roof and floor and more compression at the breaking edge of the pillar than anywhere else, so that (a) the chock is more surely brought into action (for a chock cannot be driven so tight that it will uphold the roof when it is first put in, and the sustaining strength becomes greater the more the chock is squeezed); (b) the chock is put at a point where it can aid the pillar in the most effectual manner. If the pillar is not thus aided, its edges will be broken; their power for resistance being thus destroyed, the rest of the pillar will be more heavily burdened. The squeeze will move forward from the edge to the heart of the pillar. The placing of the chock should be such as to preserve all the powers of resistance of the coal. A squeeze usually advances by crushing off the edges con-



PROTECTION AGAINST SQUEEZE



CROSS-SECTION ALONG XY

tinuously till the pillar is so much reduced that it can no longer offer an effectual resistance.

2. When the chocks are so disposed, there will be no difficulty in finding an opportunity of building other chocks should they be needed. If set near the heading, further chocking cannot be attempted without removing a portion of the rib.

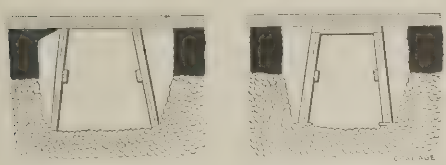
3. The arrangement of chocks shown furnishes an opportunity to inspect the progress of the squeeze, to determine its menace to workings on the advance and to point out the need of further reinforcement.

The accompanying figure shows a section *XY* across the wing and chain pillars in the above plan, with all the dimensions enlarged. The major enlargement of dimensions is in the vertical direction so as to make the curvatures and resultant inequalities of pressure the more manifest.

Post Setting in a Squeezed Heading

It is purposed to place lines of posts along the sides of a heading subjected to squeeze. What precautions should be taken in setting the posts when the underclay is soft? R. F. W.

Ans.—The posts should be set slightly leaning toward the center of the haulway (1 ft. in 12 ft. or 1 ft. in 16 ft.); so that when the underclay is squeezed out from beneath the coal, the post will be forced into a more nearly vertical position. If the squeeze is quite severe, both wing and chain pillars will be affected and the posts should slope toward one another from the opposing sides of the heading. Where this is not attended to, the push of the clay on the post or its flow beneath it, soon loosens it, so that it falls back against the rib. Should the pressure be considerable, the use of a notched cap is to be commended.



Posting in Creeping Headings

Occasions have occurred when all the heading posts, originally set truly vertical, have been upset by reason of an increase in squeeze, so that it was finally necessary to remove them. Inasmuch as such posts are likely to be knocked down by a derailed trip, if set in a haulageway, it is necessary to spike a plank from post to post, at the level of the widest measurement of the car used for carriage of coal or rock. It must be remembered that a squeeze by disturbing the track is liable to make derailments frequent. (See illustration above.)

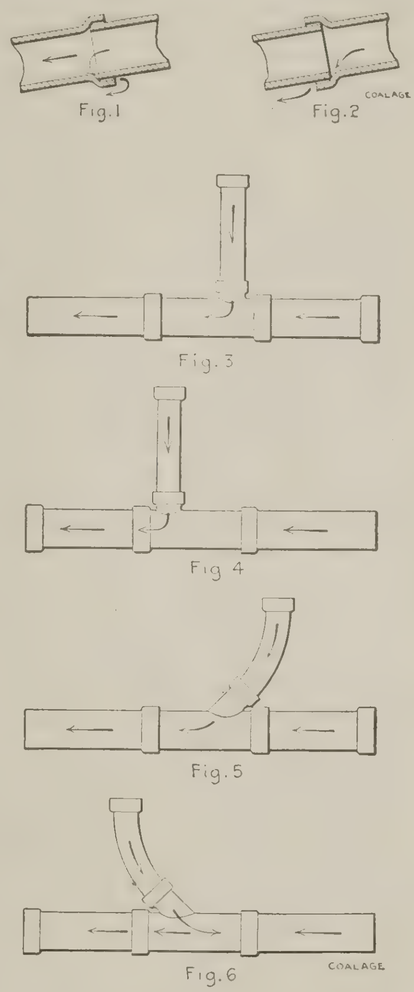
Sewer Pipe Laying

In the laying of sewer pipe, which end of the pipe should be up-grade and why?

M. E. B.

Should there be any leakage at the joints of a sewer line either through the cement-mortar or in the breaks, due to inefficient cementing, or because the sewer has been laid without filling the joints, those leaks will be of least consequence if the bells are turned upward, because the flow of water will not be toward the bell, and the water will have to pass upward to get out of the line. Should any water be passing through the ditch during the laying of the pipe, this water will be apt to wash out the cement if the bells are turned down-grade, favoring the escape of the liquid.

It will be noted that all sewer pipe "specials," wyes, tees, double-wyes, and crosses have bells on the branch lines. These bells would have to be broken off, should it be decided to reverse the accepted method of tile-laying when the branch is being laid. For it can be seen in the illustration, that however the main line may be jointed, the segments of the branch must have their bells uphill unless the first bell is broken off, for it points in that direction. All the wyes have their branches leading away from the bell of the straight line. If the bell on that line is downhill, those wyes must lead uphill, for they lead in the opposite direction to the position of bell on the main. Therefore water traveling in the branch will actually have to enter the main, when a standard wye is used, in the opposite direction to that of the water of the main channel, if the bells are clumsily disposed downhill. Where branches are to be provided, this latter argument is of predominating force, yet it is not likely to occur to the workmen engaged in laying straight pipe till a long string has been mislaid.



Right and Wrong Ways of Laying Tile

Fig. 1 shows a side view or elevation of the correct arrangement of pipe and socket, together with an arrow exhibiting the circuitous route by which water can pass from the pipe to the surface, if the jointing material is faulty or not waterproof.

Fig. 2 is the side view or elevation of an incorrect arrangement of pipe and socket, with an arrow showing how the escape of water from the line is facilitated by the poor judgment shown in laying the line in the manner indicated.

Fig. 3 shows a view from above or plan of a main line and tee branch. The lines are both correctly laid.

Fig. 4 is the plan of a main line wrongly laid and a tee branch leading therefrom. As there is a bell on the branch from the tee, the side line cannot be laid with joints reversed, unless that bell or one on the line pipe of the branch be knocked off.

Fig. 5 shows a plan of the main line and wye branch as they should be laid. It exhibits by means of an arrow how the stream from the branch is compelled to turn to a course inclined 45 deg. to the course of the main current.

Fig. 6 shows what would be the outcome of trying to connect a wye branch to a main line which had been thoughtlessly built with bells reversed. The stream coming down the branch would be obliged (1) to run uphill and (2) would oppose the current flowing in the main line. By slightly tilting the wye so that the branch would slope toward the main pipe, the first fault could be entirely corrected, but for the other there is no such easy cure. The only remedy for that is to use a tee branch or to commence to construct the main line correctly from a point just below the wye onward, arranging the equivalent of two bells on one section of pipe, the lower bell being a artificial sleeve of cement completely surrounding the break in the line, where the two socketless ends of the sections of pipe come together.

Records of Early Coal Mining

That coal was mined in the days of the ancient Britons is proved by the discovery in a Monmouthshire coal mine of one of the flint axes used in those days, and there is documentary evidence extant, showing that in Anglo-Saxon times, about the year 852, an abbot received as part rent, 12 loads of coal, while in 1180 a grant of coal-bearing land was made to a collier in the vicinity of Coundon, Durham county. It is known, too, that coal was burnt in London, to a slight extent, in the fourteenth century because an unsuccessful attempt was made in 1306 to stop its use on the ground that it was injurious to health, and in 1381 it was made an article of trade.

An improvised temporary overcast may be constructed where two roadways cross by hanging brattices and erecting air pipes through which the return air passes.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Reversing Air Current in Fiery Mines

In the course of a paper entitled "An Experiment on the Effects of Reversing a Main Air Current," read before the Institution of Mining Engineers (London), by James Bain and Dr. J. S. Haldane, the authors said the pit selected for the test was Bannockburn No. 3, belonging to the Alloa Coal Company, Limited. Describing at considerable length how the experiment was carried out, they then proceed to discuss the results, and conclude that when the air current is reversed, the air does not travel backward *en bloc*. A great deal of mixing and eddying evidently occurs, with the result that the effects of reversal are spread over a considerable period, so that it takes several hours for the air to attain a steady composition.

This fact is of importance, not only as regards the effects of reversal, but also insofar as it shows that smoke or afterdamp will only gradually attain its maximum concentration when passing through the workings of a mine, and will be but gradually washed out again by a supply of pure air. This, the author says, is of much importance in connection with prospects of rescue and the risks to rescuers in cases of fire or explosion.

In the second place, it appears to them that reversal of the air checks, for the time, the issue of firedamp and blackdamp from the air spaces communicating with the open workings. This is only natural, for, on reversal of the air current, the atmospheric pressure is suddenly increased in all parts of the mine, but more especially in the (normal) return airways.

The difference in pressure is commonly about 6 in. of water-gage, or half an inch of mercury; this will, of course, tend to drive air back into the air spaces connected with the open workings, and check the flow of firedamp, etc., from these air spaces into the roads. It must be understood that this statement refers only to places where exhaust fans are used, as is general in Europe and in the anthracite regions of America.

It would seem, therefore, from the experiments conducted by Messrs. Bain and Haldane, that reversal of the main air current is a considerably less risky operation, even in a fiery mine, than is commonly supposed. In this respect, however, they do not wish to attach too much importance to the single series of observations which they have made. They would rather recommend that opportunities should be taken of making similar trials in other mines provided with arrangements for reversal.

Among the features of interest that an analysis of the air presented, the following are noted:

Excess of carbon dioxide (CO_2) and deficiency of oxygen (O) run parallel with excess of firedamp, in the air after a reversal without the occurrence of an explosion, the percentage deficiency of oxygen being (in the samples taken) about double the percentage of firedamp. If, therefore, owing to any accidental or other cause, the ventilation was so much diminished that the roads became charged with foul air, this air would contain only about 1.5 per cent. of firedamp, when the oxygen fell to 17.5 per cent., at which point lights would cease to burn.

When the firedamp rose to 6 per cent., the oxygen would have fallen to 9 per cent., and seeing that as much as 12 per cent. of oxygen and 6 per cent. of firedamp are the minimum proportions at which even a feeble ignition of firedamp could in any circumstances occur, it seems that, as indicated, the mere slowing of the air current would never produce an explosive atmosphere along the roads. In numerous other mines, whether worked with naked lights or with safety lamps, the conditions are more or less similar.

R. O. E.

Manchester, England.

Excessive Splitting of Mine Air

There has been a long continued discussion of the subject of splitting of mine air and it is one which is so important that it deserves all the fervor which has been expended on it. On the one hand, we have mines with few splits, where the air passes from heading to heading, continuously gathering smoke and the foul exhalations from men and mules and lamps till it receives and deserves the expression "soup," which is often applied to it.

In a gaseous mine, such an air current becomes slowly explosive by the presense of firedamp as it travels through the mine, and the further it travels, the more explosive it becomes.

There are strong objections to this system of continuous ventilation. With it, are necessary very high pressures of air, just as high voltages are necessary when electric currents travel in series and not in parallel. All such high pressures involve leakage and make it hard to keep brattices sufficiently tight. It becomes increasingly hard to ventilate such workings and any ventilating system where this method is carried out consistently will eventually break down. Under such a disadvantage, no fan can deliver as much air to the faces as it could where splits were numerous.

High pressures probably increase the violence of an explosion, and the high speeds necessarily adopted make safety lamps less safe, blow out the miners' lights and raise the coal dust. Worst of all, any calamity, as a mine-fire explosion, tends to be fatal in its consequences to those in the workings nearer the point of intake, who might entirely escape if splitting had been judiciously conducted. And as has been seen, the explosive qualities of the mine gas are more marked at the working places furthest romoved from the intake, so that an explosion in a continuously ventilated mine is likely to involve all the workings.

I am inclined to think that some of the advocates of moderately split or unsplit air-currents are influenced too much by the brisk breezes of air which are used in continuous mines. They appear very satisfactory; there is an abundance of air to inhale, but the quality of the ventilation is really the crucial consideration. A baleful wind, full of carbon dioxide, firedamp or nitrous fumes, or deficient in oxygen, is but little preferable to a milder breeze of air fresh from nature's filters outside the mine.

Legislative Action in Regard to Splits

We find that some, or all of these considerations (we may not be able to determine which) have caused the legislators of Pennsylvania to require that not more than 70 men shall work in one current in a bituminous mine. The law of West Virginia puts that number at 60, though these States permit mine inspectors to increase the numbers to 90 and 80 respectively. Utah requires not more than 75 in a split.

When splitting is omitted, doors are frequent and an open door near the intake end of the workings is the equivalent of a stopped fan. The Pennsyl-

vania bituminous-mining law obviously does not favor their use. "No permanent door," says Art. IX, Sec. 1, "shall be erected or allowed to remain in the main entry in any mine, unless its removal shall be deemed impracticable by the inspector." The objection to doors is sixfold; they leak, they cut off the ventilation whenever a trip passes them, they may be left open and cause an explosion, they too often involve expense, and in one case at least a door by ignition has caused a mine fire followed by a disastrous explosion; moreover, in many cases on steep-grades they are a menace to driver and mules and destroy rolling stock.

Arguments against Splitting

Looking at the other side of the question, we have mines with the air split till it travels so slowly it has no vitality. This is to be avoided. Such air cannot sweep firedamp or carbon dioxide. The small amount of air arranged to travel in any split is unequal to the work of diluting the gases and still more unequal to the work of removing them. But it is feasible with good main airways and powerful fans to provide plenty of air because the splitting makes the resistance low, so that plentitude of air is obtained without excessive velocity in the working places. Unfortunately, the average mine is conducted on a slow plan. Too many headings are working at once, and none working at very high pressure, and as regulation is usually unscientific, the slowest working places have air in plenty and the others hardly enough to deflect a light.

Francis N. Goff.
Pittsburg, Penn.

The British Colliery Lass

The coal-mining industry in America has not tolerated the employment of women in or about the mines; through legislation, English practice is about to adopt the same principle. A few comments on the subject may interest Coal Age readers.

The British Coal Mines Bill, having passed through the committee stage, will be reported to the "House" for third reading this autumn. A provision has been inserted in the bill to the effect that no girl or woman, other than those employed on or before Jan. 1, 1911, shall be permitted to engage in colliery (pit brow) work at any time. The government does not approve the clause and at the third reading will endeavor to have it expunged.

Some extravagant arguments have been employed, both on behalf of and against the employment of these women, who have been described as the "Junos of the pit brow." It may be said that the work they have to do is neither so bad nor so good as opposing parties have endeavored to prove. There are many sturdy, bright-eyed women among them; but while occupation in the open air may have transformed some of them into living embodiments of the classic Juno, it must be confessed there are others less fortunately circumstanced.

Occasionally cars get off the rails, and to replace them it is necessary for the girls to exert their utmost strength. As this is work to which as a sex they are not accustomed, there is considerable liability to overstrain. Where cars do not have to be handled by the girls, objection to their employment is less pronounced.

Girls' Pay Seldom Exceeds $2.50 per Week

It is important to note that the Miners' Federation of Great Britain has expressed the opinion that the work is not fit for

Type of British Colliery Lass Employed in Lancashire Field

women and girls, but even here there is a suspicion that their earning power regulates the view in some measure, for she is a fortunate pit-brow girl who exceeds $2.50 a week.

Whatever the ultimate decision may be, the deputation sent to the Home Secretary to protest against the new clause has made the worker on the pit brow the "girl of the hour." Everywhere the girl members of the deputation were received with interest and respect, and they were even taken to have tea on the terrace of the House of Commons, being also afforded an opportunity for "doing" the show places of the city of London. Undoubtedly it was the supreme moment in the lives of many of the girls, who will look back with pride and pleasure upon the "picnic," whatever fate may have in store for their occupation.

While they created some stir and sensation in their picturesque clogs and shawls, the lassies, during their visit to London, were admittedly welcomed with some little amusement. There was greater interest in the "Juno of the Pit Brow" than sympathy for the cause she had traveled so far to advocate.

J. R. Enright.
Wigan, England.

Gas and Oil Lines as a Menace in Mining

So far we have no record of gas lines being broken by surface movement consequent on mining accompanied by the contamination of the mine air by the escaping gas. In fact where blowing fans are used the mine pressure is greater than the atmospheric, and there is no tendency for gas to enter the mine unless the pipe is confined by being buried beneath the surface. It is owing to this last condition that the Consolidation Coal Company is arranging for the uncovering of all buried gas lines of small diameter passing over its mines.

The larger pipes are usually left in situ, and a contract entered into with the gas company providing for the sale of sufficient coal to maintain the gas line in place without danger to the miners below. It is said that the gas companies show a keen sense of their obligations to coal companies in this matter, readily permitting the coal company the use of the maps for the purpose of locating all wells and pipe lines and making every provision to protect the mines from damage, though the mining law of West Virginia is deficient in provisions covering this necessary coöperation between mining and gas or oil companies.

When wells are located, the coal company is informed and a location satisfactory to that corporation is chosen. These general statements do not refer to the smaller gas companies. To watch and arrange for the control of these, a man is engaged to keep himself posted as to the erection of new rigs and the building of new lines. The public prints recently gave a somewhat lurid account of the flooding of a mine with oil from a line destroyed by mine workings. Whatever the degree of truth in that sensational story, the facts remain that when the coal bed mined is thick and the breaks consequently large, such floodings or seepages are to be dreaded and their occurrence avoided.

A German method of lessening dust in longwall mining is to force water at high pressure into the face through the drill holes, thus saturating the coal as well as helping to break it down.

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

First Aid Work

SPECIAL CORRESPONDENCE

About the year 1891, Thomas Boundy, living in the anthracite-coal town of Jermyn, Penn., wrote a story entitled "Martin Diamond's Ambition: A Tale of the Mines." The hero of the story was a motherless boy, who, while studying to become a physician, found it necessary to work part of his time in the mines. One day an accident occurred and Martin, through the elementary knowledge gained from his studies, was enabled to be the means of saving two or three lives.

Before the story was printed, the manuscript was submitted to Dr. M. J. Shields, then a practising physician of Jermyn, for corrections and suggestions. Later the story was printed in the *Jermyn Press*, but before its publication Dr. Shields had decided to crystallize the lesson drawn from Thomas Boundy's story, and Jermyn, Penn., became the birthplace of the first-aid association movement in the coalfields of this country. Dr. Shields and Thomas Boundy continued for some years to nurture the "infant plan." In 1900, together, they published a "First Aid Handbook."

The great growth of the movement and the relation of Dr. Shields to its present activities as lieutenant of the U. S. Medical Relief Corps, working directly under Major Lynch, of the American National Red Cross Society, are too well known to require further mention at this time, as the purpose of this article is to deal with the social value of the first-aid movement in mining communities rather than with its history.

A Response to Natural Law

Herbert Spencer said that to understand sociology (the science of society) one should have preparation in the study of biology (the science of life). We know how the various parts of the body coöperate—one part contributing to the needs of another. You stumble and bump your knee, and how quickly the hands respond to the "emergency call" of the knee and rub away the pain! The response of the operators and men in the first-aid movement has been similarly prompt. In the span of a few years, we have seen the appointment of mine inspectors, the starting of the first-aid movement, the provision for scientific mine-rescue work, the opening of mining institutes, State-wide and local, and the creation of the Bureau of Mines, so that today the subject of mine safety is the concern of all the more intelligent men around the mines, the operators, physicians, foremen and other employees. The extent of the change we cannot easily realize without reflection, so steadily and naturally has it taken place.

The Need of First Aid

At a soft-coal mine, a few years ago, a Polish carpenter was repairing a tipple. While fastening a timber he reached out too far, lost his balance and fell to the railroad. Several bones were broken, his head was severely cut and skull fractured. The hospital was 35 miles away and no means of transportation except the local combination train which was not due to leave for a couple of hours.

Many willing hands and sympathetic hearts would gladly have responded to the moans and pleading of the injured man, but not one of his fellow workmen present knew how to give that "First-Aid" that might have meant relief and life to him.

Finally the doctor came, unfortunately a student fresh from a medical college—long on cigarettes and professional bearing, but short on the horse-sense and deep human sympathy that we feel assured mark him in these later years. Well, he gave the fellow a "jab" of morphine, lit a cigarette and told the men to get the "hunky" on the train and he would take him to the hospital.

Think of that ride to the hospital! Thirty-five miles away—changed from one train to another four times—wounds and fractures not dressed! He died in the hospital.

VIEW OF RECENT FIRST-AID MEET, ANTHRACITE COAL COMPANIES, INKERMAN, PENN.

The men composing the first-aid associations and the "squads" in the various communities are of the progressive type. The nature of the work is evidence that these men are inspired by unselfish motives and the constant practising of the principles of the movement increasingly develops the altruistic spirit. This spirit once aroused leads them to take part in the general activities of their home communities. Thus their awakening consciousness finds opportunity to express itself in a way that contributes to the general welfare and progress.

The regular contact the men have with the physicians who instruct them is of more than "technical" value. I recall a pleasant and instructive meeting with an association. The physician in charge led the men in an interesting discussion on anatomy and physiology, then he talked to them on laws of health and sanitation and closed his discussion with a strong appeal to the men on the opportunity to serve their fellow men not only when injured but in the ordinary course of home and community life.

The deep emotion that is aroused in the men by the knowledge that the general public and the chief officers of State and nation are watching and commending the work being done, enlarges their humanity. Then the discipline of the training and the competition in the contests develop that self control which is imperative in the betterment of human society.

The Liquor Problem in Mining Communities

In the first place we state most emphatically that all miners do not drink liquor, and that among the miners we find many of our most sober and industrious citizens. But that there is a serious liquor problem in mining communities and that the problem requires practical consideration is generally conceded by mining men.

A study made recently, with the co-operation of several men prominently identified with coal mining, revealed several interesting facts.

First. A mine superintendent with over 40 years' experience in coal mining and a close observer of the general conditions prevailing in mining communities, says: "I don't know of anything that has caused such blight, shame, sorrow and ruin in the homes of the miners as that resulting from the liquor traffic.

"One of our miners beat his wife without mercy. She was left in a helpless condition and required the services of a physician. In order to discover the facts and endeavor to prevent a recurrence of the beating, I had the man, his wife and the wife of the saloonkeeper brought to the office. I learned that the wife was compelled by her husband to keep whisky in the house all the time and that sometimes he would drink a quart after supper, and if the supply ran out the wife would receive a beating.

"A short time ago a miner's wife came to see me the day after pay day. She asked me to speak to her husband. He had received his pay the day before and had gone to a saloon with it and was still there. She said they had five children and she had no money to buy bread and shoes and no money to pay rent. These are but sample cases. There are hundreds of them." *It is a social problem.*

The Economics of Insobriety

Second. In some instances the normal production of the mine is reduced from 10 per cent. to 15 per cent.

A well known mine manager states that, "Last week we lost fully 15 per cent. of our normal output on account of the liquor consumed at a couple of weddings and christenings."

Fifteen per cent. reduction of the normal output at that mine in one week! *It is an economic problem.*

One coal company official says: "Were it in my power I would destroy the whole liquor traffic. But as that is impossible under present conditions, the only thing left for those of us who interest ourselves in the welfare of the men and the industry is the *regulation* of the traffic, and here you come up against a variety of opinions, all advanced by well meaning people, but many of them impractical."

I recall an instance where a coal company tried to prevent the sale of liquor to the men employed in its mines, and three days after the order went into effect, the men went on strike and refused to work until the beer wagons were again permitted to enter the town. The order was withdrawn! *It is a complex problem.*

The Variant Local Conditions to Be Met

Regarding some of the obstacles to be met in attempting to apply remedial measures, we quote a coal-company official who has given the subject considerable study:

"We have to take account of the present status of the liquor traffic, and work within the limits of the law. The Brooks law, which obtains throughout Pennsylvania, is susceptible of a variety of interpretations. This is due to the large latitude allowed the judges of the different countries. Under such conditions, it will be almost impossible for a plan of regulation to be adopted that will meet the requirements of all the counties. Each county must be treated as a separate entity.

The Question of Regulation

"In the counties where there are mining communities, the question of regulation presents itself in a way entirely different from a mercantile or agricultural community. It has usually been considered more difficult to deal with the mining communities because of the foreign character of so many of the population. My experience and observation lead me to the conclusion that this very fact of the majority of the population being foreign ought to make the governing of the communities easier instead of harder. These foreigners are from countries where the evidences of governmental authority are ever before them, and give them a respect for law such as the native born never have. It is not only respect, but borders on fear. Coming to this country, they not only see others violating the law with impunity, but themselves are taught how they can do likewise.

As an illustration: In many mining villages there are licensed saloons. These are supposed to be under certain restrictions as to when and how much they shall sell to their patrons. But these same patrons, foreigners, know that such restrictions are merely nominal, and that the only real restriction is the will of the saloonkeeper, who is in the business to sell all he can. Then in districts where there are no licensed houses he sees the activity of the liquor agent and of the solicitor for orders from the breweries. These various agents operate supposedly under the rules of the local county courts, as issued by the judge. But that they violate those rules is well known to anybody who takes the trouble to watch their methods. And they instruct their patrons how they may violate the rules of court. The sole purpose is to increase their sales.

"I regard this feature of the business, the activity of the brewery agents, as the most difficult we have to deal with, and the most pernicious. Their methods of soliciting orders and delivering the same to houses of the miners make for an increased consumption and consequent intoxication of the people. The final result is a decreased efficiency, so far as the men are concerned, and in the homes a lowering of the social and moral status."

However, there are men in the coal-mining and other industries that have discovered sane, practical methods for dealing with this social and economic problem of the ages in a way which tends to minimize the evil results of the liquor traffic as it relates to mining operations.

The evils of the liquor problem in mining communities can be minimized! We do not intend, in this series of articles, to discuss present or possible liquor legislation, but to present studies of plans that tend to *minimize* the drink evil.

We will deal with facts rather than theories.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Observance of Danger Signals

Examination for inspectorship of mines, bituminous-coal district of Pennsylvania, May, 1909. (By special request.)

1-A. What precautions would you enforce to avoid the danger in mines to employees going beyond danger signals?

I would arrest and prosecute all those violating the law by passing a danger signal. I would instruct the mine foreman that it is his bounden duty under the law to report to me at once in writing all employees who have passed danger signals. I would point out to him that neglect to make such report is a misdemeanor and that the report must be made whether the foreman has personal or other definite information of the violation. See article 5, section 5.

I would instruct the mine foreman to be careful that he or his assistants or his firebosses instruct all non-English speaking miners as to what a danger signal means, using an interpreter for that purpose. Article 5, section 1.

And as signals may be overlooked or misunderstood, I would require that they be as legally provided, uniform, of approved design and in good condition. Failing this I would require them removed from the mine under article 3, section 3, and good standard signals provided.

But where safety lamps are used, I would advise the management to require the firebosses to give out the lamps to the men working in their respective districts and withhold lamps entirely from those men whose places are unsafe.

1-B. What precautions would you enforce to avoid dangers to employees incident to electrical and other mechanical haulage?

To secure the safety of men not engaged in the operation of cars or motors or other haulage appliances, I would observe carefully whether the old haulways comply with the legal provisions of article 4, section 8.

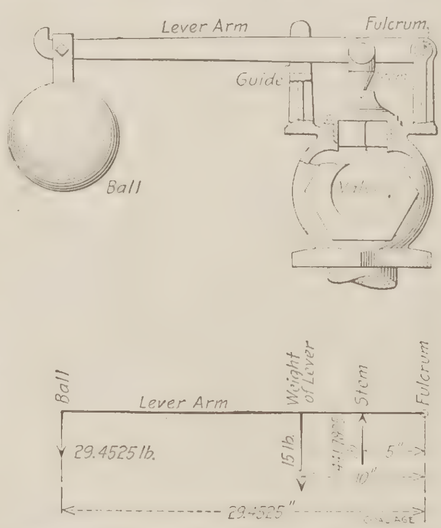
For branch roads, shelter holes must be 30 yd. apart or less and for main roads 15 yd. or less. They must be 2½ ft. deep and 4 ft. wide. Rooms will serve for shelter holes if not further apart and if clear for 3 ft. from the heading rib. I would see that all shelter holes are on one side of the entry, are all whitewashed, level with the haulage road and clear of obstruction.

All entries driven after June 1, 1911, the date of passage of the new Act, should provide a clearance of 2½ ft. continuously on one side of a passing car, unless I believe, as inspector, that the condition of the roof will not permit it.

(The use of electric haulage involves certain wiring and general electric requirements which are very extended and do not properly relate to haulage but to transmission and safety in the presence of gas. These matters will be treated shortly in a comprehensive review on article XI of the new bituminous-mining code of Pennsylvania in a complete and elementary manner.)

Safety Valve Regulation

The distance from the fulcrum of a safety valve to the stem is 5 in., the diameter of the valve seat is 2.5 in., the weight of the lever 15 lb. and the center of gravity 10 in. from the fulcrum. If



FORCES ACTING ON A SAFETY VALVE

the ball weighs 75 lb., how far should it be set from the fulcrum, in order that the valve will blow off at a boiler pressure of 90 lb. per square inch.

The area of the valve seat equals the square of the diameter multiplied by $0.7854 = 2.5 \times 2.5 \times 0.7854 = 4.90875$ square inches.

Such a downward pressure of the lever arm must be provided as will equal 90 lb. for every square inch of valve seat; that is, as there is a valve-seat area of 4.90875 sq.in. there must be a downward pressure of $90 \times 4.90875 = 441.7875$ pounds.

The upper figure shows a typical safety valve with the parts marked thereon, showing plainly its manner of action. Below it is a diagram showing the forces acting on a line, which represents the lever arm. The "moment" of any force, whether that force be a weight or a steam pressure or what not, equals that force multiplied by the distance from the fulcrum. The distance from the fulcrum is what we otherwise term the "leverage." When a body is balanced all these moments sum up to zero, the upward moments balancing the downward. The moment of the stem equals the pressure on the valve, which the stem holds down, multiplied by the distance of the stem from the fulcrum. From what we have deduced that pressure is 441.7875 lb., and from the question the distance is 5 inches.

So the moment $= 441.7875 \times 5 = 2208.9375$ in.-lb. and its direction is upward.

The weight of the lever is 15 lb., as you will see from the question, and the center of gravity of the lever is 10 in. from the fulcrum. The moment of a body is the same as it would be if the weight of it were all concentrated at its center of gravity.

Therefore, the moment of the lever equals $15 \times 10 = 150$ in.-lb. and the direction is downward. We have considered so far an upward movement of 2208.9375 in.-lb. and a downward moment of 150 in.-lb. and the difference between them is $2208.9375 - 150.0000 = 2058.9375$ in.-lb. The moment of the regulating weight or ball is downward and it is the only moment yet to be considered, so it must equal 2058.9375 in.-lb. Its weight is 75 lb. (see question) and so we must multiply 75 by such a number as will make it equal to 2058.9375 or $\frac{2058.9375}{75} = 29.4525$ in. So to provide for the valve to pop off at 90 lb. pressure per square inch, the ball should be moved out till it is 29.4525 in. from the fulcrum.

West Virginia Questions

GLEN JEAN EXAMINATIONS—GENERAL PRELIMINARY QUESTIONS

Ques. E—What are the requirements as to the distribution, measuring and recording of air currents? What must be done when the current is seriously interrupted?

Ans.—Sec. 15 of the mine law says:

"And the mine foreman shall measure the air current *at least* twice a month at the inlet and outlet and at or near the faces of the advanced headings, and shall keep a record of such measurements in a book, having a form prescribed by the chief of the department of mines. An anemometer shall be provided for the purpose by the operator of the mine."

When the current is seriously interrupted, the men must be withdrawn from the mine at once.

Mine Maps Must Be Made

Ques. G—What does the law say in regard to mine maps, (a) with reference to the information to be placed thereon; (b) as to their extension; (c) their accuracy; (d) to whom furnished, and (e) where they must be kept? (f) What penalty is imposed for failure to furnish a lawful map?

Ans.—(a) "The operator or agent of every coal mine shall make or cause to be made an accurate map or plan of such mine, on a scale to be stated thereon, of 100 or 200 ft. to the inch; such map or plan shall show the openings or excavations, the shafts, slopes, entries, airways with darts or arrows showing direction of air currents, headings, rooms, pillars, etc., and such portions of such mine or mines as may have been abandoned, the general inclination of the coal strata and so much of the property lines and the outcrop of the coal seam of the tract of land on which said mine is located, as may be within 1000 ft. of any part of the workings of such mine." (Sec. 5.)

(b) "The operator shall, twice within every 12 months, and not more than 7 months apart, while the mine is in operation, cause such mine to be surveyed and the map thereof extended so as to show accurately the progress of the workings, and property lines and outcrop as above provided; and he shall immediately thereafter notify the inspector of his district, who shall forward to the said operator, or his engineer, the maps held by such inspector to be extended as above required." (Sec. 5.)

(c) "If at any time the chief of the department of mines has reasons to believe that such map or plan or extension thereof furnished in pursuance of the preceding section, be materially incorrect, such as will not serve the purpose for which it was intended, he may have survey and map or plan or the extension thereof made or corrected and the expense of making such survey and map or plan of extension thereof under the direction of said chief of department of mines, shall be paid by the operator, and the same may be collected as other debts are recovered by law; and if found correct, the expense thereof to be paid by the State."

(d) They must be furnished to the mine inspector. (Sec. 5.)

(e) He must keep them among his records, turning them over to his successor in office. No copying of these maps may be made without permission of the operator or his agent. (Sec. 5.)

(f) There is no penalty attached to the failure to furnish a lawful map. "But if the operator or agent of any coal mine shall neglect or fail to furnish to the mine inspector of his district any copy or map or extension thereof, the mine inspector is authorized to cause a correct survey and map or plan of said coal mine or the extension thereof to be made at the expense of the operator of such mine, the cost of which shall be recoverable from said operator as other debts are recoverable by law."

Law Controlling Air Stoppings and Haulage

Ques. H—What are the law's requirements with reference to (a) doors, (b) overcasts, (c) stoppings, (d) breakthroughs, (e) air splits, (f) refuge holes, (g) slopes, (h) haulways and (i) motor roads used for travel?

Ans.—(a) Sec. 12 of the mine law requires that "doors on main haulways shall be avoided in gaseous mines where practicable, and where used they must be substantially built and hung so as to close automatically."

(b) "Overcasts built of masonry or other incombustible material and of ample strength shall be adopted in all mines generating firedamp."

(c) "All stoppings must be built of suitable material, which shall be approved by the district mine inspector." (Sec. 11 and 12.)

(d) "Breakthroughs for air shall be made not to exceed 80 ft. apart in pillars." (Sec. 11.)

(e) "Not more than 60 persons shall be permitted to work in the same air current; provided, that a larger number, not exceeding 80 persons, may be allowed by the district mine inspector where, in his judgment, it is impracticable to comply with the foregoing requirement." (Sec. 11.)

(*To be continued*)

Maintenance of Pillar Thickness

Ques.—A haulway and an airway run parallel and 60 ft. apart between centers; it is desired that they be turned 45 deg. to the left, yet that they maintain the pillar between them at the original thickness. If the airway lies to the left of the haulway, how much further must the center line of the haulway be driven beyond the center line of the airway before the desired turn is made?

Ans.—In the figure, let *A* be a point on the center line of the airway at the turn in the same. Let *B* be a similar point in the haulway, the location of which is dependent on *A* and is yet to be determined. Drop two perpendicular lines *A C* and *A D* from *A* to cut the center line of the haulway before and after the turn of the heading at *C* and *D*, respectively. It is clear that *C B* is the distance being sought, that is, the length that the center line of the haulway must be extended beyond that of the airway before being turned. *A C*, being the distance between centers, must be 60 ft. long.

A C is at right angles to *C B* and *A D* to *B D*. Now, *C B* and *B D* are inclined to each other at 45 deg. It is easily seen that lines which are at right angles to other lines are inclined to one another at the same angle as are those other lines to each other. Hence *A C* and *A D* are inclined to each other 45 deg., and that is equivalent to the statement that *C A D* is an angle of 45 deg. Since the triangles *A B C* and *A B D* are precisely similar, angles *C A B* and *D A B* are equal. Therefore, *C A B* must be half as large as *C A D*, or must equal 22 deg. 30 min.

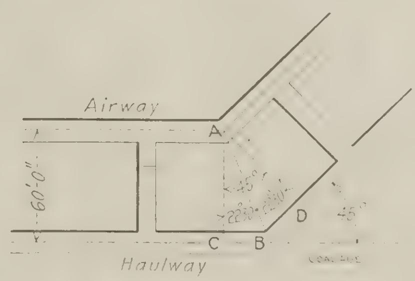
$$\frac{CB}{CA} = tan. CAB = tan. 22\ deg.\ 30\ min.$$

But

$$CA = 60\ ft.$$

$$CB = 60 \times tan.\ 22\ deg.\ 30\ min. = 60 \times 0.4142\ ft. = 24.85\ ft.\ or\ 24\ ft.\ 10\tfrac{1}{4}\ in.$$

Thus the haulway must be driven 24 ft. 10¼ in. at its center line further than the airway at its center line in order that on making the required turn the thickness of the chain pillar may not be changed. It will be seen that, whatever the angle of turn may be, the distance of retarded turning always equals the distance between the lines considered, multiplied by the tangent of half the whole angle turned, and that the longer heading along the lines considered is longer by twice the distance of retarded turning.



Maintaining Pillar Thickness

Example—If angle of turn is 15 deg., retarding of turn is 7.89 ft. If angle of turn is 90 deg., retarding of turn is 60 ft., where the distance between center lines is 60 feet.

If angle of turn is 120 deg., retarding of turn is 86.60 ft. where the distance between center lines is 50 feet.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

The date for opening the controversy involving the West Virginia coal region and the Pittsburg bituminous region as competitors for the Great Lakes coal trade has been set for Oct. 23. Louis D. Brandeis, the Boston lawyer, who has appeared in several important cases before various government bodies, including the advanced-rate case, before the Interstate Commerce Commission, held a conference here on Sept. 28, for the purpose of consulting with witnesses and arranging the order of presentation of argument.

The case in which he will appear is Boileau vs. certain railroads. The complainant is a mining engineer of Pittsburg, who has become interested in the situation, while the roads concerned are those chiefly engaged in moving coal from the bituminous region to the Great Lakes. The point at issue is a request to the Interstate Commerce Commission to reduce the rates on coal for the short haul from the Pittsburg district to lake ports, these rates being now about 88c. a ton, while the rates from the West Virginia district to the Great Lakes region, a haul several times as long, are about the same.

The argument of the complainant in the case is that the West Virginia coal ought to be allowed to go direct to tidewater, while the Pittsburg district coal should find its natural outlet in the Great Lakes region. Propositions have already been made to the shippers who are agitating the question, looking toward an increase of the West Virginia rates, but they have not been content with that solution of the question. They want the rates from the Pittsburg district reduced and they will urge, as in the advanced rate cases, that the coal roads serving the district are making so large an income already as fully to warrant the reduction in rates and yet leave them adequate earnings.

Connellsville Coke Rates

The controversy in regard to the coke rates from the Connellsville district to South Chicago bids fair to rival in severity and importance the issue raised by the West Virginia coal-rate cases. Briefs have just been filed in this controversy on behalf of the Wisconsin Steel Company vs. the Pittsburg & Lake Erie Railway Company in complaints affecting the rates from various points in the Connellsville district to South Chicago, Indiana Harbor, and other consuming ports.

The Coal Roads' Case

The Federal Government has filed in the Supreme Court of the United States at the opening of the October term, its new brief in the so called "coal cases." This is the case of "the United States appellant vs. the Reading company *et al.*," etc. Cross appeals are brought from the United States Circuit Court of the eastern district against the Philadelphia & Reading, the Lehigh Valley, the Central Railroad of New Jersey, and other roads and their affiliated coal companies. The argument of the Government reviews the history of this protracted litigation in the lower courts and then makes an assignment of error.

The principal errors assigned by the Government, stated broadly, are the dismissal of the charges in respect to (1) the general combination, (2) the 65 per cent. contracts, (3) the combination of the Erie railroad and the New York, Susquehanna & Western railroad and their coal companies, (4) the combination of the Philadelphia & Reading railway and the Central Railroad of New Jersey and their companies, (5) the holding by the Erie railroad of the capital stocks of the Pennsylvania Coal Company, the Delaware Valley & Kingston railroad, and the Erie & Wyoming Valley railroad, (6) the holding by the Lehigh Valley railroad of the capital stock of Coxe Brothers & Co., and (7) refusal to dismiss without prejudice what was dismissed.

A lengthy description of the anthracite coal deposits is given and the coal tonage of the various roads is analyzed and described. Argument is presented to show that the interests of the defendant railroads in the shares of coal-owning companies and in anthracite coal lands are in violation of the constitution of Pennsylvania; that the railroads engaged as defendants, in transporting coal of the same kind from a sole and restricted area of production to the principal market, are competitive, although their tracks may not reach the same mines; that all the defendants are engaged in a combination of general scope by which the Reading company and other railroads and their affiliated companies control the anthracite-coal business, and that the 65 per cent. contracts thoroughly discussed in the lower court, whether considered as part of a plan or singly, restrain trade in violation of the Sherman law. Argument is also presented to show that the control through stock ownership by the roads of the various companies mining coal is a combination in restraint of trade.

Pennsylvania

Scranton—One of the oldest and largest breakers in the anthracite region, the Hampton, of the Lackawanna company, is to be demolished within a short time and the coal which was handled there will be sent to the Hyde Park and the Continental collieries, Scranton.

The executive boards of the three districts of the anthracite miners' union have issued a call to all of their constituent locals, announcing that the annual convention will be opened at Pottsville on Monday, Oct. 30. It is at this convention that the demands of the miners, which are to be embodied in the agreement to be submitted to the operators, will be considered and formulated.

Wilkes-Barre—The East Boston breaker of the Payne Coal Company, near here, burned Oct. 3. The loss is placed at $100,000. Smoke filled the passageways of the mine, and at first it was thought that four pumpmen had been suffocated. The men, however, made their way out of the workings by a second opening. Four hundred and thirty men and boys are thrown out of work.

Drifton—Five men were drawn into an air shaft and smothered to death by an inrush of culm at the Drifton colliery of the Lehigh Valley Coal Company on Oct. 4. The men were engaged in tearing down a 40-ft. stack at the top of the air shaft, which was surrounded by a bank of slate and culm. When the stack fell the bank rushed into the opening and carried the men with it.

Ashland—It will not be long before the Humboldt workings of the Lehigh Valley Coal Company, which are awash with water to the top of the slopes as left 15 years ago by Linderman and Skeer when their lease ran out, will be opened for operation. It is planned to work them from the Oneida mines, which are now operated by the Valley company.

Pittsburg—The final transfer of title was made Sept. 30 in the deal by which the H. C. Frick Coke Company, the coke subsidiary of the United States Steel Corporation, purchased the Colonial Coke Company holdings from the Pittsburg Coal Company and the coking-coal holdings of the Monongahela River Consolidated Coal and Coke Company, an interest in

which the Pittsburg Coal Company holds control. The prices are $1450 an acre for about 7000 acres of coking coal controlled by the Colonial Coke Company, this price including nearly 1000 ovens and other improvements, and $850 for about 9000 acres of the Monongahela River company, there being no improvements in connection with the latter acreage, so that the transaction involves about $17,000,000.

West Virginia

The Davis Coal and Coke Company is arranging to open another mine on its property at Dartmoor, which is near Weaver, W. Va. The mine will be located in the Beaver Creek seam district, and will, in all probability, have a maximum capacity of 1000 tons daily.

The United States Coal and Oil Company, which has extensive holdings in Holden, W. Va., has purchased 25,000 acres of undeveloped coal land on Blackberry creek, in the eastern part of Kentucky, and the operations in this section promise to rival in importance those in Logan county. The development of this land will be started at once, it is said.

Illinois

Edwardsville—An attempt to sell the personal property of the De Camp Coal Company was stopped by an injunction. The execution for the sale was issued after 160 miners sued the company for a month's pay. The miners claim wages due to the amount of something like $12,000.

The Peabody Coal Company's mine No. 3, at Marion, the top works and washer of which were destroyed by fire last spring, resumed operations, Oct. 1. The washer has not been rebuilt.

Harrisburg—A recent gas explosion in the Wasson mine, killed one, and severely burned twelve.

Centralia—A fire in the mine of the Junction City Coal Company, the latter part of September, caused a heavy loss.

Marion—The "White Ash" mine of the defunct Standard Collieries Company, at Marion, has been allowed to fill up. The new mining machines, cars, rails, etc., were all left below.

Nokomis—Six miners suffered broken legs and two were probably fatally injured when the cage in the Peabody mine fell 80 ft. on Oct. 6.

Ohio

Columbus—One of the final details in the reorganization of the Columbus and Hocking Coal and Iron Company as the Hocking Valley Products Company was the filing of a mortgage given by the latter company on all its coal, oil, mineral and timber lands and other property in Ohio to the Bankers' Trust Company, of New York City, as trustee to secure an issue of $2,000,000 of bonds.

Considerable interest has been aroused in Ohio and adjoining coal States over litigation challenging the rates of coal shipments from the fields to the consumer or to lake ports.

In the case of the New York Coal Company, of Columbus, against the Hocking Valley Railway Company, in which the Ohio Public Service Commission ordered a sweeping reduction in rates from the Hocking valley almost to Toledo, the application of the complainant to have the matter reopened was argued Oct. 6. The complainant avers that the reductions made were not all that was warranted by the evidence adduced and seeks to have still more radical reductions ordered. The Franklin County court has granted a temporary injunction restraining the shippers from putting into effect the reduction in rates, but the railroad company was compelled to give a heavy bond to cover shipments made in the meantime.

Indiana

Clay Mining—The miners of district No. 8, comprising Clay county, have taken up the matter of preparing a scale for mining clay and shale. Several of the mines have disposed of the clay, which was formerly consigned to the dump, by selling it to factories, and the miners believe that clay will be dug here after the coal industry has ceased. It is therefore deemed necessary that a mining scale should be adopted now to avoid disagreement in the future.

Weekly Pay—The miners are still agitating the matter of a weekly pay in accordance with the law passed by the last legislature, but it is rumored that the subject will be settled for the present by abiding by the request of the operators to continue the semi-monthly plan until the expiration of the contract next April.

The Ehrlich-Pierce Mining Company has incorporated for the purpose of opening and equipping shafts for mining coal and clay. The company's headquarters will be at Turner, Clay county.

The Miami Coal Company, which last year opened a new mine south of Clinton, is opening a second one within a quarter of a mile of the first, and has recently taken on 100 men and plans to add about that many more within the next ten days. Mines in the Clinton district are beginning to be more active, but the activity usual at this time of the year is not yet apparent.

The Wizard Coal Mining Company, of West Terre Haute, has filed articles of incorporation. The initial capital stock is $15,000, and the declared purpose of the company is to carry on the business of mining coal, clay and other minerals.

Kentucky

The Stewart Coal Company, of Ashland, Ky., incorporated under the laws of West Virginia, has changed its name to the Letcher Coal and Coke Company. It has decreased its capitalization from $400,000 to $200,000.

The Consolidation Coal Company is starting to build a model mining town on Wright's Fork of Boone, in Letcher county, similar to the city of Jenkins, now being built on the Elkhorn, in the Elkhorn coalfield. The Nicola Building Company, of Pittsburg, has already received a contract to build 600 miners' houses on Wright's Fork, the work to be started at once.

Texas

Newcastle—Shaft No. 4 of the Belknap Coal Company, of Newcastle, is nearing completion and will soon be in operation. A very substantial tipple has been erected, which is 66 ft. high.

Washington

Vancouver island coal properties, lying between Nanaimo and Ladysmith, embracing 2400 acres and estimated to contain approximately 30,000,000 tons, have just been consolidated into an operating proposition by Andrew Laidlaw, of Spokane, and J. D. Farrell.

Glacier—Development work at the anthracite-coal camps near Glacier will continue throughout the winter.

Alabama

Flat Creek—A coal washer of large capacity is to be erected at Flat Creek by the Pratt Consolidated Coal Company.

Colorado

Delta—A fire in the Summerset mine of the Utah Fuel Company resulted from shot firing, which ignited the timber. Four miners barely reached the bucket in advance of the resultant gas and smoke. The Government rescue car summoned from Trinidad was not needed. The mine was flooded and the fire easily subdued.

California

Amador County—The W. E. Downs coal mine, near Campo, is soon to be opened. A new engine and boiler have arrived on the ground, and it is understood that the shaft will be unwatered immediately and the development work commenced.

Oklahoma

McAlester—A fire destroyed the tipple, the washer, boiler and engine houses and several other buildings about the mine of the Milby & Dow Coal Company at Dow. The loss is estimated at $20,000.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The general tone of the coal market, with a few exceptions, is dull and heavy; however, an optimistic view is taken of the expected winter trade. The protracted summer that prevailed in most sections, particularly in the East, the curtailment policy of a number of the large steam users and the smaller crops in the Northwest, have had a singularly depressing effect on the coal trade generally.

In the Eastern market, prices seem at times about to reach the low point of 1909, and contracts are made to suit the purchaser. The mines of the Pittsburg district are working from 60 to 70 per cent. capacity, which is lower than during the same period of last year. Excess of production is evident throughout the East and prices are only moderately firm.

The anthracite trade is normal, both East and West. The coke trade has suffered as a result of the curtailment in production of pig iron, upon which it is directly dependent.

The Rocky Mountain and Pacific coast trade is in much better condition, being nearly normal. Shipments in from Australia to Pacific-coast points are a number of cargoes behind, and the probability of transportation troubles due to strikes on the Harriman system are making the trade active.

New York

The better grades of steam coal, of which there was an increased tonnage contracted for this year, are now moving on contract in substantial volume. At this season, and until navigation is closed by ice to the shoal-water points, the volume is constantly increasing; the consumers whose only method of transportation will be cut off when the rivers freeze, are stocking up to carry them over the period when navigation is closed.

The arriving and the standing tonnage at the New York piers, while not large, is sufficient to meet the demand, as the mines producing the better grades of steam coals are now working full time, and have had the benefit, for the past two or three weeks, of a satisfactory car supply. There is but little current business going here at the present time and not much is to be expected, when coal is purchased so largely on "year-around" arrangements, until the producers having the regular business, are unable to take care of their customers.

Inferior-grade steam coals do not find a ready market at the present time, as these coals are not purchased so generally on contracts, and have to depend more on the current demand for business. The supply of the better-grade steam coals is equal to the demand, and the inferior coals are always hard to dispose of.

Prices at the New York market for better-grade steam coals while not strong, are being held firm, especially by those shippers who are heavily contracted. For the inferior grades, prices are not so satisfactory.

Pittsburg

Bituminous—This year's coal tonnage is not proving as satisfactory as was expected. Production in the Pittsburg district during the first half of the year fell about 10 per cent. behind production in the first half of last year, but expectations were entertained that the second half of the year would make up the loss. This is not proving to be the case, and the year promises to close with a material loss from last year's tonnage, although still with a fairly good record.

Shipments in the lake trade have been uniformly behind those of last year, the total movement of soft coal from all districts in the lake trade through August being about three-quarters of a million tons below last year's tonnage. September, instead of showing an improvement over September of last year, has shown a slight decrease, and shipments during the balance of the season are likely to be light.

The demand for domestic coal was slow in opening up, but is now of good volume and the movement is practically normal. Demand for coal from manufacturing industries has shown a slight improvement since Sept. 1, as compared with July and August, but is hardly equal to the demand at this time last year. Operations at mines in the Pittsburg district average between 60 and 75 per cent. of full capacity.

Prices are moderately firm and at about the same general level as had obtained through the year. Slack coal has stiffened a trifle, owing to the lake shipping season being nearly over; lake shipments, being of ¾-in. coal, produce an abnormal quantity of slack. While a month or two past, sales were being made freely at 60c. and less, the market is now quoted at 65@70c., with little tonnage moving below 65c. Nut coal is a trifle easier, through heavier production of 1¼-in., and is easily obtained at $1.10. Mine-run continues to be quoted at $1.15, and this price is not generally being shaded, ¾-in. being held at $1.25 and 1¼-in. at $1.35@1.40, a number of producers holding $1.40 as their minimum.

Connellsville Coke—The year thus far has been the poorest the Connellsville coke trade has seen since 1908, particularly as to tonnage. The output this year to date has averaged only a trifle above 300,000 tons weekly from the Connellsville and lower Connellsville field, the poorest average since 1904, with the exception of the year 1908. The outlook is for a production of about 16,000,000 tons.

In this loss of tonnage the Connellsville coke trade has followed the iron industry, which consumes almost its entire output; prospects are that production of pig iron this year will be about 23,750,000 tons, the smallest since 1905 with the exception of 1908. The year's Connellsville coke production, however, shows a somewhat greater loss, as compared with records of a few years ago, than does this year's iron production. In other words, a slightly smaller percentage of the country's total pig-iron production is being made with Connellsville coke than was the case four or five years ago. This change is due partly to the growth in byproduct coke manufacture and partly to increased use of other cokes from this general district.

The economic question of the day is whether the original Connellsville district (including the addition of a decade ago, the lower Connellsville, Masontown or Klondike) will ever adopt the byproduct process. Old-time operators can hardly conceive of such a possibility, while others shrink at the enormous capital investment involved. The United States Steel Corporation, by far the largest interest, is so positioned as to use Connellsville coal in byproduct ovens, if at all, by shipping the coal to the byproduct plants located at the blast furnaces. Every steel interest which considers the adoption of byproduct coking, pays great attention to the question whether an easy offset to a considerable part of the capital investment in byproduct ovens may not be found by using coal from another district, in which an acreage sufficient for a half century's supply may perhaps be purchasable at much less than a Connellsville acreage sufficient for a couple of decades.

The Connellsville coke market has been extremely quiet in the past fortnight. Nearly all furnaces now operating have contracts covering either the balance of this year or a longer period. A very few are uncovered, but a month ago concluded it would be cheaper to buy coke from month to month for the rest of the year than to pay the considerably higher price demanded on three- or four-month contracts. The prompt market is firm at \$1.50@1.55, contracts over balance of year being nominally \$1.70@1.75.

Foundry coke is quiet, consumers being covered by contracts. Odd lots of prompt 72-hour coke of standard grade can be picked up at \$1.80@1.90, cokes selling at less than \$1.80 being generally inferior. Contract coke of standard grade is quoted at \$2@2.25, the favorite contract price being \$2.10.

St. Louis, Mo.

The condition of the coal market in St. Louis has been unsatisfactory from an operator's standpoint, and while coal has been going at a reasonable figure (as far the retailer is concerned), the domestic trade has not been as good as usual at this period of the year. There are some good reasons for this falling off in trade, the principal one of which is the crusade against the smoke nuisance.

The shipping interest are making less money now on their coal than they were last June, for a fall business was anticipated at that time, and on the strength of this expectation, prices kept up. At the present moment, with everything to indicate an overproduction, there is not much to be hoped for in the way of any immediate advance in prices.

Standard coal from the territory adjacent to East St. Louis, and coming in on the 52c. freight rate, is selling as follows per ton f.o.b. the mines:

2-in. lump	\$0.90 to \$0.95
3-in. lump	0.95 to 1.00
6-in. lump	1.05 to 1.10
Mine-run	0.75
Screenings	0.25 to 0.30

The higher-grade coals from the Standard field are bringing anywhere from \$1.75 to \$2.25, at the mines, but the supply of this coal has exceeded the demand for several weeks.

The middle-grade coals from the Standard field, such as Mt. Olive, etc., are bringing anywhere from \$1.15 to \$1.25 at the mines for domestic lump, and various prices on other sizes.

There is practically no Springfield coal coming in, and very little from any other field, with the exception of Williamson and Franklin counties. Some tonnage from Murphysboro Big Muddy is moving in at from \$2 to \$2.25 at the mines for domestic sizes. In the northwestern market, this coal is known as New Kentucky, and is without question the best coal produced in the State, in any great tonnage.

Franklin and Williamson county prices per ton are as follows, f.o.b. the mines, taking a 67c. freight rate to St. Louis:

WILLIAMSON	
6-in. lump	\$1.40 to \$1.50
3x6 egg	1.40 to 1.50
No. 1 nut	1.05 to 1.15
No. 2 nut	0.90 to 1.00
Screenings	0.35 to 0.40
Mine-run	0.90 to 1.00

FRANKLIN	
6-in. lump	\$1.60
3x6 egg	1.50
No. 1 nut	1.40
No. 2 nut	1.15
No. 3 nut	0.85

There is some coal moving in from the Du Quoin field at various prices, taking a 57c. freight rate. There is also some little coal moving in from Montgomery county, but not in any great tonnage. There has been a fair movement of anthracite in all sizes, but not as great as might be expected, and chestnut is somewhat hard to get for this market. During the past month more than 100 cars of West Virginia smokeless has come in, and there is still a fair tonnage moving. Anthracite and smokeless f.o.b. St. Louis are quoted as follows per ton:

Chestnut	\$7.20
Egg and stove	6.95
Stove	6.70
Smokeless lump and egg	\$4.75 to \$5.00
Smokeless mine-run	3.75

The tonnage of gas-house and byproduct coke has exceeded this year the tonnage of any previous year, and is still moving in good volume. Gas house is worth from \$4.65 to \$4.75, and byproduct is going at about \$5.

Indications are that there will be a rise in the domestic market on all the bituminous coals in the course of the next 10 days, as the domestic supply has not been laid in, and with the first touch of cold weather, the demand will tax the capacity of delivering companies.

Chicago

Officials of the Illinois Central deny that there has been any serious interruption to the movement of coal on that line as a result of the pending strike of shop workers.

J. K. Dering and C. M. Moderwell have been elected directors of the Chicago Coal Dealers' Association.

Prices in net tons to retail dealers and steam users are quoted as follows:

	F.o.b. Chicago	At mine
Steam lump	\$2.07	\$1.25
Mine-run	\$1.82 to 1.87	\$1.00 to 1.05
Screenings	1.02 to 1.12	0.20 to 0.30
FRANKLIN COUNTY		
Lump, egg and nut	\$2.70 to \$2.80	\$1.65 to \$1.75
Screenings	1.45 to 1.55	0.40 to 0.50
CLINTON		
Domestic lump	\$2.17 to \$2.27	\$1.40 to \$1.50
Steam lump	2.00 to 2.10	1.25 to 1.35
Mine-run	1.77 to 1.82	1.00 to 1.05
Screenings	1.12 to 1.22	0.35 to 0.45
COKE		
Connellsville	\$4.50 to \$4.65	
Wise county	4.50 to 4.65	
Byproduct, egg and stove	4.75 to 4.90	
Byproduct, nut	4.55 to 4.65	
Gas house	4.75 to 4.90	
CARTERVILLE		
Lump	\$2.65	\$1.60
Egg	2.65	1.60
No. 1 washed	2.70	1.65
No. 2 washed	\$2.15 to 2.30	\$1.10 to 1.25
HARRISBURG		
Domestic lump and egg	\$2.60	\$1.60
Mine-run	2.15	1.15
Screenings	\$1.40 to 1.50	\$0.40 to 0.50
Springfield Domestic lump	2.07	1.25

Boston

Bituminous all-rail has been generally slow. The low prices at tide cut away a considerable tonnage that would normally be railed from Pennsylvania, and all the shippers have suffered on that account. The mines with better established selling connections are now getting fair business, but the operators have been obliged to make as low figures as have obtained within recent years. Prices have ranged from 85c. on coals higher in volatile to \$1.30 and \$1.35 for fancy brands from the more favorably known districts. On the whole, soft coal (all-rail) has been sluggish and dull in tone.

Anthracite, both at tide and all-rail, has been about normal; that is, with no very marked change from other and recent years. The usual April and May demand at tide lasted into June on certain sizes, such as free stove and hard egg. The Kennebec and Penobscot rivers opened much later than in 1910, and the long severe winter left many of the dealers bare of coal. Early in September a cool wave turned consumers toward the dealers with considerable urgency and it was not long before the anthracite shippers had request for prompt shipments on all sizes. A feature of anthracite this season is the still constantly increasing demand for chestnut size, notwithstanding the 25c. advance over stove last spring. This seems the rule with every dealer and one ceases to be surprised that broken and egg are so seldom included in cargo schedules. Pea and the steam sizes have lately shared the generally active market. The year is certain to be favorable for anthracite.

Water freights from Hampton Roads have been about 60c. all season on large tonnage, 3000 tons and upward, with the usual differentials for ports south and east of Boston. The supply of bottoms has been ample, and the rate named is as low as sail tonnage can be run.

Buffalo, N. Y.

The prices of bituminous range from \$2.50 for Pennsylvania three-quarter to \$2.40 for mine-run and \$2 for slack, with some mines selling slack considerably lower than this. Allegheny valley grades sell at about 20c. lower. Coke has been practically lifeless since the iron market became so slack, the price being \$4.25 for best Connellsville down to \$3.50 for stock coke.

Since the freshets that created so much disaster at Austin, Penn., there has been much trouble in the Allegheny valley mines, some of them being completely flooded for a number of days.

The fall trade in bituminous is not

enough yet to stiffen prices, though they must improve as soon as consumers begin to stock up against possible stoppages of production next spring.

Philadelphia

A canvass of the various dealers reveals the fact that orders are coming in more plentifully every day, and in some cases they have run out of certain sizes of coal; their requisitions on the wholesalers are marked rush. October is a good selling month, and the present one gives no indication of going back on the tradition.

Most of the companies are working full time, and it is understood that the demand, except in one or two sizes, covers everything from "broken" to "barley." As a matter of fact, it looks as though there would be a limited supply of the small sizes before the winter is over. The almost infallible index of a stronger market lies in the fact that most all of the individual operators are now holding to circular prices, except in some cases where an inferior grade of coal is offered, and the shading of prices with these concerns is a necessity. Generally, it looks as though the anthracite trade was on the threshold of a prosperous season.

The bituminous trade is still dull. Improvement is noticed in some grades of coal, but, as a rule, the market has a tendency to stand still, rather than progress.

Cleveland, Ohio

About the only improvement in the coal trade has been in the demand for domestic business, which is a natural coincidence at this season of the year.

Prices for middle district and No. 8 coal are: $1.05 for mine-run; $1.15 for ¾-in.; $1.40 for 1¼-in.; slack, 45@50c.; No. 8 mine-run, 90@95c.; ¾-in., $1@1.05; 1¼-in., $1.10@1.15; slack, 35@40c.

Slack seems to be somewhat of a drug on the market; other conditions in the general trade are depressed, and the usual amount of fine coal is not being consumed.

The lake trade continues spasmodic, a great deal of coal still remaining on cars at Cleveland and other Lake Erie ports, waiting for boats to take the tonnage to the upper lakes. The congested condition of coal at the head of the lakes due to delays in removing it at the upper docks, and the fact that large tonnage boats will not handle coal to the head of the lakes and return light, is the primary cause of there being so much fuel still remaining on the Lake Erie ports.

The ore coming down from the upper lakes, has fallen off materially this year on account of the surplus ore being on hand from last season's shipments. The only way the coal at the Lake Erie ports can be handled this year, is to load the tonnage between now and the close of navigation and take the coal to the head of the lakes and hold it there in storage during the winter months for early shipments in the spring. This will insure an adequate supply for the Northwest during the long winter months.

Cincinnati, Ohio

Of the domestic-coal market in general it may be said that it was better a few weeks ago than it is at present. The volume of sales is greater now than then, but not as much so as the season should warrant. It was thought that the domestic demand had made an unusually early start and preparations were made by wholesalers to meet a continuing and growing market; however, for some reason, there has been a lull, and the sales seem to be only about what are forced by the condition of the weather. Reports from the northern part of the State are to the effect that the demand is good, but the weather there is much colder than here.

Local operators and wholesalers have finished a good lake season and, so far as learned, all have been able to complete their contracts. River coal men are coming into their own again here, due to favorable stages of the Ohio river above and the completion of a government dam just below the city, giving them a good local harbor.

Milwaukee, Wis.

Prices on all kinds of coal have been fairly well maintained, and as the time for actual consumption is drawing near, the increased demand will doubtless eliminate any weakness which may have been apparent in the dull season.

Altogether the outlook is decidedly more promising, and the trade in general is bound to show a decided improvement from now on.

Columbus, Ohio

Prices have been well maintained during the past month even under the slow buying of September. The circular issued by Ohio operators, Sept. 1, has been generally adhered to.

Prices which now prevail in Ohio districts are as follows: Domestic lump, $1.50, f.o.b. mines; ¾-in., $1.35; nut, $1.15; mine-run in the Hocking valley, $1.05@1.15; mine-run in eastern Ohio districts, 95c.@$1.05; nut, pea and slack, 50@60c., and coarse slack, 45@55c. There is a good demand for the fancy grades of domestic coal which sell from $1.50 as high as $2 per ton. These grades include rescreened, hand-picked and other specially prepared coals.

Nashville, Tenn.

About 90 per cent. of the coal used in this market is from the western Kentucky fields, and the remainder from the Jellico and Virginia fields. The prevailing prices on west Kentucky coal range about as follows per ton:

Standard lump coal	$1.15 to $1.25
Standard nut	0.95 to 1.00
Mine run	0.80 to 0.90
1⅛-in. screenings	0.25 to 0.30

All country trade has been fairly well supplied with their coal for the winter.

Indianapolis

The retailers and wholesalers say that conditions are not far from normal, considering the fact that warm weather continues. While the mines are working on short time, domestic coal has moved well and steadily, during the past three months, and the supplies equal those of former years at this date.

Salt Lake City, Utah

Prices on our market are firmly held and are $2.25 for lump, $2.15 for nut and $1.25 for slack, f.o.b. cars at mine.

Retail conditions in Salt Lake are both good and bad. Good, in that trade is brisk, having been stimulated by two weeks of cool weather, and by "strike talk"; as a consequence, September business was ahead of the same month in 1910. The bad side results from the fact that the producers have been entirely unable to fill dealers' orders, and the storage or reserve stocks have been drawn upon heavily. These stocks should remain in reserve until Dec. 1, to 15, at least.

Portland, Ore.

Following are the prices asked here, per ton, including cost of delivery to points within the city proper:

Japanese	$7.50	
Washington lignite	$7.00@ 7.50	
Australian	10.00@10.50	
Rock Springs, Wyo.	10.00@10.50	nut $9.50
Diamond, Wyo.	10.00	
Carbon Hill, Wash., lump	10.50	
Carbon Hill, steam	7.50	
Newcastle, Wash	7.00	
Beaver Hil, Ore	9.00@ 9.25	
Blacksmith coal	17.00	
Pennsylvania anthracite	18.00	

The Beaver Hill coal is brought here by steamer from Coos Bay and sells for $8 on the dock.

San Francisco

Stocks of coal are below normal and dealers anticipate an active fall and winter trade. The following are the prevailing wholesale prices per ton at San Francisco:

Wellington, from B. C., clean	$8.00
Wellington, from B. C., average	7.50
Australian, from B. C., clean	8.00
Australian, from B. C., average	7.50
Washington.from B. C., clean	6.50
Washington.from B. C., steam	5.00
Utah, Wyoming, Colorado and New Mexico, for domestic use only clean	8.15

To these prices the retail dealer adds from $2 to $3 per ton, accordingly as delivered direct from cars or from storage.

Alphabetical Index to Advertisers

Classified Index to Articles Advertised

The Ouptut Of The Mine

> *The Boiler Plant is the Heart of the Coal Mine. Any curtailment of the necessary power means a corresponding reduction in output with increased cost of production.*

When a man's heart is strong, pumping the red blood to every part of his body, he is pretty sure to be in a position to give the best that's in him.

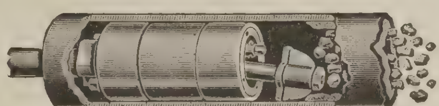
When the boilers in the power plant of the mine are at highest point of steaming efficiency and the power is being transmitted to every part of the mine for the hundred and one different operations, the mine is pretty sure to be delivering its maximum output.

That's why we say the Boiler Plant is the Heart of the Mine. And why the boilers should always be kept at highest point of steaming efficiency. The boilers are not at the highest point of efficiency as long as there is any scale on the tubes, forming a non-conductor for the heat.

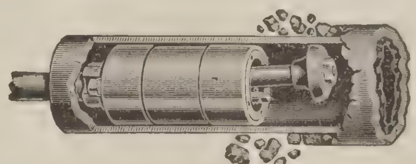
Scale *will* form and especially in coal mine plants where feed water must be taken from the most convenient supply, which nearly always contains not only the ordinary impurities, but also those introduced by contamination with mine water.

There is only one sure way of removing *all* the scale and of *knowing* that all scale has been removed. That is by means of

The Dean Boiler Tube Cleaner



The Dean removing scale from the tube of a water tube boiler.



The Dean removing scale from the tube of a return tubular boiler.

The cleaner that operates on the principle of "*broken-up vibration*," caused by the striking of 3000 to 6500 light blows a minute.

It goes where no inspector can. It cleans 10 to 30 tubes an hour, leaves every tube through which it travels as clean as a gun barrel.

It is the easiest, quickest, most economical way of removing scale, and what is more important, the user *knows positively* that his boiler is free from all scale. Let us tell you why.

Trial Offer And Guarantee

We sell the Dean Boiler Tube Cleaner entirely upon its merits.

We send it for trial on one boiler to let the purchaser see how it operates and prove to his own satisfaction that it does remove all the scale.

We sell it under a guarantee that i will pay for itself within six months or we will refund money.

The Mine Operator, Superintendent, or Manager who realizes the benefit of high efficiency in the plant of the coal mine will send for a Dean on trial.

The Wm. B. Pierce Company

335 Washington St., Buffalo, N. Y.

Form The Habit Of Reading Each Week This Buyers' Finding List

Start now, with this first issue.
The above index is an accurate guide which will lead you every week through the Selling Section of COAL AGE. It furnishes complete information regarding every concern whose advertisement appears in this paper. It tells you "who's who and who makes what."

To be here is a badge of responsibility
To buy from here is a guarantee of satisfaction

Coal Age Is YOUR Paper

LET this one idea sink firmly into your mind—COAL AGE is *your* paper. ¶ It has but a single purpose—to serve the common interests of the men engaged in the Coal Industry.

¶ It is going to advocate—first, last and all the time—reforms and methods that mean *safer* Coal Mining, to hunt out and describe ways and means for *more profitable* Coal Mining.

¶ Your battles are its battles; your problems, its problems.

¶ Look through this issue and you will appreciate the force of this statement. And remember that this first issue is but the beginning, that every week *your* paper is going to grow better—become stronger and more helpful.

¶ You *need* COAL AGE and COAL AGE needs *you*.

Don't miss a single issue of Coal Age—subscribe NOW. Send in your $3—the yearly subscription price for the full 52 issues in the U. S. and Mexico—$4 in Canada, $5 in any other foreign country—TODAY so that you will receive the second issue just as soon as it is out.

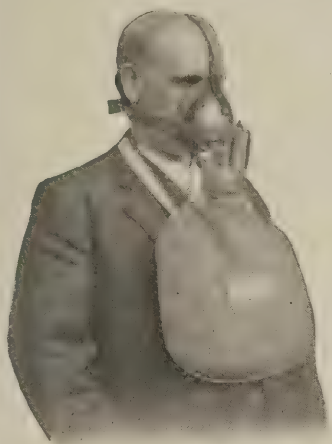
Address

COAL AGE

505 Pearl Street, New York City

Invaluable In Rescue Work

The Servus Emergency Mine Rescue Apparatus



As an adjunct in Mine Rescue and recovery work, this apparatus is invaluable, weighs but four pounds, supplies the wearer with ample pure fresh air, rich in oxygen, for over one-half hour and it's thoroughly practical for any service. Write for circulars.

Servus Rescue Equipment Co.

10 Johnson Street Newark, N. J.

Why Waste Air?

Why waste air by using cheap Brattice Cloth?

You are obtaining air by mechanical energy that costs you money to generate.

And when that air seeps through a cheap Brattice cloth it is a loss.

So why be penny wise and dollar foolish, by saving money on cheap Brattice cloth and wasting it many times over in wasted air?

Kern's Non-Inflammable Brattice Cloths are made of hard yarn, closely woven.

They are a big economy not only because of the air they save but also because they wear much longer, resist moisture better, and hold better to the nails than the cheap, loosely woven article.

They keep good air on the side where it is needed and enable you to get a larger percentage of air to the working faces.

Why not make a trial?
Write today for Samples.

Kern Commercial Co.

114 Liberty St. New York

$55 a Month to $3,000 a Year

Through I. C. S. Training

Mr. Isaac G. Roby, Uniontown, Pa., who is now Inspector, Fifth Bituminous Inspection District, writes us under date of October 10, 1910, as follows:

When I enrolled for the Mining Course with the International Correspondence Schools, of Scranton, Pa., I had had only 20 months of schooling all told. I was employed at the time as assistant foreman, and was getting $55 a month. After enrolling with the Schools, I was soon advanced to the position of mine foreman at $75 a month, which was voluntarily increased to $90 a month. I am now Mine Inspector of the Fifth Bituminous District, at a salary of $3,000 a year.

Correspondence instruction as conducted by the I. C. S. is the finest and most complete in the world today; every young man that desires to advance or better his condition should enroll at once. No one can enroll with the I. C. S. and apply himself to his work without being greatly benefited.

The success of such student should be an inspiration to *you*.

Would you be willing to make a small investment that would increase your salary 100, 200, or 300 per cent.?

To learn how the I. C. S. can help *you* to secure increased earnings, promotion and a happy, successful life, mark and mail the attached coupon. Doing so will cost you only postage and will place you under absolutely no obligation.

SEND THE COUPON NOW

International Correspondence Schools
Box 1104, Scranton, Pa.

Please explain, without further obligation on my part, how I can qualify for a larger salary and advancement to the position, trade, or profession before which I have marked X.

Mining Engineer	Gas Engineer	Automobile Running
Mine Superintendent	Electric Lighting	Architect
Mine Foreman	Electric Railways	Architectural Drafts.
Mine Fire Boss	Electrician	Advertising Man
Mine Surveying	Telephone Expert	Window Trimming
Metallurgist	Machine Designer	Show-Card Writing
Assayer	Mechanical Drafts.	Bookkeeper
Chemist	Marine Engineer	Stenographer
Civil Engineer	Municipal Engineer	Commercial Law
Concrete Construct'n	Railroad Engineer	French } With Edison Phonog'ph
Electrical Engineer	Sanitary Engineer	German
Mechanical Engineer	Sheet-Metal Drafts.	Spanish
Stationary Engineer	Ornamental Design'g	Italian

Name ______________________

St. & No. ______________________

City ______________ *State* ______________

Moments with the Advertising Editor

A Department for Subscribers Conducted by the Service Department of Coal Age

Between you, the reader of COAL AGE, and you, the advertiser in COAL AGE, this department is to be the alternating current of stimulus and information.

Many of the things that will be told here the COAL AGE advertiser knows; and thus far this page will be You, the advertiser, talking through us to You, the reader. Sometimes the reader, the buyer himself, will have space to give his testimony to the advertiser as to what advertising means or should mean to him. The life of the page will flow back and forth, between You—and You.

You, the reader of COAL AGE, invested in the paper to obtain certain values in the editorial columns which we engaged to give, and now you find, when you open the first number, before and after that editorial section, the pages of a Selling Section—commercial ventures of people trying to induce you to buy or investigate things in the Coal Mining field that they have to sell. Was this Selling Section part of the bargain? Let us defer that question a moment, and get at this thing from another angle.

To put it without furbelows, the reason for existence of every honest, alive, coal man is *to get coal out* with the utmost degree of safety, more rapidly, more cheaply (in energy or dollars) than the next man—if he can.

To accomplish this he knows that communion with every other coal man who has ever said anything or done anything out of the rut of the day-by-day, here or beyond the Atlantic, is vital and indispensable. That is why COAL AGE was started.

But he also knows that the "how," the "why," the "where," by which he is to exceed what he has heretofore done, or what the other man is doing, must be yoked with the "what to do it with."

Demand makes supply, and you, that coal man, become aware through hearsay, from a traveling salesman, or through reading advertisements, of machinery, appliances, etc., that square or pretend to square with your situation.

Among those three—the firm whose goods get known through hearsay, the nonadvertising firm whose goods are sold by traveling agents, and the firm which advertises—the latter has to begin with a big handicap.

It has to pay an advertising bill *before* it has sold any goods. That advertising bill is no small one, either, in a paper which halts at no money-limit to secure the best, most authoritative contributions to its editorial columns and whose subscription price hardly more than meets the bill for the white paper.

But the *buyer* of advertised goods has one four-square advantage from the first moment, and when the momentum of sales has begun, to the seller comes an advantage which wipes that first handicap completely out. This is why—

Advertised goods have to be precisely what they are represented to be or the advertising is a self-annihilating boomerang both to the advertiser and the paper carrying the copy. Advertising in a paper which does not give away its advertising pages can pay the man who buys the space only when it brings continued buying, which is impossible unless the goods are what they are represented to be. Thus advertising cuts a gulf between the kinds of goods that can be sold by a fakir who skips on, never to be heard of again, and the kind of goods which have to prove right because the life of the salesman depends on it.

For the advertiser, advertising begins the process right by getting him, without experimentation, directly to the return-givers, the men in that field who read, who think, and who act on reasonable representations.

And before the process has *gone far* it puts the advertiser tremendously to the good in returns, because the total of sales, each with its closely figured but definite profit-margin, multiplies at higher ratio than the ratio of publicity—streaming out beyond the horizon of the man who holds to the junk-pile idea that advertising is a bunco game.

We of COAL AGE know these things; no one has entered this Selling Section whose product has not "lived up to the ad" in other publications of this company or been investigated.

The advertisers in this Selling Section know it; no one of them would have paid money for space here without the round measure of conviction that COAL AGE is to be read in editorial and advertising pages by men who know what they want and recognize a thing's merits through sincere, straightforward statement of them. The ability of COAL AGE to make good with the advertiser, and with the standard we set up to begin with, depends on that—*action* between reader and advertiser.

Now back to that question—was this Selling Section part of the bargain?

We won't answer it, for before long we wager you, the reader, will answer it yourself with another question, viz:

What sort of a bargain would COAL AGE have been *without* the Selling Section?

Moments with the Advertising Editor

A Department for Subscribers Conducted by the Service Department of Coal Age

Last week we talked about the reliability of advertised products. It was shown that a product given advertising publicity in a reputable paper has to be what it is represented to be both because the good name of the publication depends on it and because only continued selling (that is, *continued advertising*) overcomes that initial advertising outlay.

But what of Price?

When a firm spends $50,000 a year on advertising, are not the consumers of its product, excellent though it may be, paying a good deal more for it than they should pay? And then the price that a firm's advertising outlay justifies it in putting on its goods may be the shield under which the rival nonadvertising firm, with a product not quite so good, runs up its prices almost to the same limit—so that whether you buy advertised goods or not, you have to shoulder that needlessly big advertising burden.

Yes, it is true, advertising *has* a bearing on the price of every product you buy, whether advertised or not. But not exactly in the way indicated.

The cost of any manufactured thing, tooth brush or paint brush, toothpick or miners' pick, has two parts—

1. What it takes to produce it.

2. What it takes to get it to the user.

Sometimes the second is larger than the first, but, larger or not, the distribution bill is as real and necessary an element in the total cost of the product as the manufacturing bill. Manufacturing bill and manufacturing could go to the Limbo of the Forgotten if there were no way to get the manufactured thing to the people who need it or to make those who don't know they need it but really do, see that fact. *You* pay this distribution cost in every product made by machinery or human hands that you buy.

The question is, what method of selling is going to cut that distribution cost the lowest? What about ADVERTISING?

Now it may seem an extravagant statement to make, yet it is true that when a firm advertises $50,000 a year, that outlay may mean a *saving* of $50,000 a year to the consumer instead of a burden of that figure. Because—

The multiplied volume of production that advertising-built demand calls for enables the firm to reduce the manufacturing cost of the individual article so much that its total manufacturing expense is cut $2 every time advertising adds $1. Such a ratio as this isn't likely to exist in the case of such individually costly products as mining machinery, yet it is a real factor in the price there too.

And that nonadvertising firm?

The real fact is that instead of being able to shove its price up under the shelter of its competitor's advertising bill, in order to keep in the running at all it has to adopt selling methods *infinitely more costly than advertising.*

Advertising is simply selling by print, manifolding a convincing salesman's words 1,000 or 10,000 or 1,000,000 times, and when this nonadvertising firm passes the printed salesman up for the man-salesman only, or some other selling way, it not only makes a bigger outlay in money and energy to keep in the race in sales with the advertising firm, but it also misses all that wide *general education* of the people in that field or industry into the particular points of its own product—education that, ramifying out, makes for future sales.

Thus the cost of the nonadvertised article *cannot be less* than that of the advertised article; it is likely to be more. And besides that, the responsible well known paper that dictates the printed salesman's words to you, the Buyer, takes its stand between you and the firm whose name is new to you, introduces you to it, tells you where you can find it at every moment, stands behind its guarantees, saving you the trouble of investigation.

If it were not for mediums such as the Selling Section of Coal Age you could not purchase the products advertised therein at the prices their makers will quote you.

Advertising thus is not only the *shortest* route, but it is the *cheapest* route between YOU, THE COAL MAN, and THE COAL MINING APPLIANCES YOU WANT.

This is the True Story of the relation of Advertising to Price!

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 2.
Issued Every Saturday.
HILL PUBLISHING COMPANY.

NEW YORK, OCTOBER 21, 1911.

Ten Cents per copy
U. S and Mexico. $3 per year.
Canada, $4; other Countries, $5.

Ellsworth Mines, Washington County, Typical of Recent Coal-Mining Construction in Southwestern Pennsylvania

COAL AGE

Vol. 1 NEW YORK, OCTOBER 21, 1911 No. 2

The Gad and the Man Who Cut It

A FABLE runs thus: Two Surajahs of Hind were minded to mend the conditions of their people. Now there lay nearby a rich Satrapy of Persia. One Surajah, he of Gwalior, spoke thus: "I will build unto my people a school that they may learn to speak unto these rich barbarians from Persia and that they may barter with them." And so he did and the people waxed fat withal.

The other said, "I will build highways; thus may the traffic be great with these rich strangers, who are come from over the mountains." And so it was.

And while yet the Surajahs were in counsel with skilful engravers of stone, so their deeds might be emblazoned that all might know of them thereafter, a murmuring arose.

Then the Surajah of Gwalior said, "Why murmur ye?" and the people said, "Because we have no roads, therefore our commerce is straightened."

And the other Surajah made like inquiry of his people and they made reply: "Sire, our people are dumb men before the Persians. The scholars of Gwalior speak in the tongue of the stranger and lo! where is now our trade?"

Thus it has been and will ever be till water no longer turns the mills or the sun ripens the rice in the meadow.

———o———

Time was when mining had hazards far greater than today. So to subdue these hazards, the operators met them one by one.

The risks of mining did not appear all at once. But as they appeared, someone checked them. Thus the enlightened operators introduced the safety lamp, then the return airway, the trompe, the furnace, the overcast.

Then they ripped out the furnaces. They put gates on the shafts; installed devices to stop runaways; put firebosses to detect gas; fireproofed the stables; concreted the shafts; built headframes of iron; hooded the machinery; put safety stops on the hoists; dampened the coal dust; built stoppings of stone; analyzed the mine air, and stationed boys to tend trapdoors.

Space will not suffice to tell what was done. Still murmurings arose.

———o———

Some operators did more than others. Some took one course, some another. All did much. But the people still raised a cry, "Why not all this and why not more?"

———o———

The operator sees his duty and acknowledges his social obligation. In most cases his fad is safety and the comfort of his men.

True, he likes dividends which muckrakers, yellow journalists and some legislators refuse.

But he has not been unmindful of his duty and he does not always ask how the law reads.

He takes the unwritten law and devises or adopts new means of safety, enforces new rules, which are often bitterly opposed by his employees and their confederations.

He knows the law is not the guide of the good man, but the curb of the rogue, the clamped bars which restrain the thief; and he reads, marks, learns and digests that he may lead the way to safety, and the law corrals the stragglers.

———o———

The operator cut the gad and to the operator it is applied. And the public grasps the small end and applies the other, for a pleasant thing is the use of the hammer on offenders, providing the other fellow is the offender. And, after all, the gad has its uses. We should find it a slow, slow world were it never applied.

Collieries on the Ellsworth Branch

By R. Dawson Hall

A field of recent development with the most modern equipment. The operators have duly recognized the risk attendant on open lights and discarded them at all shafts. Not less modern than the plants are the new methods being pursued to promote the welfare of the operatives.

The field, of which the outlet is the Ellsworth branch of the Pennsylvania Railroad, is of quite recent development, the line being built to Ellsworth in 1900 and extended to Marianna in 1907. The district contains many features of interest from the large scale in which its development has been conducted. Commencing at Monongahela City, on the left bank of the Monongahela river, it extends along Pigeon creek to its headquarters at Scenery hill and thence to the valley made by the waters of Ten Mile creek. The northeastern half of the field follows the valley of Pigeon creek, of which the three branch valleys are as important geographically as the main. The southwestern half is drained by Daniels and Little Daniels runs, which joining, enter Ten Mile creek a little above Zollarsville.

A winding syncline, known as the Waynesburg, divides the field roughly in two, but throughout its length, in the field under discussion, there is a gradual rise in the measures, the coal being about 350 ft. higher near Monongahela City than at Marianna, which village marks the southwestern end of the field. The Bellevernon anticline to the southeast and the Amity anticline to the northwest, are both about 4½ miles distant from the syncline between them, but the steeper rises are toward the former.

In every part of the field, the Pittsburg, the only producing bed in the district, lies below water level. The Monongahela measures along Pigeon creek and its branches and on Ten Mile creek, do outcrop a little, but for the most part over all the surface lies the Permian or Dunkard group of measures, including the Washington formation and in part the Greene also.

Consequently, the field, lying so far below the water level of the entire surrounding country, is a gaseous one. The Marianna explosion, with its death roll of 154, impressed that fact firmly on all concerned from end to end of this field. To protect the mine against the most remote possibility of fan stoppage, the Pittsburg-Buffalo Coal Company has two fans installed, either of which is sufficient to ventilate the mines, and one of these is connected to two engines, so that if one needs repair, the other can take its place. Of course, in practice, it is customary to use one fan and to drive that fan by one of the two engines provided for that purpose.

As a further result of the explosion, the same coal company has installed pneumatic locomotives, though every preparation had been made to haul coal by electrical power. There is every precaution taken to prevent a repetition of the disastrous occurrence of Nov. 28, 1908, and the use of safety lamps alone and the unannounced inspection of men entering the mine, make conditions at this operation very safe. Only recently, a miner, the sole survivor of the Marianna explosion, was arrested and fined for taking a tobacco pipe down the shaft.

Tipple and Washer, Ellsworth Colliery No. 1, Ellsworth, Penn.

Humidity and Firedamp are Measured Once Each Week

At the Ellsworth collieries, both humidity and methane are regularly measured once a week in each section of the mine. The former generally runs from 90 to 100 per cent. of saturation and the latter, in the returns, under 0.5 per cent.

It appears that the gas is found in live, and not in those pillar workings where the roof is broken. It is found in the latter, of course, after a fan is shut down, but only because diffusion is not complete, so that the gas rises and displaces the air. The gas was found in the sinking of the Ellsworth shaft No. 1, when the sandstone of the roof was penetrated, but not before, so that it must be in the coal proper or in the roof-coal and not in the strata above. In the mines of the Ellsworth Colliery Company, electric motors have been employed for gathering. Most of these had a return-wire attachment, but it is purposed to use a crab motor, so that it will not be necessary for the locomotive to travel to the end of a room. Thus, there will be no need for the motor to approach faces of newly cut coal, which is charged with gas and bleeding it freely.

The section of the coal at Ellsworth colliery is very typical of the field and is given in the inclosed illustration. The coal bed at Marianna runs from 5 ft. 6 in. to 6 ft. 8 in., and usually nearer the larger figure.

An analysis based on eight samples of the whole bed in the Amity quadrangle, as used for shipments, is as follows; the figures following on the right being those for run-of-mine coal at Marianna.

COMPOSITION OF PITTSBURG COAL

Moisture	1.86	0.92
Volatile matter	35.95	36.11
Fixed carbon	56.26	56.19
Ash	5.93	6.78
	100.00	100.00
Sulphur	1.12	0.99

It is a good steam and coking coal. There are ovens at Marianna, Ellsworth, Coalburg and Bentleyville, those at Bentleyville being Mitchell ovens. These are, of course, leveled and drawn by machines. One machine can draw, or rather push, 150 ovens in six hours. At both Marianna and Bentleyville there are a number of ovens connected by conduits with the boilers, and these are fired wholly or partly by the waste heat from the same.

Tipple and Washer, Acme No. 2 Mine


A Group of Ellsworth Colliery Dwellings


General View Acme No. 2 Mine, Pittsburg-Westmoreland Coal Company

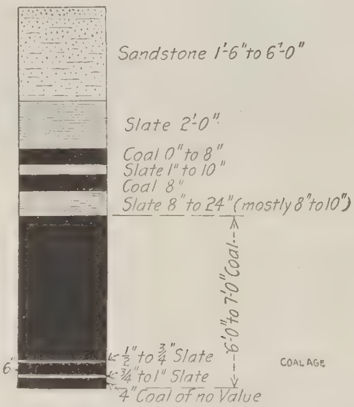

View Showing Washer and Power House at Acme No. 2 Plant

Mining Methods

The system of working at the Ellsworth collieries varies but little from that favored in the Pittsburg district and the

extraction on first mining, contrasts strongly with that of the Connellsville and Georges Creek regions. Instead of a primary extraction of a little over 50 per cent. of the coal, these more easterly districts produce only 13 to 15 per cent. so that nearly all the work is pillar work. The fact that mining machines can only be used in advancing the breasts and in the first cut made thereafter, has something to do with this, but another cause is to avoid the large amount of advance work demanded by more modern methods. In the Ellsworth mines, the width of the pillar is 20 ft. and of the room 22 ft. This is an extraction of about 50 per cent. at first mining. The length of the neck of the room is 21 ft. Rooms including the necks are 250 ft. long. All main entries, which are here driven in the direction of butt entries, are constructed four-fold. The face entries are driven with three openings, while the secondary butt entries have two haulways, one of which is used for a return airway and one for an intake. The chain pillars in the main and face entries are very wisely driven on 40-ft. centers but are protected with equal wisdom by large flanking pillars 100 ft. wide. On the other hand, within regulation distance of the next face heading, rooms are started at the end of the heading and progression in starting and driving rooms and recovering the pillars is from the end of the heading back to the protection pillar of the face heading. The cover runs from 350 to 500 feet.

The Acme mines of the Pittsburg-Westmoreland Coal Company have another



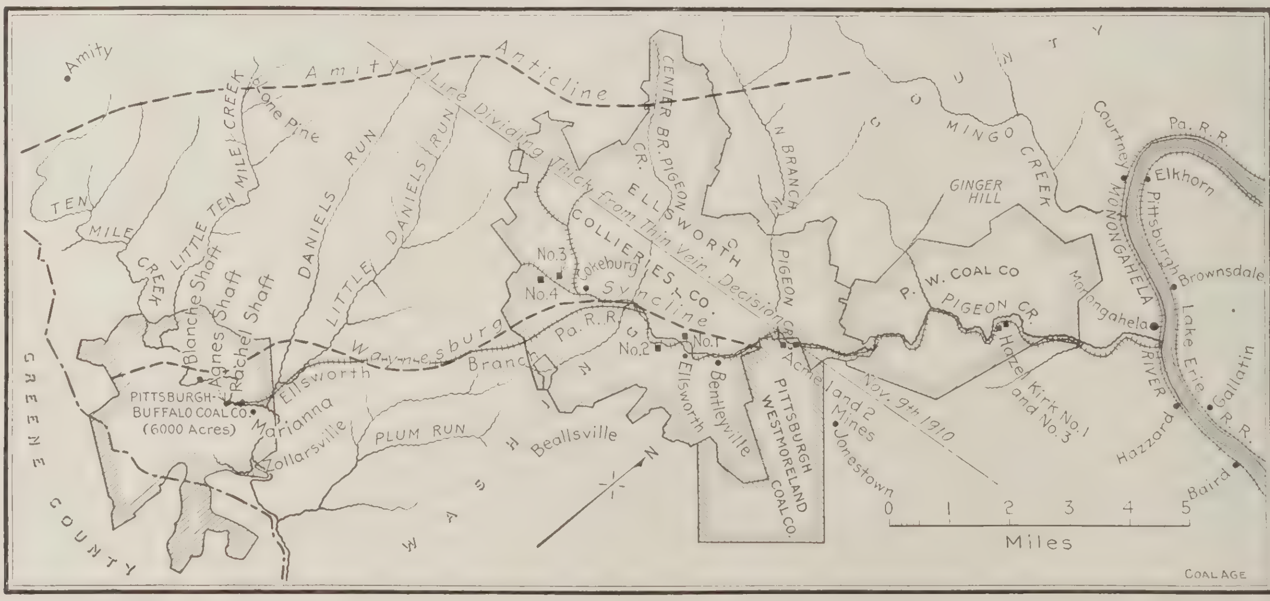
Pittsburg Coal at Ellsworth Collieries

center to center. It is the intention to do retreating work in the future.

The Marianna mining methods are not fully decided on and have hardly passed the experimental stage. The mines have heavier cover than any others, perhaps 650 to 750 ft. is reached in places. But the working is largely under Marianna town and the company hesitates to completely extract all coal from the support of a village on which they have spent so much money for brick houses with modern sanitation, cement walks, etc., and they have decided on a chamber 27 ft. wide and a 6-ft. pillar. They expect that the pillar will crush and one cannot see why a well conceived retreating plan with an attempt to retrieve the last ton of coal would not be preferable.

Sociological Provisions

In an article of this kind there is little place for detailing the new methods of caring for the welfare of the miners outside the mines. The Marianna mines have always been preëminently distinguished for such welfare work. The explosion, and the situation of the town at the end of an unimportant branch line, have made it difficult for such enlightened

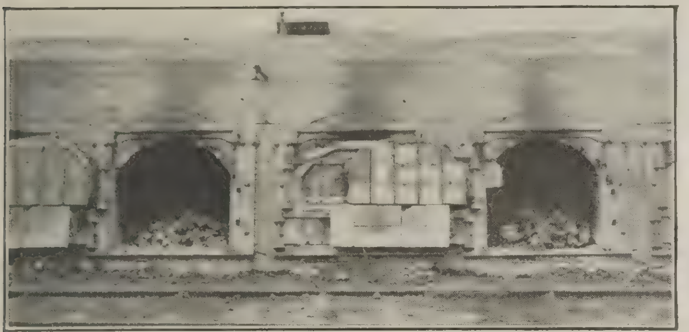


The Ellsworth Branch Coalfield, Washington County, Pennsylvania. An Unbroken Body of Pittsburg Coal

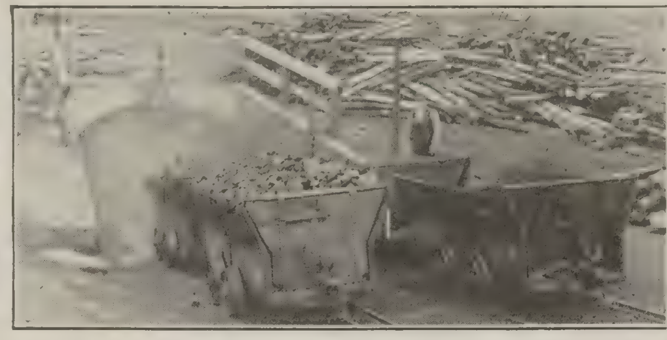
the chain pillars in butt entries are 60 ft. through. A fair average of coal extracted is 90 per cent. in room pillars and 75 per cent. only in the chain pillars of the butt entries. The system followed is a peculiar one. One pair of headings is run up with rooms driven right from the right-hand heading and left from the left, the first rooms being started as soon as the 100-ft. flanking face pillar is provided for. The rooms are drawn in regular order as they have been driven up. The next pair of headings is in skeleton, mere headings without rooms with a 250-ft pillar flanking them. When they come system. The main butts are six-fold. The face headings three-fold, and the secondary butts are double. The rooms are only driven from the haulways. They are set with 35-ft. centers and are 20 to 21 ft. wide, leaving a pillar from 14 to 15 ft. wide, the extraction on first mining being 60 per cent. There is a little less overburden to support at Acme, but in places the coal is at least 400 ft. deep. The necks are 21 ft. long and the rooms including necks 250 to 260 ft. in length. The headings of the main butts are centered 60 ft. apart, but the face headings and secondary butts are 50 ft., from

purposes to blossom into full-blown success, though eventually the well-built houses and universally established sanitary sewerage, the amusement hall, wash houses and other comforts will bring the best kind of miners. At present the improvements must appear uncomfortable and undesirable to many of them, largely Pan-Slavs, who have been used to snug quarters in a dirty hut covered by a thatched roof and who measure against the stately discomforts of a good house and a bathroom, the one clean pleasure he can understand, at the end of every two weeks, a fat roll of bills. The Ells-

worth colliery has houses, offices and stores of marked English type and will certainly appeal to the artistic sense, though possibly the houses are not as well lighted as if they had been constructed according to American plans. They are, as at Marianna, all the property of the company. The Ellsworth firm has a dairy farm where milk is sterilized for sale to the miners and is endeavoring by the use of garbage boxes placed along the sides of the road, and emptied every week, to induce the foreign-born families to live more cleanly lives, and very neat is the village, alike where the Americans and Europeans live, but the Italian cannot be induced to relinquish his jackdaw habit of gathering every cast-off box and slat to litter up his yard. To prevent the disposition to drive across the unfenced lots, so marked in mining villages, resulting in mere house sites and roads with an unsystematic appearance, cinder walks, held in place by heavy 12-in. planks staked firmly in position, are being laid. The plank is high enough to keep vehicles in the road. To beautify the town, the coöperation of the school teachers was secured and after the children had been well indoctrinated into the methods of planting, 300 catalpa trees from the company's own grove were distributed free throughout the village, the people of all nationalities taking pride in planting and caring for them. As a result, they look very thrifty and relieve the dull bareness of the house lines. One marvels at the stupidity which makes some operators order a small copse completely cleared for houses, robbing the village to be constructed of the one beauty all people, from east or from west, equally understand—the beauty of foliage. And to protect the trees, the help of the schools should not be disregarded for it is rarely adults who mutilate shade trees.



Mitchell Ovens at Bentleyville



Slope Mouth, Acme No. 2

A String of Coke Ovens at Ellsworth with Boiler Plant Utilizing Their Waste Heat

Standing of the Nations

It is more than a coincidence that the standing of the leading nations parallels their product of the prime mover of civilization—coal. Taking the figures of the report of 1909, the most recent available, we have:

United States, 460,803,416 short tons, Great Britain, 295,427,229; Germany, 239,676,934; Austria Hungary, 53,136,000; France, 41,856,269.

Alone of all the five countries mentioned, Austria-Hungary appears above the order which it deserves as a world power.

Colliery Dwelling Construction

By A. T. Shurick

This is the first of a series of articles which will take up in detail the construction of miners' houses. References on this subject are unusually meager and the methods here described are selected as typical examples of those employed by some of the larger companies and may be taken as the standards for this class of work.

To obtain the maximum economy of operation in the modern coal mine of today, a certain amount of high-grade help is essential, to procure and retain which, comfortable quarters must be provided. This applies not only to the official force, but also to the rank and file, for it is generally conceded that the permanent man has a higher efficiency, and men of this class are often attracted and held by adequate and agreeable living conditions even at times with lower wages.

The selection of a house suitable for the office men and mine officials is not usually a difficult problem. They appreciate and care for any of the small luxuries which a company may feel inclined to install, and are ready to pay the additional rent necessary to make such installations a profitable investment. On the other hand, the selection of a proper house or houses to meet the requirements of the cosmopolitan population which forms the bulk in the average coal camp, is often a difficult problem.

Some companies with a view to bettering the condition of their miners include cellars or bath tubs in designing the houses, which often results in their later having the chagrin of seeing these turned into a stable and coal box, respectively. It seldom happens that a class of miners as a whole will be obtained who appreciate expenditures of this character, although there is nearly always a certain percentage who will, and a few houses of this kind will seldom lack the necessary tenants.

The term "coal camp" usually conveys to the layman an impression synonymous to that of New York's famous Ghetto, or the picture of a straggling road lined with dilapidated "shacks" inhabited by a gun-fighting population of rough-necks. While such conditions may have prevailed in the early history of the industry and still be in effect in some isolated instances, the advent of large capital in recent years has brought with it far-sighted men who appreciate the fact that permanent organization and legitimate business cannot exist under such conditions. For this reason the day of the shack camp, except for temporary construction purposes, is past.

For the average miner's house the question then resolves itself into something between the shack and the "cellar-bathtub-house." While this appreciably limits the range for selection, a surprisingly large number of different designs and grades of construction occur within these limits. I remember one camp having for its subdivisions Papercollar Row, Sandal-Foot Row, Darkest Africa, Japan and Chinatown, each division having a standard design of its own and some several different designs.

This article will take up in detail what is believed to be a house of average design for this purpose. The construction of houses of this character is often undertaken without special plans, specifications, etc., because of their low first cost. Where 40 three- to five-room houses are being erected, the first cost will run about $30,000 or $35,000, when good permanent construction is used and no frills. Unless careful designs have been drawn up it usually develops when the houses go into use that the rafters on a lean-to having a light pitch are too small to carry the snow-load or the floor joists over a particularly long span are too weak. Since the total investment exceeds the amount of a single large house for which detail plans and specifications would naturally be drawn up, this cannot be considered good practice.

Types of Houses

While in some instances the two-story house in used in large camps and where land values are an important item, these conditions do not often prevail and houses of this class are rather the exception than the rule. The house most commonly met with today is a low, single-story frame structure, substantially built and having from three of five rooms.

Two-room Houses—With camps located in remote districts and subject to the occasional visits of officials who are obliged to remain over night, it sometimes becomes necessary to provide for their accommodation. Fig. 2 shows a comfortable little house adaptable to such emergencies, which may be cheaply built and will accommodate four persons comfortably. It has a sitting room 9x12 ft. and a bed room 12x15 ft., the latter having a good roomy closet. Studs and rafters of 2x4 stuff are used throughout, drop siding on the sides, a shingle roof, and the interior lathed and plastered. Four spring-lock windows, 8x10 twelve light, are provided, and a single 2-ft. 6-in. by 6-ft. 6-in. outside door equipped with a good lock.

Fig. 1. A Commodious Superintendent's House

Three-room Houses—In Fig. 3 is shown an illustration of a neat and substanially built house of the three-room variety, the floor plan of which is shown in Fig. 10. There is always a certain demand for houses of this type, and mining towns are seldom built without including a certain percentage of these.

A house of the dimensions here shown provides ample room to meet the requirements of the small family, for which purpose it is intended. These overall dimensions are often cut down four or five ft., effecting considerable saving in construction and still being of sufficient size for ordinary purposes.

Two exterior doors, 2 ft. 8 in. by 6 ft. 8 in., are provided, one each for the kitchen and living room. Should it be desirable to have a porch at the rear, the kitchen door should be changed to the other side from the one here shown, which places it close to the corner, mak-

FIG. 2. TWO-ROOM HOUSE

FIG. 3. THREE-ROOM HOUSE

FIG. 4. FOUR-ROOM HOUSE WITH HIP ROOF

FIG. 5. FIVE-ROOM HOUSE WITH GABLE ROOF

FIG. 6. FOREMAN'S HOUSE WITH GABLE ROOF

FIG. 7. FOREMAN'S HOUSE WITH HIP ROOF

FIG. 8. A SUPERINTENDENT'S OR FOREMAN'S HOUSE

FIG. 9. SUPERINTENDENT'S HOUSE WITH HIP AND DECK

ing the porch easier to support and providing more available wall space. Interior doors, 2 ft. 6 in. by 6 ft. 6 in., connect all adjoining rooms, and each room is provided with two double-sash, spring-bolt, 12x14, eight-light windows with the exception of the bed room which has three. Transoms are not ordinarily stipulated for miners' houses, but one should be provided for the front door.

In Fig. 11 is shown a plan of a three-room house of the smaller variety, but having a few additional conveniences. The total cost of this house would, under equal conditions, probably be about the same as for that shown in Fig. 10, and to the small family for which it is intended, would doubtless be more acceptable.

The kitchen is provided with a sink and drip board, items of small cost and no little convenience, and has also a commodious pantry. Off the bed room is a closet, and the front entrance has a 5-ft. 6-in. by 8-ft. porch which adds much to the appearance and has a real practical value, since the house has no entrance vestibule. A double-flue chimney is so located as to be accessible from all three rooms.

Four-room Houses. The four-room house is one of the most popular types met with, since it provides the maximum floor space with the minimum expenditure of labor and material.

In Fig. 4 is shown an example of the ordinary house of this variety, and in Fig. 12 a ground plan. These houses are commonly built from 24 to 28 ft. square, 26 ft. being a good average size. In the plan here shown the house has 28 ft. frontage and 26 ft. depth, which gives 1 ft. additional length to each of the rooms, over that obtained in the 26-ft. square house.

Houses of this variety are often constructed with the hip roof, as shown in Fig. 4 instead of the gable roof as shown on the five-room house in Fig. 5, with the mistaken view of securing economy of labor and material. In the hip-roof construction all the rafters are of variable length and require bevel cuts at one end, necessitating the careful attention of a competent carpenter to insure good results. The four sloping hips present difficulties in obtaining a weather tight joint and excessive waste of both labor and material occurs due to the variable lengths and bevel cuts necessary in both the sheathing and rafters.

These houses are ordinarily divided into four equal and separate rooms by partitions running through the center each way. In some instances a foot or two is taken from the bed rooms and added to the dining and living rooms, which is generally considered a good plan. With the hip roof some difficulties in the chimney construction occur when this is done, owing to the chimney not being in the center of the building, since it is usually desirable to have it readily available from each room and supported at the intersection of the partitions.

Five-room Houses—The five-room house is one of the standards in coal-camp construction, a certain percentage of these nearly always being included in the general scheme.

In Fig. 5 is shown a typical example of this class of house and in Fig. 16 is a ground plan of the same. This house is essentially the same as the four-room house with a lean-to addition at the rear, and much that has been said of the former will apply equally well to this.

Since these houses are, of course, intended for the larger families it is customary to make them amply large, not less than 26 ft. square for the main building, and 28 ft. being still better. The lean-to additions are ordinarily made 12x16 ft., the short dimension being placed perpendicular to the main building in order to provide a maximum slope with the minimum loss of head room. With the addition of the fifth room, another chimney becomes necessary, one with a small single flue being sufficient.

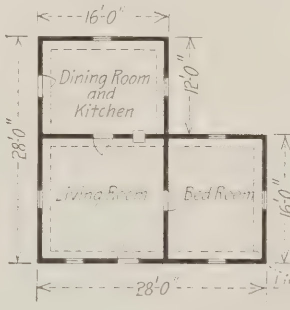


Fig. 10

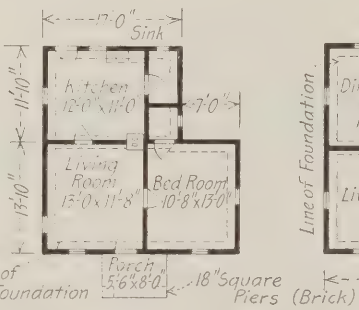


Fig. 11

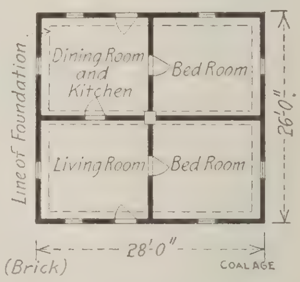


Fig. 12

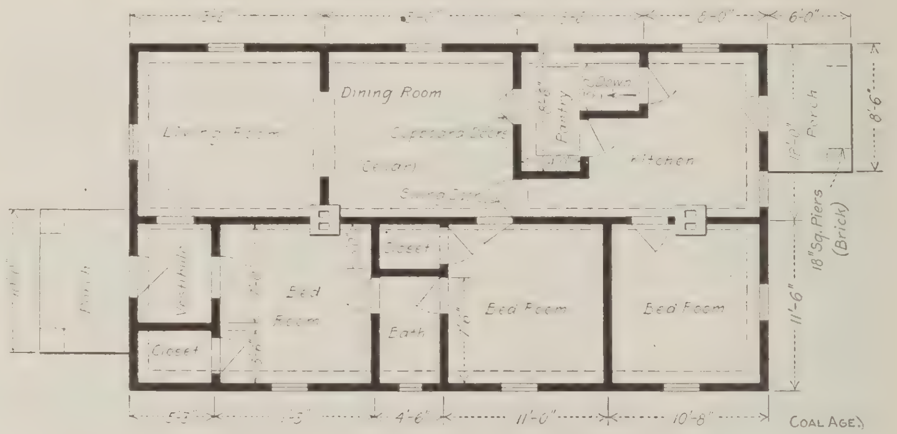


Fig. 13. Superintendent's or Foreman's House

Superintendents' and Foremen's Houses

The range for selection of houses of this class is unlimited, and, of course, dependent on the position of the individual for whom it is intended, and the policy of the company. They may be anything from a slight improvement on the ordinary five-room house to a large, commodious two-story building with all modern appurtenances. While a discussion of the latter variety will not be attempted, a description of a few typical examples of the former will be given.

A modest improvement on the average miner's house is shown in the illustration, Fig. 6. This is built along the lines of the usual five-room house, but finished up much better, and has an ordinary gable roof and a commodious porch. The interior is lathed and plastered, special single- and two-light windows are used for the front rooms, while large four-light windows are used in the others. Another house along the same lines, but having a hip roof and finished with drop, instead of lap siding, is shown in Fig. 7. This is a very neat, attractive and well-balanced type of house for moderate expenditures.

A more elaborate and substantially built house is shown in Fig. 8. The floor plan for one very similar to which is shown in Fig. 13. Hip-roof construction is used, in order to add to the appearance of the house, and both front and rear are provided with porches. A cellar is also included, access to which is obtained by stairs from the kitchen leading under the pantry. The main

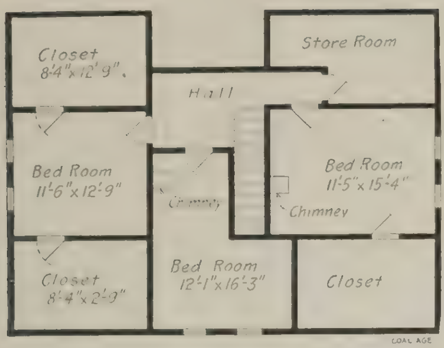


FIG. 14. SECOND FLOOR, TWO-STORY HOUSE

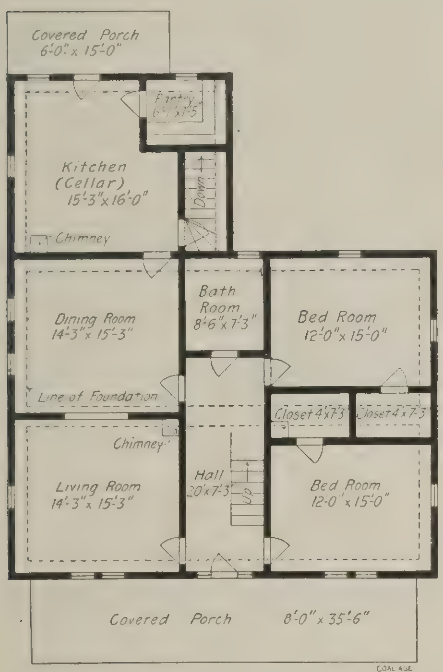


FIG. 15. FIRST FLOOR, TWO-STORY HOUSE

FIG. 16. FIVE-ROOM HOUSE

pantry door leads to the kitchen and cupboard doors also give into the dining room. The number and distribution of the remaining rooms is clearly shown in the plan. Another house of a very similar design but more elaborately finished is shown in Fig. 9. This house has a hip roof with a deck and a number of minor details which adds much to the appearance of the completed structure.

A well balanced, good appearing and commodious house of the two-story variety is shown in Fig. 1, floor plans of which are shown in Figs. 14 and 15. The usual gable roof is used, with a dormer window in front which gives an additional room on the second floor, and relieves the straight lines of the house. A cellar is provided under the kitchen, and the latter has a large roomy pantry. The bath room is on the first floor, which also has a large hall containing the stairs leading to the second floor. The ceiling on the first floor is 9 ft. high, and the interiors finished in lath and plaster, with appropriate base boards and picture mold. The length of studs used is 14 ft., which makes the hight of the walls under the eaves on the second floor about 4 ft. The partitions for the second-floor rooms are placed back far enough from these low walls to get an even 8-ft. ceiling and the remainder of the space utilized as closets and store rooms.

Mining Law in Virgina

The following provisions cover all the mining regulations in force in the State of Virginia:

To secure operatives and laborers engaged in and about coal mines and manufactories, the payment of wages at regular intervals and in lawful money.

(1) All persons, firms, companies, corporations or associations in this Commonwealth engaged in mining coal, ore or other minerals, or mining or manufacturing them, or either of them, or manufacturing iron or steel, or both, or any other kind of manufacturing, shall pay their employees as provided in this act.

(2) All persons, firms, companies, corporations or associations engaged in the business aforesaid shall settle with their employees at least once in each month, and pay them the amounts due them for their work or services in lawful money of the United States, or by the cash order, as described and required in section three of this act; provided that nothing herein contained shall affect the right of an employee to assign the whole or any part of his claim against his employer.

(3) (As amended by chapter 118, acts of 1887-'88.) From and after the passage of this act, it shall not be lawful for any person, firm, company, corporation or association engaged in the business aforesaid, their clerk, agent, officer or servant in this State, to issue for payment of labor any order or other payment whatever, unless the same purports to be redeemable for its face value in lawful money of the United States, made payable on demand, and without condition, to employee or bearer, bearing interest at legal rate, and redeemable by the person, firm, company, corporation or association giving, making or issuing the same; and any person, firm, company, corporation or association engaged in the business aforesaid, their clerks, agents, officers or servants, who shall issue for payment of labor any paper or order, other than the one herein specified, in violation of this section, shall be guilty of misdemeanor, and upon conviction shall be fined in any sum not exceeding one hundred dollars, in the discretion of the court.

(4) From and after the passage of this act, it shall be unlawful for any person, firm, company, corporation or association engaged in mining or manufacturing, either or both, as aforesaid, and who shall likewise be either engaged or interested, directly or indirectly, in merchandising as owner or otherwise, in any money, per centum, profit or commission arising from the sale of any such merchandise, their clerks, servants, officers or agents, to knowingly and wilfully sell, or cause to be sold, to any employee any goods, merchandise or supplies whatever, for a greater per centum of profit than merchandise and supplies of like character, kind, quality and quantity are sold to other customers buying for cash and not employed by them; and shall any person, or member of any firm, company, corporation or association, his or their clerk, agent or servant, violate this section of this act, they shall be guilty of a misdemeanor, and upon conviction shall be fined in any sum not exceeding one hundred dollars, in the discretion of the court.

Survey Stations Underground

In surveying a fairly thick vein in a dry mine, spad stations usually give better results than hole stations drilled in the roof, inasmuch as the variation of the plumb-bob string held in the hole station is greater than when held from a spad station. When a spad is used as a station, it is so driven into the plug that the hole in the spad takes a slant position so that when a string is hung through the hole it always hangs in the same position. Where the roof is low, spads should not be used for stations as they are likely to be disturbed.

Anthracite and Bituminous Mining

By Eli T. Conner*

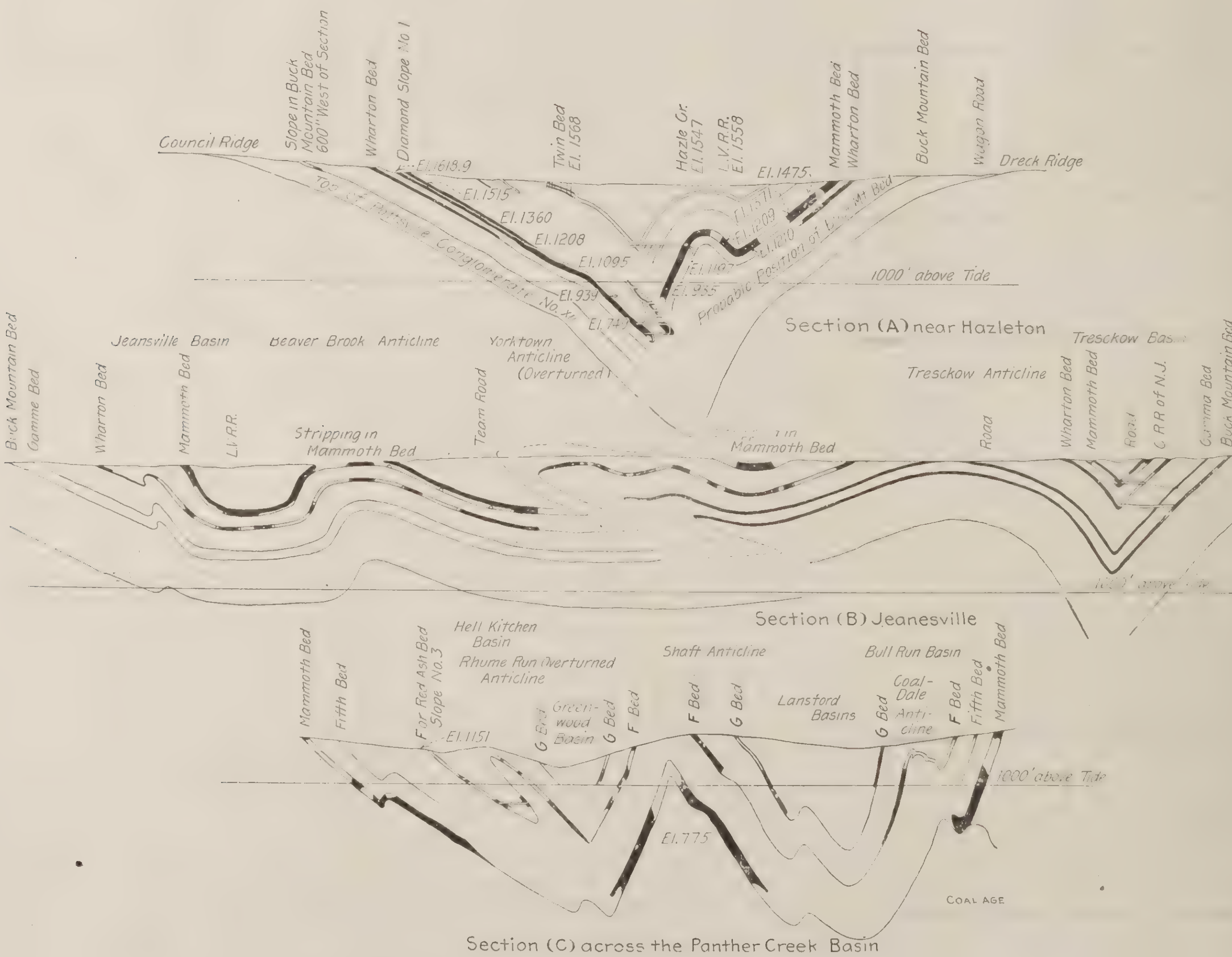
A description of the methods and measures in the Eastern Middle or Lehigh Region where the pitches are so severe that the coal frequently breaks up and runs without mining. The second of a series of articles by Mr. Conner.

It is purposed in this article to discuss the geology and economic development of the Eastern-Middle or Lehigh region. The former article, which appeared in COAL AGE, Oct. 14, treating of mining conditions in the northern anthracite field, was illustrated by cross-sections, which should be compared with the three cross-sections accompanying this article in order that the reader may appreciate the widely different conditions met with in the Lehigh region. It will be noted that the main basins in the Lehigh district are deep and distorted, causing excessive pitches; consequently the methods of attack, development and operation must differ widely from those of northern anthracite-field practice, and must necessarily require quite different training to develop competent miners, foremen and managers. It has been found by experience that men whose early training has been in the northern anthracite field do not generally make competent employees in the Lehigh or southern regions and vice versa.

The Mammoth Bed and Its Extraction

The principal seam of coal found in the Lehigh region, as elsewhere, is the great Mammoth bed, which corresponds to the Baltimore seam in the northern field. This bed in the Lehigh region varies from 24 to 50 ft. in thickness, the average being about 30 ft. Most of the early mine development was made on the Mammoth seam. The methods of development and mining that were inaugurated many years ago have been continued with comparatively slight changes. These methods are well illustrated by cuts accompanying this article, taken from the report by H. H. Stoek, contained in the 22d annual report of the United States Geological Survey, which illustrate gangway and airway, and chamber workings in thick and thin seams on steep pitches.

It will be noted that where the chambers are worked "full," the entire content of the bed whatever it may be, together with any "slab," "clod," or "loose top rock," must be drawn out of the chute at the bottom of the chamber, into the mine car, as there is very little opportunity to separate the impurities from the good coal in the mine. This is not an unmixed evil, as it avoids the great waste, referred to in the article on the northern anthra-



COAL BASINS IN THE EASTERN MIDDLE ANTHRACITE FIELD

*Mining engineer, Real Estate Trust building, Philadelphia, Penn.

cite field, of throwing into the gob doubtful and off-color benches of coal, which, if sent outside to the breaker, as is the case where coal is loaded from running chutes, can be inspected and some part at least of the doubtful coal saved for the market. In other words, it is not left to coal is shot off the solid, but in the Mammoth seam it frequently happens that after the chamber has been developed so that the whole seam is cut from floor to roof, it becomes impossible to control the chamber by reason of the coal "running." When this happens, the miner continues down. This may, perhaps, occur before all of the solid coal has been recovered. There is no possible way of ascertaining whether or not, all of the coal that should come out of a given chute or series of chutes has been recovered, consequently it is necessary to handle the rock that

Shovel Working on 50-ft. Coal Bed

Stripped Coal at Lattimer

A 100-ft. Cut to Uncover Coal

Shovel Mining a 50-ft. Coal Bed

Rock Bed in a 100-ft. Stripping

A Stripping with Pitching Coal

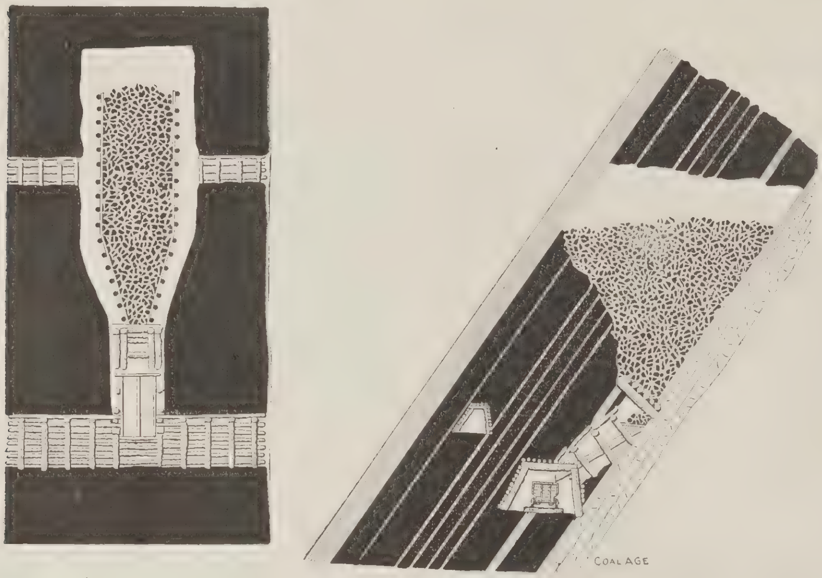
the judgment of the individual miner or his laborer to determine what is or is not marketable coal.

The "Running" of the Mammoth Bed

In driving the chutes and chambers, as shown by the cuts before referred to, the to draw coal out of the chute so long as it will "run." It frequently happens that when one or more chambers break loose in this manner, not only the coal directly in line with the chutes, but also the pillars between adjoining chambers, run out, permitting the roof rock to come comes when a fall occurs, until the foreman feels convinced that no more coal can be recovered from that chute. In this way enormous quantities of rock are loaded in the mine cars, transported to daylight and dumped on the waste bank.

SLICING METHOD OF MINING THICK BEDS

It is well known that this method of mining very thick beds of coal standing on steep pitches oftentimes results in the recovery of a lamentably small percentage of the original content. Earnest thought and effort have been put forth by able managers to devise better methods of winning these thick beds of coal, but very little change resulting in improved recovery has been made since the early days.



HEAVILY PITCHING BREASTS ON MAMMOTH BED HAZELTON

American engineers have been much interested in reports of the successful mining of thick beds of coal in Europe by what is known as the "slicing method," by which the coal is extracted in slices from the bottom upward, each slice being about 6 to 8 ft. thick, and the space from which it is removed being filled with flushed sand or other material before the next slice is extracted. This operation is reported to result in the recovery of practically all coal, with comparatively slight subsidence of the overlying rock.

As a report is shortly to be made on this subject by a commission recently sent to Europe by the Mining Bureau of the United States Government, no further description of it is necessary here. The forthcoming report will be of great interest to engineers familiar with the methods pursued in mining thick and steep beds in the Pennsylvania anthracite field.

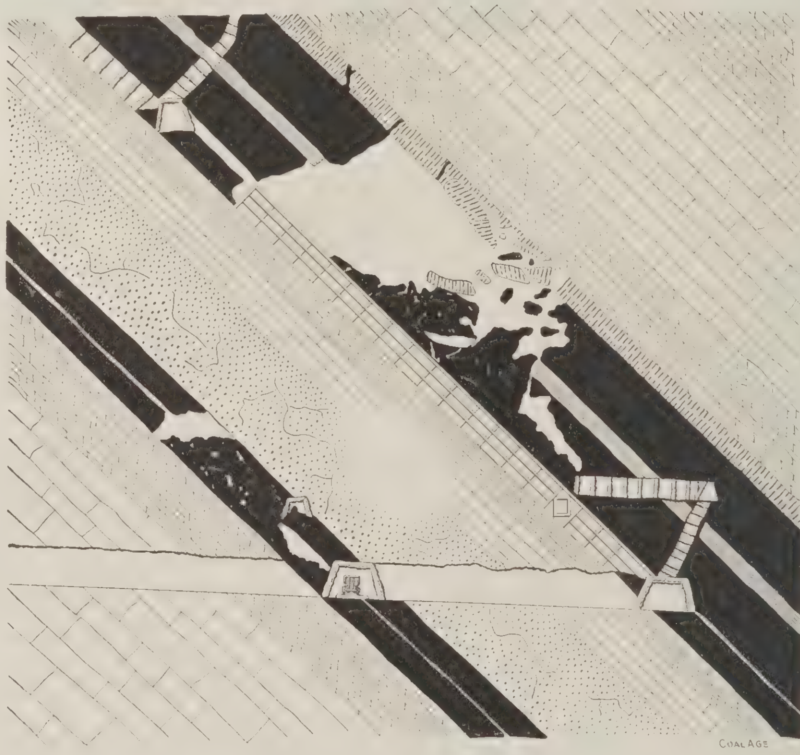
THE NEED FOR LARGER CONSERVATION

The great loss of coal due to the methods and conditions to which reference has been made, was very carefully investigated and reported upon by the Anthracite Coal Waste Commission, composed of the late Eckley B. Coxe, William Griffith and the late Heber S. Thompson, who reported to the Governor of the State of Pennsylvania in 1893. This commission estimated that in the average mining of the Mammoth and other beds where the pitches are steep, not over 40 per cent. of the original content in the ground had up to that time been recovered. This represents an appalling irrecoverable loss of exceptionally high-grade fuel. Very little, if any, improvement in recovery has been made since that report was filed, excepting that in recent years buckwheat Nos. 1, 2 and 3 are now being marketed. The estimates mentioned included pea and buckwheat No. 1, but not the two lower grades.

The loss of coal in the Mammoth seam is not the only damage done, as in most cases in the earlier days of the industry no attention was paid to thin and so called inferior seams of coal overlying the Mammoth, which, in many instances, have been practically destroyed by the dropping of the underlying strata, due to caving of openings in the Mammoth bed. This destruction of overlying beds was, of course, more pronounced years ago than in recent years, because more attention has been given to the conservation of the marketable coal in all beds, even in those as thin as 30 inches.

STRIPPING METHODS FURNISH COMPLETE CONSERVATION

It will be noted by the cross-sections that there are many instances where the beds of coal come close to the surface at the "spoon" ends of basins, the marginal outcrops and on the crests of anticlinals. In such cases it has been found profitable to strip off the overlying earth and rock, exposing the seam of coal, which can then be quarried in open-cut mining. The first work of this character on an extensive scale was undertaken by Ario Pardee, at his Hollywood colliery, near Hazleton, Penn., in 1881. This work was commenced by the late Capt. William I. Conner, my father, who introduced the first steam shovel used for this purpose in the anthracite field. Since that time extensive stripping operations have been carried on in the Lehigh region with satisfactory results. It was then the opinion of engineers and operators that 1 ft. of overburden could be removed with profit to effect a recovery of 1 ft. in vertical thickness of coal seam, even though the



METHOD OF WORKING CONTIGUOUS SEAM THROUGH HORIZONTAL ROCK TUNNEL

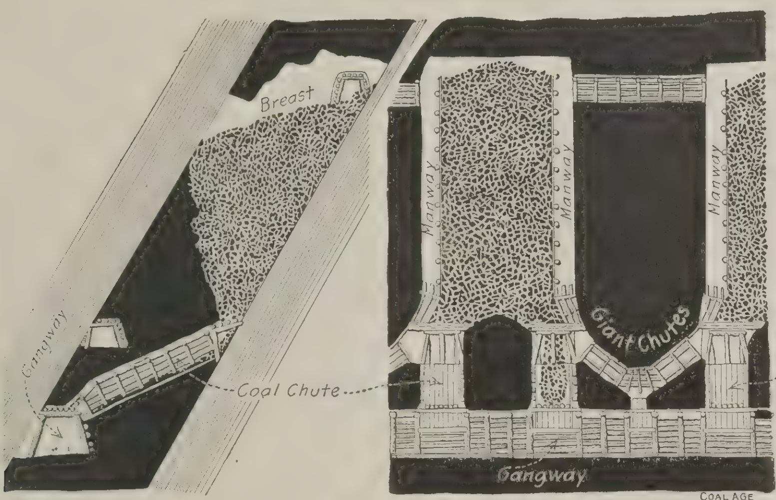
coal bed had been partially mined by underground methods. This relative proportion has been greatly changed during the past 10 or 15 years, until as much as 3 ft. of overburden, 60 per cent. of which is rock, has been removed for the recovery of one vertical foot of coal bed.

On large operations, the cost of this stripping work has been done within my knowledge for 18c. per cu.yd. of earth, and 35c. to 40c. per cu.yd. of rock. While stripping means a large outlay before much return can be secured, it permits the recovery of all the coal, with cheap methods of mining and handling. In order to illustrate the stripping methods, several photographs are introduced showing typical operations.

Slopes in Coal vs. Shafts with Tunnels in Rock

The early developments in the Lehigh region were by slopes sunk directly to the true dip on the bed, usually following the floor or footwall. From these slopes levels were turned on the strike of the seam, usually at intervals of about 500 ft., as measured on the pitch. This former method of development was quite successful, in most cases, for the operation of four or five lifts, but beyond that, it was found as years went by, that the cost of maintaining the slopes and levels was excessive, due to the very large amount of extra heavy timbering that was required to maintain the openings.

In recent years important developments have been made by sinking shafts of large area in the centers of the basins, with the long axes of the shafts parallel to the axes of the synclines. From these shafts, levels are turned off in rock on both sides. These levels are placed so as to intersect the old levels formerly driven from the slopes, and are generally about 400 ft. vertically apart. A notable instance of this type of development, which has worked out quite successfully, is the Hazleton shaft of the Lehigh Valley Coal Company.



Double Chute Breasts, Anthracite Region

The advantages of this method of development are that all the levels to the main outlet are in rock, and are consequently much easier of maintenance, besides which the main haulage roads can be materially shortened and upper levels, when the coal is exhausted, can be abandoned more readily than by the slope method. Another advantage is the ability to concentrate the drainage and centralize the pumping plant. This is quite important as the quantity of water to be handled is, in this region, greatly in excess of the average amount in the northern anthracite field.

American Mining Congress

The American Mining Congress will meet at the Hotel La Salle, Chicago, Ill., October 24 to 28, both dates inclusive, for its 14th annual session. The following delegates have been appointed by the President: John Hays Hammond, Washington, D. C.; George Otis Smith, Director of the U. S. Geological Survey; Robert N. Dickman, Chicago, Illinois; J. Parke Channing, New York City; W. R. Ingalls, New York City; Frank H. Crockard, Birmingham, Ala.; F. W. McNair, Houghton, Michigan; C. H. Lindley, San Francisco, Cal.; Dr. J. A. Holmes, director of the Bureau of Mines; George S. Rice, Pittsburg, Penn.

It is expected that President Taft will address the congress on the closing day, being accompanied by the Secretary of the Interior, Walter L. Fisher, and director of the Bureau of Mines, Dr. J. A. Holmes. John Hays Hammond, consulting engineer, President B. F. Bush, of the Missouri Pacific Railroad, and Governors Spry, of Utah, Carey, of Wyoming, Hawley, of Idaho, and Sloan, of Arizona, are expected to be present.

National Secretary James F. Callbreath, Jr., announces the following as the subjects with which the convention will principally occupy itself:

1. The prevention of mining accidents.
2. Compensation for the victims of mining accidents.
3. The prevention of waste of natural resources and the conservation of energy.
4. The general problems of the bituminous coal-mining industry as intensified by the demand for better protection to miners and the conservation of fuel resources.
5. The Alaskan question.
6. The public-lands questions of the West as they affect the mining industry.

A New Colliery near Crows Nest Pass

The Hillcrest Collieries at Hillcrest, Alberta, have, during the past year, been developing a large coal measure in the Crows Nest Pass territory. The location of their mine is known as Hillcrest, about two miles from the famous town of Frank. The past year has been spent in development work; an expensive rock tunnel has been driven to the coal, and many entries driven in the seam. An extensive electric haulage system is being installed, and the company has just placed an order with the Ottumwa Box Car Loader Company of Ottumwa, Iowa, for a large steel tipple.

The coal will be brought along the mountainside on a tramway, received at the upper end of the tipple, and then carried by a conveyer system down the mountainside, over 600 ft., where it will be loaded into railway cars, or dumped into storage bins, from which it may be drawn later, as convenient.

The coal is of the famous Crows Nest Pass grade, and the ultimate capacity of the mine will be 3000 tons per day.

Watering a Mule

Mules should be watered three times a day when in the stable; when working, more frequent watering is desirable. Small quantities of water taken at short intervals are preferable to heavy drafts three times a day. No harm is done by watering mules or horses when warm if they are allowed to take only six to ten swallows of water. It would be well to follow this, when the animal is being stabled, by a pound or two of hay. Then give him a rest of an hour before receiving his regular ration. If water is given to him after this hour of rest, he will in all probability refuse it or will drink sparingly.

A little water will not hurt a warmed-up mule, but the condition the animal is in induces him to drink to excess and it is mainly in that excess that the danger lies.

The Castle Valley Coal Company

By Benedict Shubart *

Description of a mine that is typical of the far West. The seam is nearly flat and varies in thickness from 23 to 35 ft. There are two main-haulage entries, and each side of the mine is handled as a separate operation.

Situated in the beautiful Cedar Creek cañon, in Emery county, practically at the edge of the Utah desert, lie the mines of the Castle Valley Coal Company. For the past 30 years the farmers and precious-metal miners in the vicinity have been digging coal from this unusual seam, driving their teams into the opening, mining the coal by hand and loading it into their wagons. A cavern about 100 ft. long, 200 ft. wide and 35 ft. high has thus been made, and all these years this opening has stood without a prop and without any sign of caving.

Several years ago, James H. Mays and Moroni Heiner, of Salt Lake, visited this country and acquired 4000 acres of land, which are now owned and operated by the Castle Valley Coal Company. Mining operations were commenced two years ago and the coal has now been in the market for 15 months.

The mines are situated about 20 miles from the town of Price, a point on the Rio Grande railroad, where the company owns extensive yards and trackage, and lie a little west of south. In connection with the opening of the mine, it was necessary to build a railroad over the rugged foothills to the mines, six miles from Castle Junction, where the Castle Valley railroad meets the Southern Utah railway. The topography of the country made the building of this road exceedingly difficult, and the road as now built has the disadvantage of grades as heavy as 5 per cent., both with and against the loaded trains. It is probable that within the next year, this line will be abandoned and a road constructed practically direct from Price up to the mine, securing a favorable grade all the way.

*Engineer, Boston building, Denver, Colo.

Coal Seam Is 35 Ft. Thick

The coal seam is a continuation of the bed now being worked at Hiawatha by the Consolidated Fuel Company. It is, however, much thicker, reaching a thickness of 35 ft. in places. The roof is quite irregular although good from the mining standpoint and the coal varies in thickness from 23 ft. up to 35 ft. The floor is of sandstone and is quite even. The coal pitches approximately 1 deg. west, not much more than enough for proper drainage, although the water question has not yet proved troublesome. In fact, just about enough water has been developed to keep the haulageways properly wet. No props are necessary at any point in the mine.

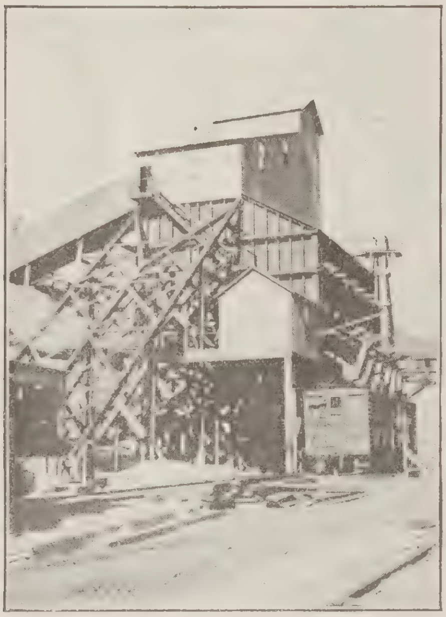
In addition to the seams now being worked, there are at least four other beds which have been proved, of which two can easily be worked at the present time. The second thickest seam is 10 ft. in thickness and contains a good grade of coking coal. In the main seam, the coal does not show any marked slips. It is massive in its structure, is hard, stands handling and storage well, and while it is rather hard coal to mine, yet it shows a good percentage of lump coal, and quite a small percentage of slack.

The company reports the following analysis of its coal, although it is probable that the run-of-mine will average somewhat higher in ash:

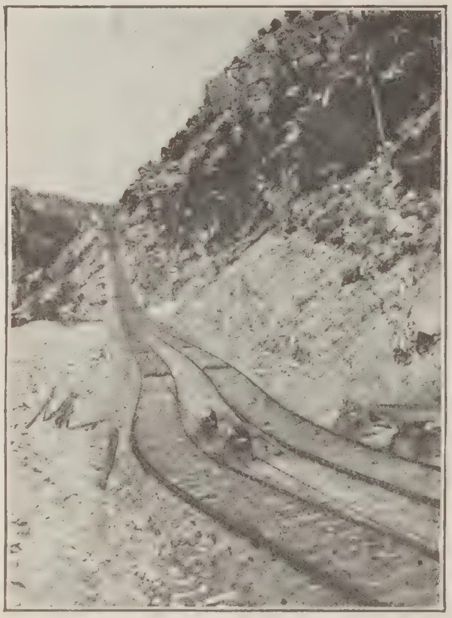
ANALYSIS OF UTAH COAL

Moisture	3.76
Ash	3.50
Volatile combustible matter	39.89
Fixed carbon	52.85
Sulphur	0.52
Phosphorus	none

The mine lies 8000 ft. further up the cañon than the tipple, and the two are connected by a gravity incline with grades varying from 25 per cent. at the top to less than 4 per cent. at the bottom. The trips are lowered by a pair of Stine sheaves and are landed at a point about 800 ft. from the tipple. On account of the heavy grade at the head of the incline, it is necessary to get a good running start for the trip, making it a rather dangerous incline to operate. It is probable that it will be necessary to install a different type of sheave so as to secure better control of the trip. The cars are taken from the incline to the tipple by means of a 12-ton Goodman single-motor locomotive.



Side View of Tipple Looking Up the Canon



Showing the Incline and Rope Haulway

Front of Tipple, Showing Loading Chutes

The main-track gage is 48 in. Steel cars holding about five tons net of coal are used. About 100 of these cars are now in service.

There Are Two Main-haulage Roads

The mine is laid out with two main-haulage entries, the return airway being

between the two main roads, each side of the mine being handled as a separate mine. The main-haulage roads are used as air intakes and a 7½-ft. Stevens fan is installed outside about 20 ft. out of line of the return airway. This is driven by a 100-h.p. variable-speed direct-current motor furnished by the Ridgway Dynamo and Engine Company.

Mining is on the room-and-pillar system. Rooms are driven about 25 to 30 ft., wide with 30-ft. pillars. The good roof and floor, together with the physical condition of the coal, make it satisfactory to attack the coal in almost any direction. The rooms are driven 400 ft. long. A parting about 9 ft. above the floor permits taking down this amount of coal and the roof coal and pillars are drawn retreating as the entry is abandoned.

View of Tipple and Power House of Castle Valley Coal Company

Another View of Surface Plant when Looking Up the Canon

Castle Valley Coal Company's Power House and Slack Chute

The Company Store Is a Substantial Structure Built of Native Rock

A large portion of the coal and all the entries are cut by means of Goodman chain-breast mining machines. The machines are manned entirely by Japanese crews who operate the cutters with considerable skill. Machine mining has been quite successful.

Electric locomotive haulage is used throughout and there are few horses in the mine. For the main-haulage work, the twelve-ton single motor type of locomotive has been selected. For gathering, six-ton locomotives are now in use but an eight-ton locomotive is now being placed in the mine, and in view of the very large cars in use, better service is anticipated from it. These large cars operate against horse haulage and in favor of electric haulage, so that it is considered that the system of locomotive gathering that is here employed is well adapted to this mine.

The power plant shown in the accompanying illustration is placed opposite the tipple. The building is a substantial one of steel and native stone and contains three 100-h.p. return-tubular boilers which furnish steam for a belt driven 200-kw. Goodman generator driven by a Ridgway center crank engine. Practically none of the current is used at the tipple except for lighting. The entire current is carried at 250 volts up to the mine 8000 ft. above. This makes a poor and uneconomical transmission and plans are under way for the alteration of this plant into 2300-volt, three-phase, sixty-cycle alternating-current plant with a motor generator at the mine to furnish the necessary direct current. All the auxiliaries about the tipple are driven by steam engines. Coal is taken from the tipple to the boiler-house by means of a conveyer, thus providing coal for the boilers without any extra labor costs.

Details of the Tipple

The tipple is a peculiar design and consists of two distinct divisions. The original tipple is shown in the photograph. The coal is dumped at a point 90 ft. from the tipple and is carried up into the tipple house by means of a corrugated apron Link-Belt conveyer which feeds the coal evenly upon the screens. The shaker screens form 7 different products which are delivered into 7 different 100-ton bins, providing storage.

This system did not work out well, the coal was badly broken in handling and it was found impossible to load any reasonable amount of coal through these bins. This portion of the tipple was, therefore, abandoned except as an auxiliary, and a new set of screens of the usual type were installed at the upper end of the old structure, loading coal direct onto three tracks. The coal is fed onto the screens by the apron conveyer just as before, but when necessary to make more than three products, the screened coal is elevated and rescreened over the old set of shaking screens, dividing the screened coal into egg, nut coal, pea coal, and slack or rather dust. This dust is usually wasted, as there is very little market for it. The lump coal is loaded direct into cars while the screened coal consisting of the egg and smaller sizes is elevated 80 ft. by a massive Link-Belt continuous bucket elevator and discharged onto the old shaking screens, where it is rescreened as above described.

A portable Christy box-car loader was originally purchased in order to move

from chute to chute and load the coal into box-cars. This has now been permanently installed so as to take the coal from the new screens.

At present, approximately 1000 tons of coal per day are shipped. The mine is gradually being opened up so as to secure an output of about 4000 tons per day. This tonnage can be handled easily over the present incline.

The coal is handled by the Western Fuel Company, of Salt Lake City, and marketed throughout Utah, Idaho and the Pacific Coast. There has been no difficulty in disposing of the entire mine tonnage.

The town of Mohrland has been well laid out with houses of attractive type, streets straight, clean and well lighted at night.

The accompanying photograph shows a unique type of store. It is unquestionably a striking and handsome building and was built entirely of native stone quarried in the immediate vicinity. The left-hand wing is used for the mine office.

The active officers of the company are: J. H. Mays, president; Moroni Heiner, vice-president; Archie J. Orem, assistant general manager; and these, with J. G. Berryhill, W. W. Armstrong and W. C. Orem, constitute the active management.

One of the Locomotives with Trip of Cars

A View of the Main Opening Leading Into the Mines

National Safety Demonstration

Arrangements have been practically completed by the Bureau of Mines for the National Mine Safety Demonstration which is to be held in Pittsburg on Aug. 31 under the auspices of the Bureau of Mines, the American Red Cross Association, and the Pittsburg Coal Operators Association. A request has been made of the Pittsburg operators to declare Oct. 31 a holiday in the mines of the district. It is believed that this demand will also be made in West Virginia, Virginia, Ohio, Illinois, Indiana. Other States further away will send large delegations of miners and first-aid teams.

It is expected that the American Mining Congress which is to meet in Chicago, Oct. 24 to 28, will go almost in a body to Pittsburg to attend this demonstration.

Already more than half a hundred teams from as many mines throughout the country have entered the life-saving exhibition, one team signifying its willingness to come all the way from Roslyn, Wash., to show its skill. Among the teams that have entered are the Berwind-White Coal Mining Company, Windber, Penn., four teams under the direction of General Superintendent W. R. Calverley, No. 1 in charge of Captain William Brownlee, No. 2 in charge of Captain George Grove, No. 3 in charge of Captain J. C. Nedrow, No. 4 junior squad, Captain Edward Greyback; Cabin Creek Y. M. C. A. team, Charleston, W. Va., in charge of T. J. Robson; the Consolidation Coal Company, Maryland and West Virginia, two teams, No. 1 in charge of H. V. Hesse, superintendent Georges Creek division, and No. 2 in charge of E. B. Moore, chief engineer of the Fairmont division; the Delaware, Lackawanna & Western Coal Company, Scranton, Penn., two teams, No. 1, the Brisbin colliery team under Captain John Pierce, and No. 2, the Woodward colliery team under Captain Benjamin Lewis; Dunbar Furnace Company, Dunbar, Penn., one team in charge of Stewart B. Marshall, general superintendent; Ellsworth Collieries Company, Ellsworth, Penn., three teams, in charge of W. A. Luce, assistant general manager, No. 1, Captain E. C. Roberts, No. 2, Captain Fred Gulick and No. 3, Captain George Lindsay; Lehigh & Wilkes-Barre Coal Company, Wilkes-Barre, Penn., one team, in charge of C. F. Huber, vice-president and general manager; Lehigh Coal and Navigation Company, Lansford, Penn., one team, in charge of Baird Snyder, Jr., general superintendent; Lehigh Valley Coal Company, Wilkes-Barre, Penn., two teams, one representing Derringer colliery, under W. H. Davies, division superintendent, Hazleton division, and the other representing Centralia mines, under J. M. Humphrey, division superintendent, Centralia division; Miller Coal Company, Portage, Penn., one team, under J. H. Buckwalter, superintendent; Northwestern Improvement Company, Roslyn, Wash., one team, in charge of C. R. Claghorn, general manager; Oliver & Snyder Steel Company, Uniontown, Penn., one team, in charge of F. C. Keighley, general superintendent; Pennsylvania Coal Company, Scranton, Penn., one team in charge of Captain W. A. May, general manager; Parrish Coal Company, Plymouth, Penn., one team in charge of W. G. Thomas, general manager; Philadelphia & Reading Coal and Iron Company, Pottsville, Penn., one team in charge of George Richards, general manager; Pittsburgh-Buffalo Company, Marianna, Penn., one team in charge of S. C. Reynolds, superintendent; Pittsburgh Coal Company, Pittsburg, Penn., five teams in general charge of G. W. Schluederberg, general manager, No. 1, McDonald district, Superintendent L. C. Sarver, No. 2, Finley district, Superintendent James Porter, No. 4, Carnegie district, Superintendent H. Cattley, No. 5, Whitsett district, Superintendent W. Kelvington; Pittsburgh Railroad and Coal Company, Pittsburg, Penn., one team in general charge of W. W. Keefer, president; Portage Coal Mine Company, Portage, Penn., one team in charge of H. A. Tompkins, superintendent; Republic Iron and Steel Company, Republic, Penn., one team in charge of W. H. E. Royce, general superintendent; the Rochester & Pittsburgh Coal and Iron Company, Punxsutawney, Penn., one team in charge of W. O. Calloway, general superintendent; Spring Valley Coal Company, Spring Valley, Ill., one team in charge of J. M. Luther, assistant to the general manager; Stearns Coal and Lumber Company, Stearns, Ky., one team in charge of J. C. Butler, manager; Sunday Creek Mining Company, Poston, Ohio, one team in charge of Edward Coll, president; Susquehanna Coal Company, Wilkes-Barre, Penn., one team in charge of R. A. Quinn, manager; Tennessee Coal, Iron and Railroad Company, Birmingham, Ala., one team in charge of Edward Coxe, general superintendent; Tower-Hill Connellsville Coke Company, Uniontown, Penn., one team in charge of L. W. Fogg, general manager; and the Stag Cañon Fuel Company, Dawson, N. M., one team.

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Of this issue of COAL AGE, *we will print 5000 copies. No copies will be sent free regularly. There will be no back numbers. The figures which will be shown here each week will represent live, net circulation.*

This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

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COAL AGE

Reducing Mortality

A number of important subjects now absorb the attention of thoughtful men. However, no problem is more deserving of careful study than the saving of human life. Conservation of resources, no doubt, will benefit posterity, but conservation of health and limb among the "daddies" of posterity, will be preservation of the nation's most valuable asset.

The mine-safety or first-aid convention to be held in Pittsburg, Oct., 30 and 31, under the auspices of the U. S. Bureau of Mines assisted by the Red Cross, promises to be a meet of national importance. Enthusiasm is abundant, and never was interest in such an affair more widespread. Large coal companies in practically every field are sending their quota of trained rescuers, and the encouragement and general recognition being accorded the first-aid movement is sure to result in much good to coal men.

Not only will benefit come from within, but there will accrue profit to the industry from educating the public. It will be an enlightenment to those unfamiliar with coal mining, to know the universal attention being accorded the humane work of safeguarding the men who produce coal.

The object of the Pittsburg meeting is not only the furtherance of first-aid work, but the diffusion of advanced ideas concerning all effort to safeguard coal miners. The government experimental mine and all details of the research work being conducted by the Bureau of Mines, will be fully explained. Let everyone who can, turn out, and help show the outside public that the first and foremost desire of the American coal industry is safety in mining.

The Coal Land Inquiry

One of the most extensive investigations into coal lands and the conditions under which they may be taken into private ownership, their relation to the Government, and the problems relating to the leasing of such lands or the granting of their use on a royalty basis, will be undertaken within a comparatively short time at Washington. The return of Secretary Fisher and Director Holmes from Alaska, will supply expert evidence from the standpoint of the Government on this subject, in addition to the large mass of material which is already available. The inquiry will be started by the committee on Controller-Bay lands which was appointed under House Resolution No. 103 last session "to investigate the expenditures in the Interior Department."

While the investigation was nominally begun for the purpose of studying the Controller-Bay lands, as the title indicates, and while the further progress of it was somewhat rambling, owing to the introduction of political charges, the fact remains that the substance of the remainder of the inquiry will probably be the natural resources of Alaska and the best way of handling them. Chief among these will be the question of coal lands and their use. It is likely that the investigation will not be solely confined to the special committee headed by Mr. Graham, but will also be carried on by the public-lands committees of both Houses of Congress, the result being to bring forward public-land legislation relating to Alaska for early action.

If present plans work out as expected, the result of the investigation and of the work of the session will be that of settling the future of Alaska so far as the use of mineral resources is concerned.

At the public-lands convention in Denver, notwithstanding the opinion of those present that the lands should be disposed of to individuals, or placed under the care of the separate States, President Taft distinctly advocated the adoption of the leasing system; the same that he has urged on previous occasions in messages and in conversation with members of Congress. So-called "progressive" members of Congress think that in order to guarantee the success of any plan for leasing coal lands in Alaska, the Government must provide the transportation by building a railroad through the coal area and guaranteeing absolutely equal terms of transportation over i

Only a few progressives are willing to advocate Government operation of Alaskan mines, although there are some who say they believe in it as a last resort. What does seem to be true is that the feeling on the subject of land legislation, particularly coal-land legislation, is growing strongly favorable to a much greater degree of stringency in the control of such lands, and much more strongly unfavorable to the passage of the lands into private ownership upon the same basis which has existed heretofore, or one analogous thereto.

It is already plain that there will be sharp controversy during the coming winter concerning the extent and value of the coal deposits in Alaska. Secretary Fisher has returned with the opinion that the value of the lands has been greatly overestimated. It is supposed that this will be concurred in by Director Holmes. Should that be the case, a good deal more detailed information is likely to be sought by Congress with reference to the matter.

The Graham Committee has already received testimony on that subject from Alfred H. Brooks, the geologist in charge of the division of the Alaska mineral resources in the Geological Survey. He has informed the committee that according to the estimate of a number of mining engineers, the coal in the field amounts to 500,000,000 tons. This was coal that could be brought out on grade, being above water level. His own estimate was that, including the coal present down to a depth of 3000 ft., several billion tons were available. If Secretary Fisher should differ from this estimate or from that of the other mining engineers who went to Alaska on behalf of some of the coal-land claimants, turned down by the Interior Department during the past summer, he will undoubtedly be called before the committee and will be asked to testify carefully concerning the character of his information. It is not likely that a reduction in the estimate of value will, however, alter the disposition of Congress in regard to stringent legislation concerning its use under such method of exploitation as may be determined upon.

The present plan is to resume the hearings before the Graham Committee shortly before the end of the current month. They are expected to continue more or less steadily through November. Louis D. Brandeis, of Boston, the lawyer who was prominent in the Ballinger inquiry has been asked to take charge of the so-called "prosecution," that is to say, the presentation of the case against the present policy of the Administration in releasing lands for private exploitation, both in the coal region and on the coast adjacent thereto. Mr. Brandeis predicts that the inquiry will be extremely fruitful of results. The understanding is that an effort will be made to turn the direction of the investigation more away from the sensational side of the case and toward the broad general question of land legislation already described.

At first, there is likely to be a resumption of the inquiry into the correspondence said to have been found in the files of the Interior Department with reference to the release of lands at Controller Bay, Alaska, suitable for the establishment of wharves and shipping facilities to expedite the taking on of coal when mined in the interior. Most of the more sober-minded men connected with the inquiry, however, have reached the conclusion that the Controller Bay episode is not likely to produce much that will be serviceable in the way of political capital. The bulk of the inquiry is therefore likely to be made up, as already noted, of continued investigation into coal-land values, criticism of the Administration's past and present policy of ownership, and inquiry preparatory to the drafting of new legislation looking to the introduction of some form of a leasing or royalty system.

The Antecedents of an Explosion

The nature of the combustion of gases is receiving new light from the able researches of Dr. Harold B. Dixon.

It was the aforetime conception that when an explosive mixture of gases reached a certain temperature, termed the point of ignition, it flamed, the flame spreading and finally igniting the mixture, and that, if so proportioned, complete combustion took place. This is still believed to be true, but we now have to recognize an earlier stage of chemical action, which Doctor Dixon terms a "pre-flame period of combustion"—a period when the heat may be so great that a certain degree of combustion takes place, but still not so intense that there is any visible burning, no light rays nor any marked increase of heat, no violence of action, nor apparently any propagation.

This silent, dark combustion, without inflammation, will doubtless have to be reckoned with in later discussions of explosions; though its practical bearing is not as yet quite apparent.

It is not impossible that we may find that all explosive bodies, gaseous and solid, which do not detonate, not only burn, but change their chemical structure during the pre-flame period, and demand a certain time limit in which to readjust themselves for combustion, and so to speak "clear decks for action."

An excessive amount of sensible heat is taken up by compound bodies, such as steam at high temperatures, out of all proportion to the rise of temperature as figured from the absorption of heat lower down in the scale. We are feeling our way toward the belief that they are not merely being heated and expanded, but loosened atom from atom at temperatures far below those we formerly declared were their temperatures of dissociation. It may be, also, that a rearrangement of atoms takes place, making isomeric combinations and bodies less stable than those existing at lower temperatures.

Doctor Dixon experimented on the compression of a mixture of carbon monoxide and oxygen in a cylinder, gaging the temperature from the known reduction in volume. He regulated that reduction carefully and thus the temperature resulting therefrom, so that his mixture came repeatedly very near, but below, the ignition point, and found that he could, by a dozen compressions, produce a silent, flameless burning of the carbon monoxide and oxygen into carbon dioxide to the extent of one per cent. in the mixture.

One can imagine many developments derived from considerations of delayed or of partial combustion; a new theory of safety-lamp protection, a cause for the occasionally evidenced remoteness of the focus of explosion from the focus of primary causation, etc. Some of these speculations may be far remote from the truth, however, some may bear investigation.

But why and how and how soon, how rapidly and how far and at what minimum temperature a gas burns, must some day have a practical bearing on the question which will not down, "How shall we avoid these recurrent mine explosions?"

COLLIERY NOTES and COMMENTS

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

Holes should not be drilled into a break in the strata, as the force of the shot is apt to be weakened or the flames may issue through the break and produce the same results as a blow-out shot, that is, ignite the gas or coal dust.

The practice of robbing pillars without regard to the overlying strata, is expensive, dangerous and productive of squeezes and a small recovery as well as demanding a large amount of timbering. It also results in a high percentage of fine coal.

When planning a drift or a slope opening, remember that while the cost of brick or stone arching is considerably higher than timber, the cost of maintenance is much lower. The life of such work is practically unlimited, and it is less liable to damage from runaway trips on slopes.

Forty-five per cent. of all mine timber used in the Anthracite field is destroyed by decay. Wear, insects and breakage account for the rest. Experience has shown that peeling off the bark and the application of certain salts and oils will greatly prolong the life of mine timbers.

The practice of allowing miners to signal themselves away from the shaft bottom, and shaft landings, is dangerous, because they must signal for the cage to be taken away before they get in. In many instances the engineer has to calculate what time should be allowed for the miners to get on the cage. This practice is a fruitful source of hoisting accidents.

When designing a mining plant, it is becoming the custom to have made a large topographical map of the proposed site; on this map locate all buildings that are to be erected, even though it is not proposed to build the entire allotment in the near future. Such foresight often saves cost in erection of foundations, as well as time and labor in future operations. It also tends to a more advantageous and orderly arrangement of the whole plant.

The steam shovel used in the coal stripping of Missionfield, Ill., is the largest in the world. It weighs about 150 tons with a turntable 24 ft. in diameter. The subframe, made of 24-in. I-beams, is 24 ft. square. At each corner of the subframe there is a four-wheel truck, and, in addition, two of the corners rest on cylinders filled with alcohol and glycerin, which are used as hydraulic jacks to keep the subframe level. The machine is 65 ft. long. The dipper has a capacity of 3½ cubic yards.

Discussing the question of turbine pumps in collieries, W. Bolton Shaw says that installing a larger pump in a big pumping station, with a view to shortening the period of pumping, will mean an increase in the maximum load on the power station and additional power will have to be supplied at the generators in order to deal with the increased load, which fact should be considered when making comparisons between different types of pumps, as it will probably add to the cost of installation.

A comparison of the wages of American miners and those of the Welsh miner gives food for thought in many directions. In the Swansea Valley district in Wales, the anthracite miner earns $2.18 per day and the wages of the other employees are as follows, plus 45 per cent. per eight hours: Surface laborer, 74c.; surface foreman, 81c. Underground workers; Laborer, 80c.; hauler, $1; repairer, $1.10; shot men, $1.20; locomotive driver, 99c. Foreman or firemen responsible for the safety of mines, $12.75 per week.

When constructing an overcast, build two side-walls of brick or masonry at the place where the return will cross the intake. Build these in the intake. Enough roof may be taken down to give the necessary hight. Place balks across from one side to the other, or if preferred, strong iron girders may be used in place of timber. Cover these with tongued and grooved boards and coat thick with cement or mortar to make all joints airtight. A brick arching may be substituted for the balks or girders.

The coal deposits of the Crows Nest Pass coalfield of Canada have a total thickness of over 200 ft., distributed in beds varying from a few inches to 30 ft. Of this total thickness, it is estimated that over 100 ft. is workable. The available coal of the field is estimated at over 45,000,000,000 tons. This is without doubt the most extensive deposit of good fuel in western North America. The coal is generally bituminous, but in one locality a fairly good quality of anthracite has been mined as well as semianthracite. The bituminous coal cokes readily.

The effect of the seasons on mine air can be strikingly shown by assuming that the outside temperature of the air in the winter is 0 deg. F. and the relative humidity is 70 per cent. Reckonings made from the dew-point tables will show that under these conditions, every 100,000 cu.ft. of air per minute carries a little over half a gallon of water into the mine, or about 750 gal. a day. With an outside temperature of 80 deg. F. and a humidity of 70 per cent., conditions which may be assumed to exist in summer, 100,000 cu.ft. of air per minute will carry 13.1 gal. of water or nearly 19,000 gal. every twenty-four hours, that is, twenty-five times as much as in the winter.

Mine foremen should measure the air current at the intake and return and near the face of the entries, at least once a week and a careful record should be kept of these measurements. Foremen should be familiar with the use of the anemometer, the water-gage, the barometer, the thermometer and the hygrometer. The anemometer shows the velocity of the air current; the water-gage the resistance offered the current, or its pressure; the barometer the atmospheric pressure; and the thermometer the temperature, while the hygrometer gives the amount of moisture contained in the air. The information obtained from these weekly measurements should be carefully studied by the mine management because the safety of the mine and miners depends to a large extent upon it.

Wetting the mine to lay the dust must be thoroughly done or it is time and labor wasted. As it is most difficult to wet dry coal dust, the pouring of water from a bucket or wetting from the valve of a water-car is of slight value. Roads should be thoroughly watered every day. A force pump should be attached to each water-car for use in wetting roof, timbers and ribs. Where the hoze and nozzle method is used, the piping should extend along all haulage roads right up to the working faces and should be well supplied with taps. The dust should never be allowed to become dry before resprinkling. This method of watering is especially adapted to watering before shot firing. It is also adaptable to roof, rib, tank, and gob sprinkling, in places where the nature of the roof will permit the use of water. Where water has a tendency to create spontaneous gob fires, shale dust should be used.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

Room Widening

In ordinary room-and-pillar workings, which way should the rooms be widened and why?

L. F. E.

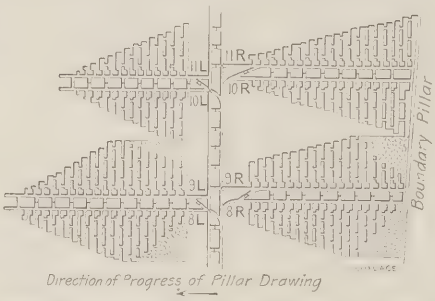
All rooms should be widened in the direction of progress of the pillar drawing. In advancing pillar drawing, the rooms should be widened "inbye" and in retreating, "outbye."

The accompanying heading shows a face heading with eight butt headings, four right and four left. The rooms in the headings to the left are to be driven up consecutively, beginning at the one nearest to the face heading and proceeding toward the end of the heading from which the rooms are turned. The drawing of the pillar between the first and second rooms is to be commenced first and the others are to follow in due order, as is exemplified in the first seven rooms of the eighth and ninth left. This is the most customary method of extracting coal by the room-and-pillar system. In the left-hand headings, therefore, the progress of the pillar drawing will be to the left, therefore the rooms should widen to the left, as seen in the plan (though, of course, when facing the necks of the rooms in their respective headings, those out of the ninth and eleventh left will be widened to the left and those out of eighth and tenth will be widened to the right).

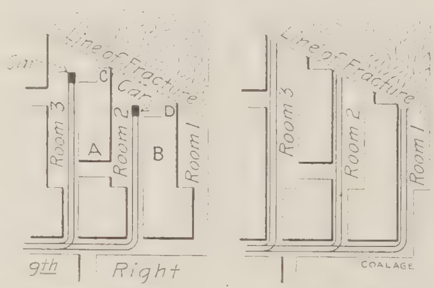
The headings to the right approach a boundary line. Here the first room is located near the boundary line and rooms are started consecutively, beginning at the one near the boundary and proceeding toward the face heading. The pillars are or will be drawn similarly. First the pillar between the first two rooms will be started and then the other pillars consecutively back toward the face heading. This can be seen in the lower right-hand corner where the eighth and ninth right are represented. This method is known as the retreating room-and-pillar system. The rooms should be widened to the left, interpreting right and left as they appear on the plan, not as we regard them facing the room necks from the various headings. Though we are considering the opposite side of the face heading to that which we considered before, the direction of progress of the pillar drawing is still to the left, instead of to the right, as it would have been, had the more customary advance room-and-pillar system been adopted.

The reason for the foregoing rules regarding widening is illustrated below. The figure shows the correct way of drawing the pillar, side by side with an attempt to mine it the wrong way. The figures assume that the miner does not crosscut the pillar in mining back, except in starting his work, but works on the exposed end of his pillar till he reaches the neighboring room.

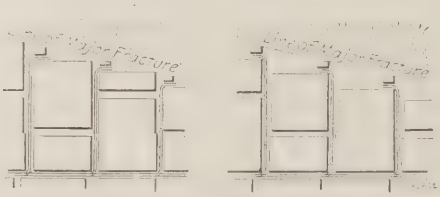
The left-hand drawing shows an enlarged view of rooms 3, 2 and 1, in the



ROOM WIDENING IN ADVANCING AND RETREATING WORK



RIGHT WAY WRONG WAY
SMALL PILLAR METHOD



RIGHT WAY WRONG WAY
CONNELLSVILLE METHOD

ninth right. Between these rooms are two pillars marked *A* and *B*, from which the miner is removing the last cut of the "slab," which he is to take off the end of the pillar. When the roof breaks it probably fractures at the extreme right edges of the slabs *C* and *D*, as shown. The line joining them represents, therefore, the probable line of fracture and it is seen how well the miner can work and yet be free of the fall. The danger point is only reached when he proceeds to take the last cut off the pillar. Very often he has to leave this in place, or, at least, that part nearest the fall.

On the other hand, in the right-hand illustration, is shown the condition that would exist, if the widening of the room was reversed. The miner would be in danger all the time he was working, because the line of fracture would follow him up closely. The remnant of the slab would not help materially to modify the line of fracture and might bar his escape to the neighboring room. To emerge from his cut or to shovel the coal into his car, he must come further into danger than he was in his working place.

Where the Pillars Are Large

In the Connellsville system, where the pillars are large, the advantages of the proper method of widening are quite apparent in the extraction of the last 8x15-ft. section. The pillar is split by an 8-ft. crosscut, leaving a slab of isolated coal 8x72 ft. toward the fall. This is mined in four sections. The last section can be gotten with much less difficulty when the whole weight falls not alone on it and other pillars like it, but also on the edges of the solid ribs between the rooms. The figures below represent this system of pillar drawing with the last section still standing. On the left side the widening feature has been correctly followed and on the right the rule has been disregarded.

Reducing the foregoing statements to their simplest terms, the miner is safest when he is robbing the shorter pillar of his room and the rooms should rarely be so widened that he has to mine the longer pillar where the hazards to his life are greater.

Sometimes where dips are steep and water is present, it is almost impossible to widen those rooms down the hill, which are situated on one side of the face heading; consequently the widening has to be all in one direction, jeopardizing the life of the miner or reducing the completeness of coal extraction, unless the work on the dip side of the face heading is conducted on the retreating system, which latter system, in that case, should be adopted.

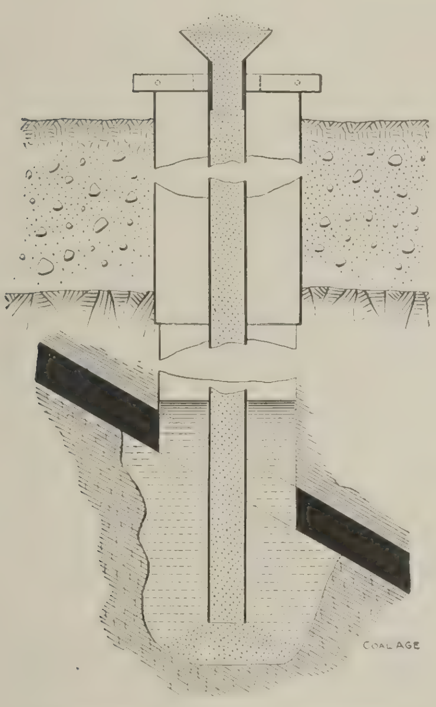
Cementing a Bore Hole

We are putting down a 12-in. hole for steam from the surface to the Dunmore vein, which lies at a depth of about 400 ft. The hole shows 80 ft. of wash and a seam of coal about 5 ft. thick, 135 ft.

from the surface. The drilling has continued to a depth of 156 ft., at which elevation it begins to cave. The strata seem to be loose all around the boring, due to a small local fault. We have, therefore, decided to cement the hole from the present bottom up to the coal, which is 21 ft. above it. The elevation of water in the hole is about 20 ft. above the coal bed. The casing pipe ends at a point 85 ft. below the surface. We will be glad if you or some of the readers of your paper can suggest a practical method by which the hole may be cemented and give the probable time required for the cement to get hard enough so that the drilling may be continued through the cement.

ANTHRACITE ENGINEER.

The accompanying sketch illustrates the question. If the hole were dry, cement grout could be poured in until it was filled up to the required elevation,



SUGGESTED METHOD OF DEPOSITING CEMENT

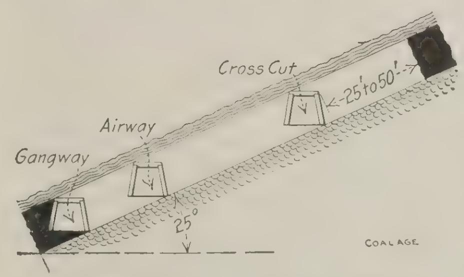
and then it could be allowed to set. But since the hole is wet, it requires a different treatment. Put down another pipe line, 2 or 3 in. in diameter, extend it until the lower end is a few feet from the bottom of the hole. Then clamp it on the surface to the casing pipe as shown on the sketch. Attach a funnel or hopper at the end of the tube. Pour the cement grout in through this hopper. The inside pipe should be raised occasionally so as to prevent choking at the discharge end. The reason for employing an inside pipe is that it is impossible for the cement grout to pass through 41 ft. of water and set properly. If the cement particles had to drop through such a depth, the large grains would settle first, leaving the finer ones suspended in water for such a length of time that they would hydrate and lose strength before settling and the resulting sediment would resemble a mass of sand without strength. By this method, the grout has a chance to expel the water up to the outside of the bore hole and thus the grout can travel in a solid mass without the water passing up through it.

It would be possible to lower the grout in a pipe sealed at its lower end and arranged with a trap valve which would unload when the bottom of the hole was reached, but the simpler plan suggested has been found satisfactory in actual practice.

The time allowed for setting and hardening the cement before the hole can be redrilled is about two weeks, although in some instances a good portland cement has a tensile strength of 100 to 120 lb. per sq.in. under similar conditions.

Irrespirable Mine Air

We have rooms working on a 25-deg. pitch; most of them are about 100 to 150 ft. to the faces from the gangway and have one to two crosscuts on each side, as illustrated in the accompanying sketch. The ventilation at the working faces is not good, for when the face is from 25 to 50 ft. from the last crosscut,



IMPURE AIR IN PITCHING BREAST

the lamp will not burn. There is no firedamp. Our superintendent sent a sample of the air to a chemist for analysis. According to the chemist the following was the composition of the air: Oxygen, 12 per cent.; nitrogen, 88 per cent.; CO_2 and CH_4, traces.

Will you or some of the readers of your paper please explain what the trouble is?

FIREBOSS.

Your case is not exceptional. Including argon under nitrogen, as your chemist has, Dr. Angus gives the following composition for atmospheric air: Oxygen, 23 per cent.; nitrogen, 77 per cent., by weight. Therefore, in the faces of your rooms, oxygen has disappeared to the extent of 11 per cent. and nitrogen has increased by an equal amount. You have a deoxidized atmosphere, probably arising from one of three causes:

1. The shutting in or occlusion of oxygen by water.

2. The combination of oxygen with the coal or lignite or whatever it may be you are working.

3. The formation of carbon dioxide from the oxygen of the mine air by the presence of men, animals, lamps and rotting timber, and its subsequent absorption in water.

It has been found that where water falls in such a way as to hold large bodies of air within it, that the oxygen and nitrogen are absorbed. From a table of constants given by the Smithsonian Institution, we learn that at 20 deg. C., or 68 deg. F., water absorbs 0.901 times its volume of carbon dioxide, 0.01599 times its volume of nitrogen and 0.03137 times its volume of oxygen. It will be seen that water occludes roughly twice as much oxygen as it does nitrogen. As a result, air expelled from water by boiling is always richer in the former than it is in the latter. (See Encyclopedia Britannica, 11th Edition, Volume II, p. 860.) Where water is used for purposes of compressing air by its direct action, as in a trompe, there is always deoxidation of the air.

Deoxidation by Metals and Coal

In metalliferous mines, its deoxidation is frequent, as some metallic bodies readily become oxidized. Coal, we know, will emit carbon dioxide, possibly partly by a slow combustion, though also without the presence of air, by the degradation of its organic compounds. It is known that oxidation of coal takes place during weathering, and also that iron pyrites oxidizes in the presence of air. It appears unlikely that your lack of oxygen is due to solution of carbon dioxide where there is evidence of so little being present.

You ask for a cure. If occlusion is the cause, it would be well to avoid the trompe action; if the trouble is due to the oxidation of the walls of the mine, I would suggest you increase the amount of air and by a brattice carry it up to the face. It is clear that you should not run your ventilation by a continuous current, but split your air and carry it a short way to the workings. It would be well, if it does not have a bad effect on the coal, to run the fan night and day. It is apparent that the stagnation of the air at the face causes excessive oxidation at that point.

It is evident that it is not carbon dioxide you are troubled with, because it would be found at the lower parts of your steep rooms and not at the face. This checks the statement of your chemist. Oxygen and nitrogen, having atomic weights of 16 and 14, respectively, would not separate any more in the mine than they do in the atmosphere.

Yours is an interesting experience, and we will welcome the ideas of others in the matter.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Why Baths Should Be Compulsory

Readers of COAL AGE may be interested in a recent address by Henry Davies, director of mining instruction in the county of Glamorgan, Wales, explaining why, in his view, shaft-head baths should be made compulsory. He says the million coal-mine workers of Great Britain may be fairly assumed to be divided between a quarter of a million homes, and thus the health of at least two million persons may be directly improved if pit-head baths are adopted. Into these 250,000 homes are unnecessarily brought every day dirty, grimy, dust-covered clothes, frequently saturated by rain and by the perspiration of the men or boys who carry them. The wearers are themselves covered by finely divided and closely adhering particles of coal dust as a result of their work in the mines. The wet clothing is placed round the kitchen fire to dry on the fender, the oven door or on backs of chairs—to the discomfort of the housewife engaged in preparing the family dinner and the children struggling over their school lessons. The erstwhile wearers in their turn will perform their ablutions and take their meals in the kitchen beside the baby's cot. In some districts, many of the miners live in one- and two-roomed cottages in which there are no baths. In cases where there are lodgers, the difficulties resulting from domestic ablutions may be readily realized.

Into the British miners' homes, 1775 dead and 159,042 wounded veterans from the industrial battlefield were taken last year. The injuries of the wounded incapacitated them from their daily occupations for over seven days. The number of the sick and of those whose wounds kept them at home for less than seven days, Mr. Davies cannot tell—probably it will bring the total up to 200,000—but his point here seems to be that the home conditions retard recovery.

Some of the Benefits

The man at the coal face will be more alert mentally and physically, more active and energetic, as a result of the invigorating shower bath, and consequently less liable to accident. In the county of Durham, infantile mortality and enteric fever are prevalent, and the chief reason given by medical officers of health is the extremely filthy domestic arrangements. Overcrowding in many colliery districts is reported and there are frequent instances of two families living in houses containing three bedrooms, with as many as 13, 15 or 18 persons in one house. Compulsory shaft-head bathing will begin the needed work of making home cleanliness possible, and the miner will become a better man, morally and physically, while the purifying of his home life will mean the uplifting and sweetening of the lives of his wife and children.

Owing to the misconception and ignorance prevailing as to the character of shaft-head baths, Mr. Davies explains that:

(1) They are not large ponds into which scores of men plunge in succession, spreading diseases from one to another, but spray or shower baths, whereby every bather may receive a plentiful supply of clean water at a temperature which suits him.

(2) There is no danger that the health and vigor of anyone using these baths will be impaired. On the contrary, it will be improved. A Belgian mine manager has found that since the introduction of the invigorating shower bath he has been able to advance the wages of his men by 12 per cent.

(3) The men are not publicly exposed when bathing, but are sheltered in cubicles provided with doors or waterproof curtains. This complaint as to exposure came from a friend who used the family kitchen tub for his daily ablutions.

(4) There need not be any waiting or standing about in wet clothes for a turn in the bath. The men may take 10 minutes each, yet with a provision of 80 to 200 cubicles they may clear out as rapidly as their fellow workmen are being raised through the shaft.

(5) There will be no necessity of going on from a hot room to cold air. The change room may be utilized as a cooling room. In one or two mines in Illinois, the workmen experience no trouble in this direction, even when the temperature outside is below zero. They walk home in their warm dry clothes instead of their cold, wet pit clothing, enjoying their smokes from pipes kept safely in the pockets of their clean clothes.

(6) The clothing will not be left in the change room to rot and spread disease or be stolen. In the absence of the owners it will be hung near the roof or placed in casements to dry; different sets will be sufficiently far apart to prevent the spread of diseases; it will be under the watchful eye of attendants who may possibly execute repairs. At regular periods as decided upon, it must be taken home and cleaned. Blood poisoning, which is now on the rapid increase, owing to dirt from wearing apparel entering wounds, may thus be avoided.

(7) The miners on the continent have not complained of the adoption of these baths. They were taken up voluntarily in Belgium; about 77 per cent. of the workmen now use them where provided, and there is a provision in the new Belgian Coal Mines Bill for making them compulsory. They have been compulsory in Westphalian mines since March, 1900, and no wish to discontinue them has come from the workmen or workwomen.

(8) The compulsory provision of suitable cottage baths, even if possible during the next 20 years, will not remove the objectionable features, that the miners will sometimes enter upon their work underground in wet clothes, and will always bring dirty mine clothing into the home at the end of the day's shift.

R. L. LAWRENCE.

Manchester, England.

Sanitation of Coal Mines

American coal operators are giving closer attention to the sanitation of their mines, and it is probable that the following summary of a report made by a committee appointed to investigate such conditions, in the mines of England, will be of interest:

An outbreak of glanders at a coal mine, it is conceivable, might become a very serious matter, not merely as regards the horses, but also the workmen employed below ground. Careful and thorough inspection of the animals and the maintenance of sanitary conditions are highly essential where it is desired to maintain a clean bill of health. The mysterious death of a horse in one of the pits in South Wales engendered a very strong suspicion that glanders was present. Occasion was taken to make representation in the matter in the House of Commons the ultimate result being that instructions from the Home Office were received by Joseph S. Martin, I. S. O. and D. Rocyn Jones, M. B., D. P. H. to make a thorough investigation.

Among other things, these commissioners were informed that horses occasionally relieved themselves in main roadways and return airways, and they are disposed to the view that such practice might be serious and lead to:

(*a*) Possible danger of an air borne outbreak of typhoid fever, or even ankylostomiasis spreading if a diseased miner should happen to be employed in the collieries. Dry and dusty mines would particularly favor the spread of typhoid, while warm and moist mines would tend to foster ankylostomiasis if once introduced.

(*b*) Possible danger of blood poisoning following upon the access of polluted dust to wounds and abrasions, slight injuries so common to the miner.

From the report prepared by Messrs. Martin and Jones some suggestions may be extracted for the benefit of the coal-mine communities in the United States. The seriousness of the matter cannot be gainsaid, and it is a wise axiom that "an ounce prevention is better than a pound of cure." The recommendations are:

There should be sanitary rules incorporated in the law in regard to both the surface and underground.

Persons employed underground in mines should be required, so far as reasonably practicable, to make a practice of relieving themselves on the surface before descending into the mine or going underground, so that their having to do so underground should be exceptional and an unavoidable necessity.

PROVIDING SANITARY CONVENIENCES

Sanitary conveniences, in the form of galvanized pails, should be provided in suitably arched or otherwise convenient places throughout the mine, for persons employed in the roadways or other parts of the mine[1].

The soiling of roads by excrement (whether hauling, air or other roads) along which persons travel, from time to time, should be prohibited and any contravention should be subject to penalties.

The sanitary conveniences provided, and their surroundings, should be constantly maintained in a clean, serviceable and sanitary condition; any person soiling them or their surroundings should be held liable to penalty.

The excrement from the closets should be scavenged to the surface frequently and be disposed of either by means of incineration or burial.

Underground stables should be required to be constructed and fitted in a manner to allow of proper sanitary conditions and they should be constantly maintained in a clean and well ventilated state, being thoroughly lime-washed at least every three or four months. Stable manure and refuse should be sent out of the mine daily.

Stables and horses, both underground and upon the surface, should be examined and reported upon at least once a month by a qualified veterinary surgeon, who should note in detail the condition of the stables and of each horse as regards its condition, health, sores and injuries, such report to be kept in the manager's office.

Before horses are employed in or about a mine they should be tested by the Mallein test and certified by a qualified veterinary surgeon to be free from glanders and fit to be employed at the mine.

The law should provide for ample and suitable sanitary conveniences or accommodation on the surface, which if the conditions allow, should be flush tank closets properly connected with the sewers of the district. The maintenance of these conveniences in a clean and suitable condition for use should be provided for as well as penalties for soiling them.

Latrines should not be allowed either above or below ground which are constructed to discharge direct into running streams.

O. R. HAWORTH.

Bolton, England.

[1]For description of an underground closet that has been successfully used in some of the American metal mines the reader is referred to "A Sanitary Underground Latrine," in the *Engineering and Mining Journal*, Vol. XCI, page 556.

A Working Model of a Colliery

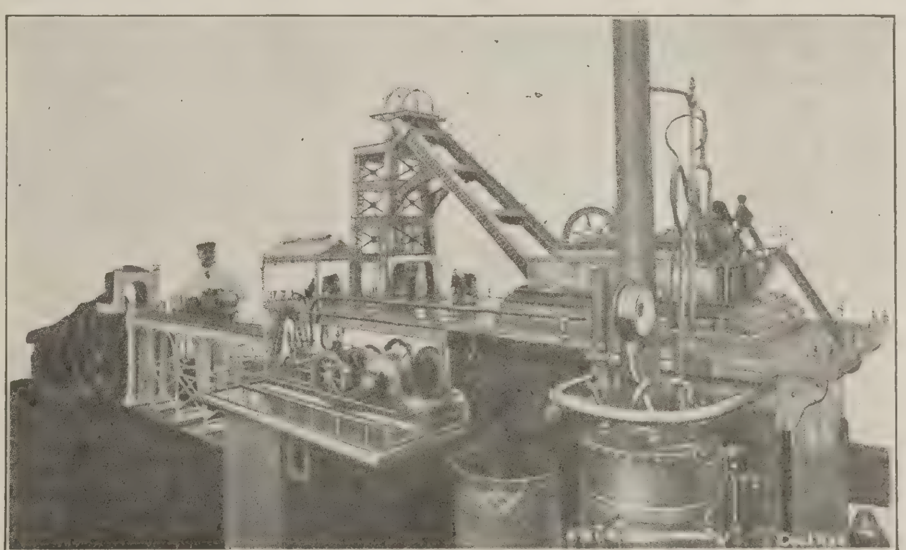
COAL AGE readers may be interested in the accompanying illustration showing what must be called a monument of industrious application. It represents a working model of a colliery constructed in his spare time by T. Thomas, of Bargoed, Glamorganshire, engineer in a Welsh colliery. As it stands it represents 25 years of application to model building and is entirely the work of the gentleman named.

The central feature of the collection is the headgear, which is an exact model of a well-known headgear in Wales,—that at the Treharris colliery. This is 3 ft. 6 in. long by 3 ft. 6 in. high, by 15 in. wide, and is made of brass throughout. In the building of this section of the model, 10,325 copper snapped rivets have been put into place, and its total weight is 161 lb. The hoisting rope has attached to it a model of Walker's detaching hook, for the prevention of overwinding, and hoisting is effected by means of a reversing double engine, weighing 200 lb. and having cylinders $1\frac{1}{2}$ in. diameter by 3 in. stroke. There is also a depth indicator worked off the drag link. Steam is applied both to this and to a fan engine by the boiler shown in the figure, the dimensions of the fan being 4 ft. by 2 ft. by 2 ft. high.

As is evident from the illustration, there are model pit cages, ten-ton trucks, screens, tipplers, trams, etc., and the coal when loaded into trucks is transported from the colliery over a viaduct, to the entrance of a tunnel by means of a steam locomotive.

MODEL DEMONSTRATES WORKING OF DETACHING HOOK

To make the model complete, the hoisting engine is driven by a model engine driver, fashioned in steel, who is 7 in. high, and who, on receiving a signal from a similar model brakesman, starts his engine. The model is capable among other things of demonstrating the working of the detachable hook in case of an overwind, and at the recent mining exhibition at Manchester, England, it attracted considerable attention, not merely as a curiosity, but for its undoubted technical interest. It is rarely the case that a model is so completely finished throughout in metal (brass and steel) and it will therefore be interesting to mining engineers in America, to know that it will probably be exhibited at the great exhibition which is to be held at San Francisco to celebrate the opening of the Panama Canal.



MODEL OF A COLLIERY CONSTRUCTED BY A BRITISH ENGINEER

HENRY TAYLOR

Bristol, England.

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

Liquor Problem in Mining Communities

SPECIAL CORRESPONDENCE

"Business is business" sounds well when stated by the average man, but it sounds farthest when stated by the man who can forge words into deeds.

For many years thousands of farmers said: "A great need in the rural districts is better roads." But they continued to lose time in hauling produce to market and to "wear out" horses, wagons and patience traveling over roads filled with rocks, cut up with "ruts" and running over heavy grades.

The automobile brought in a new factor—the man of wealth and political power. What was the result? In a short time "State made" macadamized roads began to take the place of old-time highways. Yes, it makes a difference who says "Business is business."

For generations many people in the ordinary walks of life have organized and complained and waged warfare against the liquor traffic and much good was accomplished, but when the men back of the great industries of the country fully realize that the drink traffic interferes with the wheels of industry, that it is an economic problem and these men speak, something will happen that will sound like the driving of nails into a liquor-traffic coffin.

The heads of some of the biggest industries in the country are sorely perplexed over the loss their enterprises sustain through the liquor traffic and they are beginning to say "Business is business." These men are not engaged in temperance-reform work nor are automobilists running truck farms; but their ability and their large interests make possible for them what is impossible to less able and less influential interests.

The great question is, as ever, "How can we successfully deal with the problem?"

Men are asking the question today who are in the habit of answering their own questions, and that is significant.

THE CONTROLLED SALOON A FAILURE

The controlled saloon has proved a failure, at least under existing laws. The "control" fails to make good or else the court's interpretation of the law prevents its operation under rigid control and restrictions.

[NOTE—This is the second article discussing the above subject.]

We quote an official of a large coal company: "Regarding our experience here, this community was better off when we had a tap room. You will understand, of course, that our tap room was run absolutely without profit to this company, as under an arrangement made with the county court all the profits derived from the operation of the tap room were devoted to public welfare. I might say in this connection that this was done primarily for the reason that the interests controlling the company would not participate in the handling of liquor in any manner which would give them profit, and the idea of handling this business through a tap room was that the traffic might be absolutely controlled and restricted.

"Unfortunately, however, it appeared to our county court, after having granted us a license on these terms for one year, that such an arrangement was outside the letter of the law, and it refused to renew our license for the present year. You will also understand that in our tap room we sold nothing but malt liquors and soft drinks, and in connection with the tap room we ran a restaurant. In the conduct of our tap room we could be as arbitrary as we chose, not working at any time for profits, with the result that the rules we enforced did undoubtedly tend to restrict the use of liquor in our town and, at the same time, they were not made so strict as to cause any serious complaint from our men.

INSOBRIETY ENSUES

"Since our tap room was closed, we have experienced the same trouble that exists in every mining town in this district, at least so far as my experience goes. There is no question but that the consumption of liquor has greatly increased; our town is not nearly as orderly as it used to be, and during the first month of no license, three murders were attempted, one of which, I believe, resulted fatally, and another resulted in disabling the victim for life. The trouble is that now the men club together and get a great quantity of liquor, which it appears to them must be consumed with the least possible delay, and I have never yet known of any great amount of delay in getting away with a supply of this kind around the miners' houses or boarding houses.

OUTPUT WAS CONSTANT

"During the last year while we were operating the tap room, one who did not know our pay days would be absolutely unable to pick them out by looking over our daily-tonnage reports; in other words we figured that we did not lose a single ton of output through our men being drunk; on the contrary, strange as it may seem, our pay days used to show not only a good tonnage, but, if I am not mistaken, our record tonnage was absolutely broken on one particular pay day. Things are decidedly different now; last week I should say, we lost fully 15 per cent. of our normal output on account of a couple of weddings and christenings.

"Generally speaking, I am as much opposed as anybody to operating the saloon, and personally I am extremely proud of the high attitude our company took in this matter; namely, that of refusing to participate directly or indirectly in any profit derived from conducting a saloon business; and I regard it as extremely unfortunate that our attitude in this matter not only lost us our license and took away from us the control of this traffic, in a large measure, but also that our motives were misunderstood by some of the temperance people in this county, and I can't help thinking that their mistaken assaults on us contributed largely to our present troubles.

THE SUCCESSOR OF THE CONTROLLED TAP ROOM

"As conditions are now, speaking for our own town, the amount of liquor that is shipped in by freight and express and hauled in by wagons is simply appalling, and I seriously question, if the figures could be accurately collected, if we could make anyone acquainted with this business believe to what extent it has grown. After having gone into this matter with the greatest care, and appreciating that with a certain portion of our foreign workmen the question of drinking beer is much the same with them as that of drinking milk with you or me, I have come to the conclusion that the only effective remedy is to put the control of the traffic in the hands of responsible parties who will handle it with common sense and who will refuse any money profit therefrom. And I am coming to believe that this can best be done, not by running tap rooms, but by being intrusted with the entire control of every bit of liquor that comes within our jurisdiction.

"I should also add that when we were running our tap room, most of the drinking was confined to beer while now, as

the liquor is shipped in by express, considerably more whisky is consumed, and I have no doubt it is of the rottenest kind. I do not need to point out to you how much worse this makes its effects."

In the above instance, the law was enforced to close the "controlled tap room." There are hundreds of cases where the law fails to be enforced to prevent methods which have no element of restriction, but which solely tend to demoralize.

Anthracite First Aid Meets

The team of the Brisbin colliery, belonging to the Lackawanna Coal Company, on Sept. 16, defeated its fifteen opponent teams in the first-aid contest held at Valley View park, near Pittston, under the auspices of the American Red Cross Society, the contest being in charge of Dr. M. J. Shields, who is the field agent for that institution. By its victory the team not only gains temporary possession of the Muckle cup, but also is entitled to represent the various coal companies at the National first-aid contest to be held in Pittsburg.

Several hundred people were at the park to witness the events and the teams represented fully 70,000 mine workers. Other successful teams were as follows:

First Event—First, Brisbin colliery, Lackawanna Coal Company; second, Clarence colliery, Hillside Coal Company; third, Centralia colliery, Lehigh Valley Coal Company.

Second Event—First, Law shaft, Pennsylvania Coal Company; second, Pine Brook colliery, Lackawanna Coal Company; third, Parrish and Buttonwood collieries, Parrish Coal Company.

Third Event—First, Forty Fort colliery, Temple Iron Company; second, South Pittston colliery, Pennsylvania Coal Company; third, Stevens-Seneca colliery, Lehigh Valley Coal Company.

Fourth Event—First, Hazelton colliery, Lehigh Valley Coal Company; second, Dunmore colliery, Pennsylvania Coal Company; third, Price-Pancoast colliery, of the Price Coal Company.

Fifth Event—First, Brisbin colliery, Lackawanna Coal Company; second, Stevens-Seneca colliery, Lehigh Valley Coal Company; third, Mayfield colliery, Hillside Coal Company.

The events were as follows:

No. 1—One man. Time allotted, 10 min. Fracture of bones of nose with severe bleeding, caused by the kick of a mule. Stop bleeding and dress with first-aid packet.

No. 2.—Two-man contest. Time allotted, 10 min. Explosion of keg of powder causes severe burns of hands, face and chest. Dress the injuries.

No. 3.—Man lying on live wire. Remove and treat.

No. 4—Right collarbone broken. Left foot badly crushed, not bleeding severely. Dress injuries.

No. 5—General team contest. Man unconscious and suffering severely from shock. Right hand smashed and cuts in palm. Wounds bleeding freely. Severe scalp wound and hemorrhage from artery. Simple fracture of third left thigh. Treat and dress.

The judges of the contest were: Capt. A. W. Williams, of Philadelphia; Major Charles Lynch, of Washington, and Major J. H. Allen, Ft. Myer, Virginia.

Shamokin Meet

The Susquehanna Coal Company held its second annual first-aid contest on Sept. 16, at Edgewood park, Shamokin. The teams participating represented the Susquehanna Coal Company's collieries at Nanticoke, Glen Lyon and William Penn, together with allied operations, the Mineral R. R. and Mining Company, of Shamokin and Mt. Carmel; the Summit Branch Mining Company, of Lykens and Williamstown; also the Lytle Coal Company, of Minersville. Special trains took the officials and corps from Wilkes-Barre, Nanticoke and Lykens. Supt. W. R. Reinhardt, with his aids, had completed admirable local arrangements. Upon arrival all parties were given a badge which entitle them to all the privileges upon the grounds. Luncheon was provided for 800 persons, including first-aid corps, officials, colliery bosses, clerks and guests, in the park pavilions. The baseball ground was used for the contest, canvas being placed on the ground. Penants bearing a number and the names of each of the forty-one corps marked the places. The program and tally sheets showed corresponding numbers.

Wilkes-Barre Mining Institute

Wilkes-Barre District, Y. M. C. A. Mining Institute, opened its yearly session by a social entertainment with addresses, Saturday, Oct. 7. The classes met for study on Tuesday, Oct. 10.

In addition to the night classes, which occur Tuesday and Friday evenings, a day class is offered for those men who work at night. This class will meet at 1:30 o'clock Mondays and Thursdays, and will take up the same subjects taken up in the night classes.

Charles Enzian, of the bureau of mines, will be supervising principal, as heretofore. W. D. Thomas, of the Kingston Coal Company, will teach arithmetic, mine law and ventilation to the first-year classes and ventilation to the second-year classes. E. B. Wagner, of the Lehigh Valley Coal Company, will teach arithmetic to first-year classes and mechanics, air compression and electricity to second- and third-year students. Thomas Price, of the D. L. & W. coal department will teach ventilation and gases to the first-year classes. Edward Roberts, of the Lehigh & Wilkes-Barre Coal Company, will teach the day class, which will meet Mondays and Thursdays at 1:30 in the afternoon.

Carbondale Mining Institute

The Carbondale District Mining Institute held its first regular monthly meeting for the 1911-12 season in Watts hall, Carbondale, Penn., Friday evening, Oct. 6, 1911.

Papers were read by James R. Williams and President P. J. Moore. Various members participated in the discussions. Mining Secretary C. L. Fay gave a short address.

The greater part of the evening was taken up with the business of the institute in preparation for the fall and winter work. Particular attention was given to the subject of night schools. Teachers Panchisin and Yurkorsky were present and reported that students at Forest City, Browndale and Mayfield were ready to enroll, and from all reports and indications there will be a satisfactory enrollment at each of these points. A large number of the men who attended the night schools at Forest City and Mayfield will continue this season and take up advanced English and arithmetic.

It is hoped that schools can be opened in Simpson for the fall term some time during the coming week.

First Aid Problems

The following are the problems to be exemplified during the National First-Aid Meet at Forbes Field, Pittsburg, in connection with the National Mine Safety Demonstration:

1. Treat a lacerated wound of the right side of the head (temple), and a lacerated wound on the top of right shoulder. One-man event; four minutes.

2. Treat a punctured wound over the left eye and lacerated wound of palm of right hand. One-man event; four minutes.

3. Treat a simple fracture of left collar bone and simple fracture of jaw. Two-man event; two minutes.

4. Treat a dislocated right shoulder and simple fracture of right knee. Two-man event; two minutes.

5. Treat conditions of a man who has fallen on an electric wire, back down, clothing burning; rescue, extinguish fire, treat back and upper arms. Team event; ten minutes.

6. Treat conditions of a man who has fallen on an electric wire face down; rescue and extinguish fire, treat chest and upper arms. Team event; ten minutes.

7. Treat gas burns of face, neck, ears and hands. Team event; ten minutes.

8. Treat gas burns of hands, right arm and shoulder. Team event; ten minutes.

9. Treat a broken back and simple fracture of right forearm. Team event; twelve minutes.

10 Treat a dislocated hip and simple fracture of collar bone. Team event; ten minutes.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Sines and Cosines and Their Use

Please explain the meaning of the words "sine" and "cosine" and the way in which they are used by surveyors.

By Special Request

The words are used to express or define the relative lengths of the sides of a right-angled triangle, that is, of a triangle having one angle of the three a right angle. The sine and cosine are not fixed quantities but vary in relation to the spread of the angles considered. Nor are they the same for any two angles in a triangle, unless two angles are equal. They are, however, the same for every angle of a certain given spread or degree.

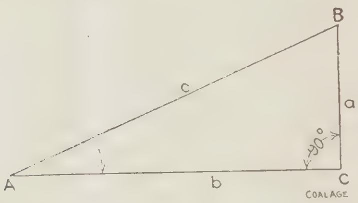


Figure Illustrating Sine and Cosine

In the triangle illustrated, which we name ABC after its three angles A and B and C, the sine of the angle A is defined as

$$\frac{\text{The length of the line between } B \text{ and } C}{\text{The length of the line between } A \text{ and } B}$$

or as it is usually written $\frac{BC}{AB}$. It is customary to say that the side, opposite angle A, has a length of a units—a feet or a yards or a meters. It is customary in a similar way to say that the side opposite C is c feet or c yards or c meters long or that it is c units in length. So we can cut the statement short and say sine A or *sin. A*, as we usually write it, equals $\frac{BC}{AB} = \frac{a}{c}$ because $BC = a$ and $AB = c$. But it must be remembered that the units used must be similar; that if a is in feet, c must be in feet. You will have to memorize that $sin.\ A = \frac{BC}{AB} = \frac{a}{c}$, because sine is merely a name for a ratio and it is necessary to remember what ratio it is, just as you would have to hold in memory the meaning of any other word. It is not a principle but a conventional name. The cosine of the angle A or cosine A, or as we still further cut the wording down to its lowest possible form,

$$Cos.\ A = \frac{\text{The length of the line between } A \text{ and } C}{\text{The length of the line between } A \text{ and } B} = \frac{AC}{AB}.$$

In other words the sine of an angle of a right-angled triangle is the ratio or comparative length of the opposite side of the triangle, to the long side, which forms one of the limbs out of which that angle is composed. This side we term the hypotenuse and, as you see, it is the side opposite the right angle.

The cosine is the ratio of the other, or short limb of the angle to the long limb. The short limb is called the "adjacent" or near side, though you will see it is not any nearer the angle than the long side or hypotenuse, but the reason for its being called "adjacent" is because it is near or adjacent not only to the angle we are discussing, but also to the right angle.

Now, seeing that the line AC is opposite the angle B, we shall say it is b units long, that is b feet, b yards or b meters, as the case may be, according with our use of foot, yard or meter units.

Thus the hypotenuse $= AB = c$; the opposite side $= BC = a$; the adjacent side $= AC = b$.

Suppose, for an example, in surveying we take a slope 1200 ft. long meas-

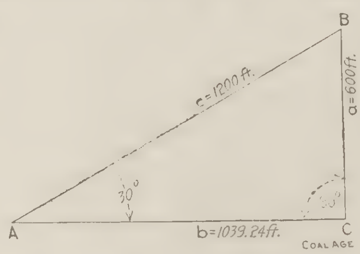


Figure Showing Rise and Length of Slope

ured on the slant, with an angle to the horizontal of 30 deg. We have seen that $sin.\ A = \frac{a}{c}$.

Now multiplying both sides by c, which will leave them still equal,

$$Sin.\ A \text{ becomes } sin.\ A \times c,$$

$$\frac{a}{c} \text{ becomes } \frac{a \times c}{c} = a.$$

Hence

$$a = sin.\ A \times c.$$

But $c = 1200$ and we find in the tables that *sin.* 30 deg. is equal to 0.5.

Therefore a will equal $0.5 \times 1200 = 600$ units. Now these units must be the same units as we used in measuring the slope; that is, they must be foot units or feet.

Therefore $a = 600$ ft., or the slope rises 600 ft. in its full length.

To get the horizontal length we take the cosine definition: $cos.\ A = \frac{b}{c}$; multiplying both sides by c we have $cos.\ A \times c = \frac{b \times c}{c} = b$.

Therefore, getting the cosine from the tables and remembering that $c = 1200$ ft., we have

$b = cos.\ A \times c = 0.86603 \times 1200.$

Therefore $b = 1039.236$ feet.

Therefore the slope extends a horizontal distance of 1039.236 ft. and if we go 1039.236 ft. on a level and then rise 600 ft. straight upward we will arrive at the head of a 1200-ft. slope like that in the problem we are solving.

Computation of Altitude

Original Question

In the illustration, P is the top of a church steeple; C is the projection point obtained by dropping a perpendicular line from P. At A a sight is taken to P and the angle of elevation from the horizontal is measured and is found to equal 20 deg. 15 min. At B, a point 500 ft. from A and on the extension of the line CA, another sight is taken and the angle of elevation to the top of the steeple P is found to be 10 deg. 42 min. Find the hight of the steeple (PC) above the level at which the sights were taken and the distance AC, designated on the plan as x.

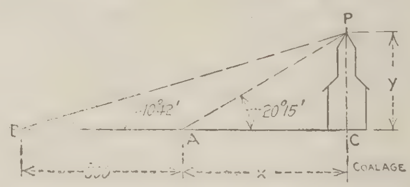


Figure Accompanying Problem on Steeple Hight

$$\frac{y}{x} = tan.\ 20\ deg.\ 15\ min.; \qquad (1)$$

hence multiplying both sides of the equation by x,

$$y = x\ tan.\ 20\ deg.\ 15\ min.$$

and $\frac{y}{x + 500}$ also equals *tan.* 10 deg. 42 min.; hence multiplying both sides of the equation by $x + 500$,

$$y = (x + 500) \times tan.\ 10\ deg.\ 42\ min. \quad (2)$$

The y mentioned in equation (1) is the y of equation (2), and since things which are equal to the same thing are equal to one another,

$$x\ tan.\ 20\ deg.\ 15\ min. = (x + 500)\ tan.\ 10\ deg.\ 42\ min.$$

From tables

$$tan.\ 20\ deg.\ 15\ min. = 0.36892$$
$$tan.\ 10\ deg.\ 42\ min. = 0.18895.$$

Hence

$$0.36892\,x = (x + 500) \times 0.18895,$$
$$0.36892\,x = 0.18895\,x + 500 \times 0.18895,$$
$$x\ (0.36892 - 0.18895) = 94.475.$$
$$0.17997\,x = 94.475$$
$$x = \frac{94.475}{0.17997}$$
$$x = 524.95\ ft.$$

We have seen that $y = x\ tan.$ 20 deg. 15 min. and now we know $x = 524.95$, we can write $y = 524.95 \times 0.36892 = 193.66$ ft. This is the elevation of the steeple above the level of sight.

Sensitiveness of Fan Doors

Ques.—The "explosion door" on the top of a fan shaft is curved to a radius of 16 ft. and measures on a straight line from hinge to lip, 8 ft., and is 8 ft. wide. If the water gage be 4 in. and the door rests at an angle of 45 deg., what must be the weight of the door if it is on the point of opening at that air pressure?

Ans.—The radius of the door does not affect the result. The gross effective steady pressure of still air on the curved surface $A\,B$ is no greater than on the plane chord surface between A and B. For the pressure on the surface of the curved face is at right angles to it, and at only one point of the cross-section is that pressure at right angles also to the chord $A\,B$. On one side of that point, the pressure is inclined to the left, on the other to the right, and the amount of inclination is the same for like points on the right and on the left, so that the amount one pressure unit would try to push the door to the right; another pressure unit would try to push it to the left. The only components of the pressure of the air, not so balanced, and made of no effect in the ultimate result, are those at right angles to the chord $A\,B$.

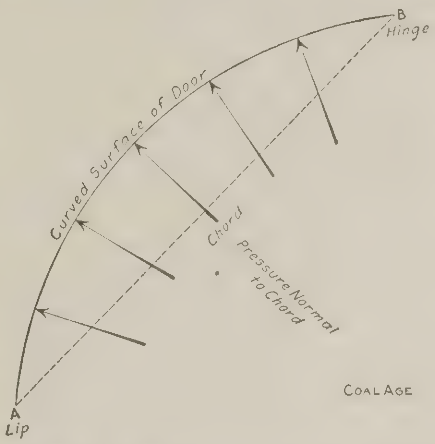
The pressure in pounds per square foot equals the water gage in inches times 5.2 lb.; because a body of water one foot square and an inch deep weighs 5.2 pounds.

So the pressure on the door in a direction at right angles to the chord surface $A\,B$, which is the sole effective pressure on that door, equals the length of the chord $A\,B$ in feet multiplied by the width of door in feet times the water gage in inches multiplied by 5.2 lb. equals 8 ft. times 8 ft. times 4 in. multiplied by 5.2, equals 1331.2 pounds.

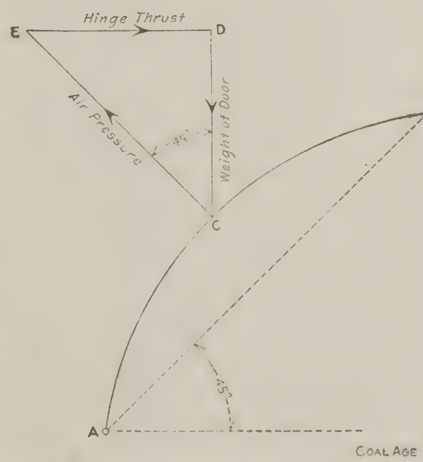
But the weight of the door acts vertically downward, so that only that part of the unbalanced air pressure which acts vertically upward can effectively oppose itself to the weight of the door.

We can now resolve the unbalanced effective pressure on the door into two components or parts, one acting vertically and one horizontally.

In the accompanying sketch let $C\,E$ be proportioned to the whole pressure on the door as calculated. Draw $E\,D$ horizontally from E and $C\,D$ vertically from C to meet $E\,D$ in D. Then $E\,D$ is the reaction of the hinge against the thrust of the door, and $D\,C$ is the weight of the door acting to balance the air pressure.



Normal Pressure on a Curved Door



Forces (Acting) on an Explosion Door

Now, $E\,C$ is at right angles to $A\,B$ and $D\,C$ is at right angles to a horizontal line. Therefore, the angle between $E\,C$ and $D\,C$ must be equal to the angle that $A\,B$ makes with the horizontal, namely, 45 degrees.

The forces in equilibrium are the air pressure $C\,E$, acting to open the door; and the weight of the door $D\,C$, acting to close it. These forces act about the hinge B as a center. According to the principle of moments,

$$CE \times \frac{AB}{2} = DC \times \frac{AB\ cos.\ 45°}{2}$$

or

$$C\,E = D\,C \times cos.\ 45\ deg.$$

and

$$DC = \frac{CE}{cos.\ 45°} = \frac{1331.2}{0.707} = 1882\ lb.$$

There is one consideration which has not been stated. The door should be symmetrically built so that its center of gravity is coincident with the center of pressure, otherwise the moment of the weight at the hinge will be unequal to the moment of the air pressure at the same point, and a correction would have to be made for this inequality of leverage. In fact, if built exactly of equal weight for unit length along the curve, the center of pressure would be a trifle further from the hinge than the center of gravity, owing to the curvature.

Example—Given a symmetrical door with a chord length of 6 ft., and 6 ft. wide, weighing 500 lb.; also having its chord line at an angle of 30 deg. to the horizontal. What would be the water gage of air under such pressure as would just suffice to open it?

Answer—2.3 inches.

West Virginia Questions

Glen Jean Examinations—General Preliminary Questions Continued From Oct. 14

Shafts and Hoisting Engineers

Ques. I—(a) What does the law require in shaft mines as to hoisting machinery with reference to its inspection, means of signaling and communication from top to bottom of shaft, safety catches and brakes, passageways and regulations as to the hoisting of men? (b) What kind of engineers must be placed in charge of hoisting machinery?

Ans.—(a) The law requires that the hoisting machinery must be inspected once in each 24 hours by some competent person.

A metal tube, through which conversation may be held between persons at the top and at the bottom of the shaft, must be provided, also the ordinary means of signaling, safety catches, cover on the cage, safety gates at ground landing and adequate brake on drum. There must also be a traveling-way made around the shaft, not less than 5 ft. high and 3 ft. wide. (Sec. 9.) The engineer must not allow anyone to interfere with any part of the machinery unless he is properly deputed to do so. No person shall interfere with or intimidate the engineer in the discharge of his duties; no more than ten men shall ride on a cage at one time and no person shall ride on a loaded cage or car in any slope or shaft. (Sec. 10.)

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

Briefs have been filed with the U. S. Supreme Court in behalf of the railroad companies which are defendants in the so called coal-roads' cases. Probably the argument for the Reading road is the most representative of the set and brings out as clearly as any the point of view of the railroads in this proceeding. The Reading company, with the other defendants, was charged with violating the Sherman anti-trust law, because it had joined with them in the acquisition of the capital stock of the Temple Iron Company, and because of certain transactions of that company.

The new briefs, however, do not go over the ground covered in the other arguments that have been presented on earlier phases of the subject, but direct attention very largely to the control of the capital stock of the Central Railroad Company of New Jersey and its relation to the carrying of coal. The point made by the Government is that the action of the Reading in controlling the Central of New Jersey brought under one controlling power not only those two carriers, but also the Reading and the Lehigh and Wilkes-Barre coal companies, thereby destroying every motive for competition between these railroad companies, and establishing a monopoly of the transportation of anthracite coal and also ending a competition between the coal companies in the sale of coal.

Reading Company's Argument

The Reading asserts that the Central of New Jersey does not operate a line that is substantially parallel to its own and which, in the absence of a restraining agreement, would be a competitor for traffic. It contends that the two roads serve entirely distinct parts of the State. The reason for the acquisition is assigned as being the purpose of enabling the Reading to cope with harbor interests in New York, which made it difficult for that road to get proper terminal facilities there.

Furthermore, it is stated that the Central of New Jersey and the Philadelphia & Reading are, and always have been, since their construction, connecting lines supplementing one another in the formation of through routes for the transportation of coal. Since the acquisition of control it is claimed that there has been no material change in the relations between the two roads, but all of the arrangements existing between them were consummated prior to that time. The anthracite-coal deposits, it is contended, are divided into five or six separate and distinct basins located miles apart and segregated from one another by mountain ranges, so that neither of these roads reaches or serves the anthracite coalfields as a whole, but on the contrary, each penetrates only portions of separate and distinct fields not penetrated by the other and severally reaches some, but not all, of the collieries located in those fields.

No Diminution of Output

As for a diminution of tonnage on either line resulting from the combination, it is claimed that there is no evidence to that effect, but on the contrary the gross tonnage of anthracite over both roads has materially increased since the consolidation. Figures for anthracite tonnage show that on the Reading 13,537,464 tons out of 43,603,585 were carried in 1908 against 10,672,556 tons out of a total of 24,404,294 in 1900. The Central Railroad of New Jersey shows an anthracite tonnage of 9,663,927 out of a total of 26,240,555 tons in 1908 against 6,632,075 tons out of 16,668,997 in 1900.

Each of the producing coal companies, it is pointed out, preserves its individuality in the ownership, control and operation of its own property, under its own board of directors, having a different personnel, and each is separately amenable to the law insofar as its doings come within the regulative power of Congress. But as to the ownership of lands, the operation of mines and the preparation of coal for the market, none of these matters, it is asserted, is commerce at all, much less interstate commerce, and they are all beyond the regulative power of Congress, which is confined to that portion of production from the mines which has been or is to be put into transit in interstate commerce. Control over such commerce is the only way in which Congress can constitutionally regulate operations in coal.

Rebates in New Guise

Action by the Interstate Commerce Commission suspending the tariff on coal recently filed by roads connecting with the Tennessee Coal, Iron and Railroad Company is intended to pave the way for a discussion before the commission of the question whether short lines of railway, owned by industrial concerns, are to be allowed practically to obtain rebates by securing a favorable division of through rates from connecting lines of road. This is also a point upon which the Stanley investigating committee of the House of Representatives has been insisting in the course of its recent inquiry into the doings of the United States Steel Corporation.

Coke-rate Controversy

The coke-rate controversy has been brought to a definite stage of development before the Interstate Commerce Commission. The rates complained of are those from the Connellsville coke region to South Chicago, Indiana Harbor and other places in the same territory. These rates are now set at $2.50 per ton for coke as against $2.35, which prevailed prior to the middle of last June.

Originally the coke from the Connellsville region to the Middle West moved partly on a rate of $2.35 and partly on a rate of $2.65 per ton. About 95 per cent. of the coke, however, moved at the lower figure. When the classification committee of the Western roads sought to bring about a greater degree of uniformity in classification, this rate was changed in each case to $2.50, which amounted to an increase of 15c. per ton on far the larger part of the coke. The Wisconsin Steel Company promptly complained, alleging that it purchased annually some 460,000 tons, so that it was a heavy loser by the change in rates.

At first the Interstate Commerce Commission seemed to be inclined to put the old rate into effect, but finally allowed the increase to occur, so that the only course open to the consumers was a formal complaint to the commission which has now been made and briefs filed as already indicated. The contest will involve considerable discussion of the question of uniform classification and whether or not uniformity is to be attained at the expense of the shipper by raising rates from the lower to the higher level.

The Meeker Case Again

The United States Court of Comerce, after a lengthy hearing in the Lehigh Valley coal case, has overruled the application for an injunction against the Interstate Commerce Commission with reference to the new rates on coal from the Lehigh district to tidewater. This brings a famous case one stage nearer to conclusion. The Lehigh Valley case was formerly the so called Meeker case and brought before the Interstate Com-

merce Commission the whole question of rates from the Lehigh district to tidewater.

After full consideration the Commission directed the railroads involved to pay to the independent coal operators reparation of over $220,000 for excessive charges made during the time the old coal rates were in operation. In addition to this the new schedule of rates for coal moving from the Lehigh district to tidewater, which was to have been put in operation Nov. 15 of this year, was ordered into effect.

Alabama

Birmingham—A $30,000,000 merger of the Alabama Consolidated Coal and Iron Company and the Southern Iron and Steel Company, of Alabama, is said to be nearing completion.

Colorado

Boulder—As the result of the sale of the property of the Northern Coal and Coke Company to the Rocky Mountain Fuel Company, it is authoritatively stated here that the end of the long-continued coal strike is in sight.

The American Fuel Company, which some time ago purchased the Centennial mine at Louisville, has now also become the owner of the Economic and Mitchell properties.

Canon City—At the mining plant of the South Chandler Coal Company, about nine miles south of this city, known as the Cuckoo mine, practically all the buildings were burned, Oct. 5, as well as the shaft all the way to the bottom of the mine. Three mules in the mine were suffocated. The loss is in the neighborhood of $25,000 and it is said to be without insurance.

Illinois

Herrin—The Illinois Central strike is seriously affecting the operation of Williamson county coal mines, and many of them which are wholly dependent upon this line for an outlet, have had to suspend operations.

Streator—Negotiations have just been closed by which the Chicago, Wilmington & Vermillion Coal Company purchases in Franklin county, 6000 acres of coal rights. The land is situated between the town of West Frankfort and Ziegler.

The company proposes at once to start sinking a shaft on the property and expects soon to be turning out 4000 tons of coal per day. Another shaft will be sunk later.

Indiana

Evansville—While drilling for oil, a mile south of St. Meinrad, Spencer county, a vein of coal 5½ ft. thick was struck at a depth of 90 ft. Samples of the coal were sent to the State geologist, and he pronounced it of first-class quality. The coalfields will be developed by several shafts.

Vanderburg County

The J. Wooley Coal Mining Company, with offices in Evansville, is installing gasolene motors in the mines operated by the company, for underground mine haulage. The use of the motors and other improvements and equipments being made will more than double the capacity of the mines.

Iowa

Oskaloosa—Difficulties between employer and employees at the Excelsior coal mine have been adjusted and no Iowa mine strike will be called, as had been threatened.

Centerville—According to a decision rendered in the district court by Judge F. W. Eichelberger, the Southern Iowa Coal Company, a firm controlling the entire output of 22 coal mines along the Burlington railroad, must dissolve. The decision means an upheavel of the coal business in Centerville and adjoining counties. An appeal will probably be taken.

Kentucky

The Baltimore & Ohio, it is persistently reported, despite denials issued by officials of the road, is securing options for a road from Catlettsburg, Ky., to Jackson, Ohio. The building of this road would give the Baltimore & Ohio a low-grade line for the transportation of coal from the Kentucky fields to the Great Lakes over its own rails. This would divert considerable coal from the Consolidation Coal Company's 100,000-acre coal tract in eastern Kentucky, as the proposed line will parallel the Chesapeake & Ohio for some distance.

Clover Creek District—One of the largest transactions in eastern Kentucky coal lands in several years was consummated recently, when Louisville and Barbourville men concluded a lease of 10,000 acres in the Clover Creek district, Harlan county, from T. J. Asher. As soon as a railroad can be constructed to the property coal developments on an extensive scale will be commenced.

Ohio

Columbus—The Black Diamond Coal Company which has offices in Columbus and which operates a mine at Amesville will soon erect a new tipple and electrically equip the mine. Plans for the work are now being made.

Ouster proceedings brought by the State of Ohio against the Hocking Valley Railroad were ended Oct. 10 on the promise of the railroad company to dispose of its holdings in the Toledo & Ohio Central Railroad, the Sunday Creek Coal Company and other railroads and coal companies and to manage its business in accordance with the statutes hereafter.

New Straitsville—The Central mine, located near New Straitsville, has been leased to a company known as the Hocking Block Coal Company. The Central mine was one of the largest and best equipped mines belonging to the Columbus & Hocking Coal and Iron Company which went into the hands of a receiver about a year ago.

The Troy Coal Company, of New Straitsville, has been incorporated with a capital of $30,000.

Jackson—The Sun Coal Mining Company, of Jackson, has been incorporated with a capital of $40,000.

Nelsonville—The Monday Creek Coal Company, which was incorporated some time ago with an authorized capital of $30,000, has opened offices in the Brunson building, Columbus. The new company will operate a mine near Nelsonville, which has an output of 1000 tons daily.

Oklahoma

Muskogee—Edward Perry, of Coalgate, has sent an offer of $15,000,000 for the segregated coal and asphalt lands of the Choctaw and Chickasaw nations. It will be remembered that the Government, the guardian of the Indians, after spending $100,000 prospecting with diamond drills, reported that $15,000,000 was all the coal lands were worth. For that reason, it appears that the offer of Perry and his syndicate is worthy of consideration.

Oregon

Portland—The largest coal property now under development in Oregon is that of the Beaver Hill Coal Company on Coos bay, which sends about 300 tons into Portland every week during the winter.

Pennsylvania

Bituminous

Pittsburg—Final action was taken Oct. 10 in the absorption of the Monongahela River Consolidated Coal and Coke Company by the Pittsburg Coal Company. Transfers of stocks are being made and the deal is now consummated. The Pittsburg Coal Company has sixty mines in the Pittsburg district and employs upward of 30,000 men.

Both companies recently transferred great coking tracts to the United States Steel Corporation in a deal involving $18,000,000. It is on these properties in Washington county that H. C. Frick contemplates expending $3,000,000 for new coke ovens next spring.

Kittanning—Work has been started on the new tipple, which will be erected by the Rochester & Pittsburg Coal and Iron Company, at Lucerne. The tipple will probably be the largest of its kind in the world, even larger than the tipple of the

Buffalo & Susquehanna Coal Company, at Sagamore, which has a daily capacity of over 10,000 tons.

Anthracite

The production of anthracite coal in September was the largest ever reported in that month, 5,730,935 tons. This is an increase of 763,419 tons over the output of the same month in 1910. The production for the nine months ending Sept. 30, is 51,376,379 tons. This is the largest production ever made in the first nine months of any calendar year.

For their work in September the mine workers in the anthracite region of Pennsylvania receive an increase of 6 per cent. on the rate of wages fixed by the anthracite strike commission of 1902. The increase is applied to the October payroll.

Pottsville—The Mammoth and Seven-Foot veins of coal have been struck by diamond drillers at West Shenandoah colliery. The former is about 20 ft. thick and will mean new life to this colliery. The other is also a large vein.

It is reported that Maderia, Hill & Company, who operate mines in this region, have consummated a deal in Schuylkill county, which involves the control of the Lawrence, Bear Ridge and Stanton collieries in the Mahanoy valley. These collieries will be pumped out, extensive developments made and employment given to about 2000 hands. It is believed that these three collieries will be jointly capable of producing nearly 2,000,000 tons of coal.

Scranton—The Oxford mine with its appurtenances, located at West Scranton and belonging to the People's Coal Company, was sold Oct. 14 to F. A. B. Leach & Co., a New York brokerage firm, the legal transfer of the property having been consummated by placing on record a judgment note for $30,000. John G. Hayes, superintendent of the company, and also a stockholder, confirmed the announcement to a representative of Coal Age. Neither the People's Coal Company nor Leach & Co., would make known the amount of the purchase money, saying that it would be inopportune to do so, just at present.

Washington

Spokane—Alexander Shary, of Calgary, Alberta, who has charge of Patrick Burns' mining operations, announces that Mr. Burns will build a railroad from Calgary to his coal properties, at the headwaters of the south branch of Sheep creek, 45 miles southwest of there.

"When we started to open up the mine," Mr. Shary adds, "we were of the opinion that the ground contained only semi-anthracite coal. Ten veins of that character now have been prospected, the seams varying in thickness from 4 to 20 ft. and aggregating 160 ft. At another part of the property we have opened up four seams of bituminous coal, each from 6 to 10 ft. thick.

"Samples of the latter coal, sent for analysis to Mr. O'Sullivan, an assayer and coal expert of Vancouver, B. C., brought us the report that it was the highest grade bituminous coking coal he had ever run across. The coal contains only 3 per cent. of ash and the coke made from it runs 94 per cent. fixed carbon."

West Virginia

Wheeling—The Four States Coal and Coke Company, with operations located at Dorothy, has increased its authorized capital and is preparing to open a new mine on its property, adjoining the Dorothy operation.

Huntington—The Yawkey & Freeman Coal Company has been incorporated to engage in mining coal and manufacturing lumber. The capital stock is $700,000.

The announcement is made that the National Fuel Company, with offices in Columbus, O., has taken over the output of two mines, one located at Lynn and the other at Clothier.

Canada

Alberta

The Jaspar Park Collieries, Ltd., according to the president, Andrew Laidlow, is now in a position to maintain a daily output of 300 tons, which, by Jan. 1, 1912, will be increased to not less than 500 tons, and will be again doubled before next summer.

The property is located 205 miles west of Edmonton, Alberta, and 35 miles east of the Yellowhead Pass. It consists of 10,240 acres, covering six seams of coal, which traverse it for eight miles from north to south. The beds vary in thickness from 4 to 14 ft. Development work was started in April, 1910, and so far consists chiefly of a tunnel 3000 ft. long, which discloses a working face of coal 12 ft. 4 in. thick. A second and lower tunnel is now being driven.

The output of the mine is bituminous coal, running from 68 to 72 per cent. fixed carbon and less than 7 per cent. ash. The first carload was shipped June 15, 1911, and since that time the Grand Trunk Pacific railway has taken the entire output of the mine. A recent contract with this latter company calls for 100,000 tons of coal to be delivered as rapidly as mined.

An English syndicate, capitalized at $5,000,000, one-fifth of which is set aside for development purposes, has acquired 20,000 acres of coal land in the Copper River district, British Columbia. This announcement was made in Spokane, Oct. 9, by H. N. Galer, of Vancouver, managing director of the Royal Collieries and vice-president of the International Coal and Coke Company, who is himself interested in the land in question.

Personals

John Mitchell, former head of the miners' union, will address miners' meetings in Scranton, Wilkes-Barre and Hazleton on Oct. 30.

John F. Meagher has been promoted to the position of general superintendent of coal mines for the Birmingham Coal and Iron Company, effective Nov. 15.

H. K. McHarg, president of the Virginia Iron, Coal and Coke Company has resigned, and the directors have chosen J. B. Newton, vice-president, as his successor.

Eli T. Conner, Philadelphia, Penn., has been appointed by President Taft as a delegate to the American Mining Congress, to be held at Chicago, Oct. 24 to 28 inclusive.

H. A. Berwind, of Philadelphia, and Thomas Fisher, of Pittsburg, of the Berwind-White Coal Mining Company, with President H. Hartwell, of the Berwind Fuel Company, inspected the new $100,000 briquet plant at Superior, Wis., Oct. 10.

Ira C. Dalrymple has resigned as superintendent, Blossburg division, Tennessee Coal, Iron and Railroad Company, to accept the position of superintendent of the Mulga mine of the Birmingham Coal and Iron Company, *vice* John F. Meagher.

Announcement was made Oct. 2 of the elevation of Frederick M. Chase to the general superintendency of the Lehigh Valley Coal Company, Wilkes-Barre, Penn. Mr. Chase has been with the Lehigh Valley Coal Company for 32 years and has ranked next to the general manager since 1905.

Milton Fies, general superintendent of the coal mines of the Birmingham Coal and Iron Company has tendered his resignation from that position, effective Nov. 1. He will then go with the Pratt Consolidated Coal Company, to be in charge of Banner mines, where State convicts are to be worked on and after Nov. 15.

Dr. M. J. Shields, of the American Red Cross Society, has been recently engaged in carrying on a campaign for the Frick Coal and Coke Company, standardizing their first-aid work after the Red Cross system, and giving a course of lectures in Latrobe, Mt. Pleasant, Connellsville, Uniontown and Brownsville, Pennslyvania.

Promotions effective Oct. 1 are announced by the Consolidation Coal Company, Fairmont, W. Va., as follows: John G. Smyth is appointed manager, Elkhorn division, with offices at Jenkins, Letcher county, Ky. C. F. Ice is appointed manager Millers Creek division, with office at Van Lear, Johnson county, Ky. T. S Haymond is appointed general coal inspector, vice C. F. Ice.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The general coal trade, as predicted last week, is showing a slow but persistent improvement. While summer weather still prevails generally, local cold snaps reported from different points have had a decidedly stimulating effect on the domestic consumption.

In the East, anthracite is reported active almost without exception, with bituminous improving, or up to normal. The falling off of the lake trade in the Pittsburg district is tending to make the market there irregular, with coke still depressed and uncertain because of lack of activity at the furnaces.

Ohio reports trade the same, or improving in some districts touched by the cold snaps. Lake trade has improved but steam consumption is not up to that of previous years.

The indications of a protracted strike on the Illinois Central line, the effects of which are already being felt, is causing greater activity than the trade has seen for sometime, especially in towns entirely dependent on these lines. As a result of curtailment in some of the large mills in Indiana, notably the Gary plant with its enormous consumption, coal business there is unusually depressed.

Western States are having a good trade in both coal and coke, with every indication of still greater improvement as the season advances. Because of the strike in the Crows Nest field the northwest has been compelled to draw on San Francisco. Recent heavy water shipments have, however, placed them in a good position to meet these outside demands.

Boston, Mass.

Bituminous is slowly but surely changing for the better. The higher water rates have begun to have effect on prices for inland delivery, but no marked advance is yet apparent on coal at the loading ports. Offerings of Pocahontas or New River at less than \$2.50, f.o.b. Hampton Roads, either are no longer made or are now confined to the brands less favorably known, and to this extent there is improvement over last week in the tide-water situation. Weather conditions and slow movement have spurred the demand for contract coal and shippers are keeping close watch on their cargoes at distributing points. Were it not for quick loading, there would be some heavy demurrage bills. At Portland, Portsmouth and Providence, things are about in proportion. At one of these ports a large vessel was recently held for thirteen days. That almost no coal is being forced on the market is an encouraging feature. Another week may show an upward lift at Hampton Roads, and if that proves so, we shall know that bituminous is well on the mend. Prices at Mystic wharf, on cars, are from \$3.25 to \$3.35 for the better grades of Pocahontas and New River.

Coal from the Maryland districts, Georges Creek in particular, is coming down more freely than a week ago. A considerable tonnage is placed, in conjunction with anthracite, in Reading barges from Philadelphia, and for that delivery there is now an active demand. Rates on such hatch loads so far continue on the summer basis of 65c. to Boston; \$2.60 to \$2.70 remain the prevailing prices for Georges Creek, at Baltimore, with the usual 7c. differential up for Philadelphia.

The Pennsylvania soft coals have been in straits all season, and there is likely to be little change until the West Virginia coals definitely reach higher levels, and southern freights advance still more. Somerset county coals of high grade are offering at \$1.05@1.10 at the mines and that leaves the Clearfields rather a slim opening. The better movement of all-rail is largely to forestall the usual delays that come with the winter months. Bituminous all over is still on a low scale, and it will be interesting the next few weeks to see to just what extent it improves.

Anthracite is taking on its usual fall activity. There is a brisk demand for all sizes and dealers are refusing to guarantee prompt deliveries. The eastern dealers, and especially those up the rivers, are taking on supplies for the long season ahead, and their usual preparations are complicated this year by suspension possibilities in the spring, before the streams are again open to navigation.

Steam sizes are in good request and prices strong on all varieties. Owing to the smoke laws there is a large demand for anthracite screenings in the large cities, and in Boston the shortage has become such that within a few days the contract price to consumers was advanced from \$2.50 to \$2.75, net ton delivered with teams. The whole subject of screenings is a serious one.

Since September 1, retail prices per ton in Boston have been as follows:

Broken	\$6.75
Egg	7.25
Stove	7.50
Chestnut	7.50
Pea	5.75
Franklin	8.75
Shamokin	7.75
Lehigh egg	7.50
Bituminous	4.25

Water freights on large vessels, 3500 tons and upward, from Hampton Roads to Boston or Portland have advanced from 60c. and are now firm at 70c., with rates to other ports and on smaller tonnage in proportion.

New York

There is no spot demand in the market at the present time, for steam coal. Tonnage moving on contract, however, is quite heavy. The supply is good, there has been no slowing up as yet in railroad movement, and the car supply has been such that the mines have been in a position, with few exceptions, to work on full-time basis, if necessary.

The market as a whole, does not show the strength at this time, that had been anticipated, but the better grades of Pennsylvania steam coals are reasonably firm, owing to the substantial demand they are enjoying on contract business, and a moderate amount of new business for these grades would bring about an increase in quotations.

The market for inferior steam coals is not in such a good condition, as these coals are not sold so largely on contract, and with the spot demand at a minimum, the supply of this grade at the piers is considerably in excess, at the moment, of the needs of the market.

Philadelphia

Weather conditions here, from the coal dealer's standpoint, are far from ideal, but the anthracite is active. Orders are piling up, and in the residential part of the city, and coal wagons can be seen in every direction. A prediction of as long ago as the month of August, that there would be a rush for coal, starting about the middle of October, is being more than fulfilled. Coal dealers report an unusual demand for this season of the year, and that is saying a good deal, for the one- and two-ton lots are commencing to make their appearance, which after all cover a major proportion of the coal man's business. This demand does not seem confined to any one size. On the contrary, there is a strong market for chestnut, notwithstanding the advance in

price of this size which took effect last year, and was supposed to shift demand for this coal, which was in excess of the production, on to other sizes which were in surplus.

Hotels, apartment houses and office buildings are getting in their supplies, preparatory to the winter season, and as a consequence there is a marked increase in the consumption of the smaller sizes. Even thus early in the season, dealers hesitate about committing themselves for any specified tonnage, having no assurance that they will be able to secure sufficient to keep them supplied.

The wholesale market indicates even a better outlook than our last report. Orders are coming in thick and fast, which is but a natural reflection of the tonnage being handled by the retail dealers. All sizes are moving off. There is a slight apathy on egg, but it is understood that the individual operators show very little disposition to shade the price even on this size, so that it is not believed that there is any particular excess of this size on the market.

While it is reported that there is a fairly large tonnage of bituminous coal moving, there is a lack of snap to the market, and no general improvement over last week. Prices of the various grades of coal remain about the same.

Pittsburg

Bituminous—The market has grown more irregular owing to the lake trade's absorbing a smaller tonnage, and prices are being cut on all sales. Mine-run and nut are frequently sold down to $1 a ton, while slack is also being sacrificed, the decreased production owing to decreased shipments of ¾-in. in the lake trade not having had any effect as yet. Occasional sales are heard of as low as 30c., but these are exceptional. Demand for domestic coal is only fairly good. The nominal price for the year is $1.15 for mine-run and nut, with 10c. rise for ¾-in. and another 10c. rise for 1¼-in. We quote ordinary market prices, subject to additional shading in some instances, as follows: Nut, $1@1.05; mine-run, $1.05@1.15; ¾-in., $1.15@1.25; 1¼-in., $1.25@1.35; slack, 40@60c., per ton at mine, Pittsburg district.

The mines in the district are operating at an average of between 60 and 70 per cent. of capacity.

Connellsville Coke—Clinton furnace, in Pittsburg, will blow in about November 1, and has bought its coke supply for November and December, to run about 20,000 tons, at $1.60, ovens. The nominal asking price on contracts running over the balance of the year has been $1.70, but since early in September consumers have shown no interest in such a figure, since it was possible to buy prompt at $1.50, and the sale to Clinton, which was made by the Connellsville Central Company, indicates $1.60 as the outside price, as operators would presumably be more willing to sell for the three months, including October, than for only the two months. A few thousand tons of prompt furnace coke have been sold at $1.50. Foundry coke is very quiet as to fresh sales, but deliveries are being very well taken on contracts. We quote, at ovens: Prompt furnace, $1.50; contracts over balance of year, $1.60; prompt foundry, $1.80@1.90; contract foundry, $2@2.25.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Oct. 7 at 314,343 tons, an increase of 1000 tons, and shipments at 3929 cars to Pittsburg, 4669 cars to points west and 1033 cars to points east, a total of 9631 cars, a gain of 27 cars.

Columbus, Ohio

There has been a slight improvement in the domestic trade in this section during the past week, due to a slight lowering in temperature and a desire on the part of consumers to get their winter's supply of fuel stored. But the trade is not what the time of the year would warrant and coal men are speculating as to the effect of the slowness on the future trade.

Lake trade has improved in the past week. The slowness of a week ago has given away to a better movement and operators have been busy looking after Lake shipments. There is some congestion at the docks of the upper Lake ports but not sufficient to retard shipments to any great extent. Prices at the docks remain the same as during the summer. Shipments at the Toledo docks of the Hocking Valley Railroad during the past week were 85,000 tons as compared with 40,000 tons for the previous week. Shipments since the opening of navigation at the Hocking Valley Toledo docks aggregate close to 2,000,000 tons.

Operations in Ohio fields have been fairly active during the week, due to the better Lake trade and the improvement in domestic business. In the Hocking Valley field the output has been about 80 per cent. of the average and the same is true in the Pomeroy Bend field and in eastern Ohio. In the smaller fields given over to domestic trade the output has been quite large.

Retail trade is somewhat quiet in Columbus and central Ohio. There is a disposition on the part of consumers to wait until later to place orders. In the country districts farmers have been too busy with their work to haul their winter's supply. The improvement of the roads has caused this to come about. Retail prices are still firm at the usual fall schedule.

Prices prevailing in central Ohio are: domestic lump, $1.50 in the Hocking valley and $1.65 in Pomeroy Bend; ¾-in., $1.35; mine-run, $1.05@1.15 in the Hocking valley and 95c.@1.05 in eastern Ohio; nut, $1.15; nut, pea and slack, 45@55c.; coarse slack, 40@50c. Fancy grades of domestic coal are sold from $1.65@2.

Cincinnati, Ohio

Demand for both steam and domestic fuel continues about the same, with a slight increase noticeable as to the latter.

In the steam-fuel trade the market in nut and slack, both splint and Pocahontas, is weak. The latter is selling for 50@80c., with the demand so light that operators are making little effort to push the sale of the lump—at least until the present surplus of fine coal is reduced. The splint, nut and slack is bringing a variety of prices, depending upon almost every factor that might influence a transaction. A fair range of prices would be from 35@60c., although there are sales reported below the first figure, but for grades that would be under others in all but times of extreme demand. Splint block may be bought as low as 85@90c. and some is sold as high as $1.35. The mine-run brings 60@90c. The mine-run Pocahontas price is about 90c., with some sales reported at less, but under special conditions that could not be taken to determine the market. Lump brings $1.90@2 or even $2.25, depending on how badly the buyer wants it and how the seller feels about it. Practically none of it is seeking a market.

The retail prices for fuel delivered are about unchanged from what they were six months ago and have continued ever since, as follows: Smokeless lump, $4@4.25; smokeless mine-run, $2.60@2.75; bituminous lump, $3@3.25; bituminous nut and slack, $1.90@2; anthracite, $7.25, since Sept. 1, when the price was advanced 25 cents.

Charleston, W. Va.

Except for the natural increase owing to the coming cold weather, and a feeling of better prices soon prevailing there has been no change in the coal situation over a week ago. There does, however, appear to be a better feeling as to the future than for a long time, and this condition is indeed a welcome one to the coal men of the Kanawha and New River sections, who have been struggling against low prices for a long time—a condition really made by themselves, but which now has bright prospects of coming to an end.

Despite the fact that shipments have been heavy along the Chesapeake & Ohio railroad, there has been no general complaint about cars. The car distribution seems to have been very satisfactory—something that has not always existed in the West Virginia fields.

The shipment for the Norfolk & Western field was not as large in September as it was in August, but even at that it was up among the months that are near the top.

Governor Glasscock has indicated that he will be in Pittsburg about the first of November to witness the national mine demonstration, which will be held under the American Red Cross and the Pittsburg Coal Operators' Association. The governor is greatly interested in safety demonstrations, and is also a believer that an experienced person is a better individual to select inspectors than a person who is not a practical miner. This he demonstrated when he placed the appointing of all inspectors in the hands of Chief of the Department of Mines, John Laing, who himself had been a practical miner before becoming a mine owner. It will be no fault of the governor if the next Legislature in this State does not give more liberally to the Department of Mines that the greatest possible safeguards may be placed around the "men under the ground," as well as the mining property itself.

Chicago

One of the important factors of the coal trade in Chicago today is the Illinois Central strike. That it is having a marked effect on the coal business is conceded by nearly everyone except the management of the Illinois Central Railroad.

Deliveries are not being made as they should be and in some towns, dependent solely upon the service of the Illinois Central, there has been a marked shortage in the supply. Chicago coal dealers say that the chief effect felt here has been in the price of screenings. Screenings are as high as 65c. today, as compared with 35c. 10 days ago.

It is the belief of many close observers of the situation that the freight-traffic business of the Illinois Central has been seriously affected by the walkout of mechanical crafts on that system. They also prophesy that the struggle will not be ended for some time, and that meanwhile conditions will mend very slowly. There are also those who foresee a serious car shortage. A recent report of the American Railway Association showed a decided reduction in the number of surplus cars throughout the country, and it is thought by many that this curtailment will continue.

Eastern coals are just about holding their own. Lump and egg coal are somewhat weaker, the city price being about $2 to $2.10, while the country price stands at $2.25. The price quoted for Hocking Valley and splint is the same as that which has been quoted heretofore. On spot shipments direct from the mines the prices in net tons to retail dealers and steam users are as follows:

	Chicago	F.o.b. Mines
Carterville:		
Lump	$2.65	$1.60
Egg	2.65	1.60
No. 1 washed	2.80	1.75
No. 2 washed	2.35@2.45	1.30@1.75
Sullivan County:		
Domestic lump	$2.35@2.45	$1.50@1.60
Egg	2.25	1.40
Steam lump	2.10	1.25
Screenings	1.27@1.37	0.40@0.50
Springfield:		
Domestic lump	$2.07@2.22	$1.25@1.40
Steam lump	1.82@1.92	1.00@1.10
Mine-run	1.82@1.87	1.00@1.05
Screenings	1.22@1.32	0.40@0.50
Clinton:		
Domestic lump	$2.17@2.27	$1.40@1.50
Steam lump	2.00@2.10	1.25@1.35
Mine-run	1.77@1.82	1.00@1.05
Screenings	1.22@1.32	0.45@0.55
Pocahontas and New River:		
Mine-run	$3.00@3.05	$0.95@1.00
Lump and egg	4.05@4.30	2.00@2.25
Hocking Valley	...	——
1¼-inch lump	3.15	1.50
Coke:		
Connellsville	$4.50@4.65	
Wise county	4.50@4.65	
Byproduct, egg and stove	4.95	
Byproduct, nut	4.55@4.65	
Gas house	4.95	

St. Louis, Mo.

With the week beginning the 16th, everything indicates that the coal trade in St. Louis is coming into its own. There is a far better demand for coal from the country, and city business is picking up considerably. There has been a general advance in the Carterville and Franklin county prices of about 15c. per ton on lump and egg, although the price on nut has not advanced.

Standard prices are advancing a trifle, but not more than from 5 to 10c. per ton. Owing to the strike on the Illinois Central, there is very little coal coming in from mines on that road in the High Grade and Standard fields. This has caused a stiffening up of the market, and with the cold wave that arrived Tuesday, it has offered more encouragement to the trade than it has received in some time.

The prevailing prices are as follows:

Standard:	
6-inch lump	$1.05@$1.10
2-in. lump	0.95@ 1.00
Mine-run	0.85
No. 1 nut	0.80
No. 2 nut	0.65
Screenings	0.30
Carterville:	
6-in. lump	$1.50@$1.60
3x6 egg	1.50@ 1.60
No. 1 nut	1.15@ 1.20
No. 2 nut	1.00@ 1.10
Screenings	0.40
Mine-run	0.95@ 1.05

The Franklin county prices are approximately 15c. per ton higher in the St. Louis market than the Carterville prices.

Murphysboro Big Muddy lump and egg is strong at $2.10. The last mentioned coals take a rate of 67c. to St. Louis, and the Standard coals a rate of 52c. to St. Louis.

The higher grade coals from the Standard field, such as Trenton, etc., are still holding their own at about $2. The middle-grade Standard coals are still holding at from $1.25 to $1.35 for lump and egg, and the other sizes going at what the market will give.

Everything seems to indicate a good movement of coal from this time on, and the car shortage troubles on roads like the Iron Mountain and Illinois Central, and the lack of motive power on the C. & E. I. will boost prices on those roads and help the other coal-carrying roads in the way of tonnage.

Minneapolis—St. Paul

The volume of retail trade in the Twin Cities at this time is satisfactory. The weather has been cold and rainy, and it has been necessary to keep furnace fires going.

Prices for domestic coal are fairly well maintained, but on all steam sizes, including Youghiogheny, Hocking and splint screenings, it cannot be said that there is an established price. Smokeless run-of-mine is also sold considerably below list. This unfortunate condition exists because the wholesale companies last spring inaugurated a campaign for tonnage.

One thing noticeable this season is a more liberal supply of nut-size anthracite at the head of the Lakes. Last season, an attempt was made to curtail the demand for chestnut by advancing the price 25c. per ton, thinking that it would turn the demand toward stove size. But it had no such effect, and the anthracite operators are sending a larger percentage of nut size into the Western trade, with the result that all dock companies are easy on the nut size.

This change is accounted for by the fact that when the advance of 25c. per ton on chestnut size was made effective in the East, it did have the desired effect and the consumer turned to stove- and egg-size coal, until the operators cannot fill the demand for the egg size, and the chestnut size became a drug on the Eastern market.

Denver, Colorado

The domestic mines of Colorado were not favored during the past summer with business to absorb more than 60 to 65 per cent. of their capacity, due largely to extended drought and crop failures which affected to a greater or less extent the entire territory served by these mines. During the winter of 1910-1911 purchases of coal were in excess of the demand owing to the exceedingly mild weather. With this surplus on hand and an apparent shortage of crops, the trade reluctantly placed orders early for but a small percentage of the usual requirement. The season's advance brought little relief and the desired increase was not manifest. Prices remained firm throughout the period notwithstanding the light volume of business.

The winter prices were effective Sept. 1 and the advance over the previous month naturally had a tendency to make orders light for immediate shipment, but the

whole production of the mines has been but little under that of the same month in other years. Orders are being freely filled at present for shipments to be distributed during the balance of the year and 50 per cent. of the total winter production has already been contracted. Recent reports from all over this territory show much improvement and while no abnormal increase has been predicted, a busy season is anticipated.

During the summer season, cars were plentiful. The fall trade has, however, utilized this surplus and there is every indication of a shortage of railroad equipment due to an extremely heavy fruit crop. The local railroads have a great many cars with their connections which further adds to their immediate distress. There has been no serious delay reported at the mines as yet due to shortage of cars, but the outlook for the future with a normal booking of orders is not exceptionally promising.

The labor supply has been adequate but with the advent of full time this condition will doubtless be reversed as is borne out by the history of previous years.

The steam trade during the past summer has been fair, considering the light volume of business done by the Western railroads and industrial institutions.

The coke trade during the past summer has been good owing to a heavy demand at the steel works in Colorado and the smelters and foundries in Montana, Colorado and the Southwest taking their usual summer requirement. Orders are gradually increasing with future prospects promising.

New Mexico

The mines of eastern New Mexico rely, for their market, principally on the south portion of the territory reached by Colorado shippers with practically no advantage over Colorado in transportation facilities and as the drought in this territory has been exceptionally severe and railroad traffic exceedingly light, a low production has been reported for the last four months. The steady upward trend in general business is evidenced by an increase in orders and preparations are being made to take care of a heavy fall and winter trade.

The western New Mexico mines report a prosporous summer season with prices firm throughout the period. All mines worked full time, due to a wide range of territory and favorable existing conditions. The advance in price Sept. 1 had no adverse influence on the volume of orders being placed. A slight shortage of railroad equipment has recently been indicated, but this condition is believed to be only temporary. More labor could be used to advantage, but from reports of former years this proves to be the rule rather than the exception. The isolated location of these mines has always operated against a ready supply of labor.

Salt Lake City, Utah

With the cold weather fast approaching the situation of the Utah mines and dealers is assuming a serious aspect. As was reported last week, the mines are working half time or less, and they are from two to five weeks behind in filling orders.

The relief promised by the Denver & Rio Grande road in increased motive power and cars has not as yet been in evidence and from the inside it is quietly given out that none is to be had this year. It is said that the Utah Fuel Company's production at Castle Gate and Clear Creek, has fallen off to such an extent, that next year will see the company kept almost entirely busy in furnishing coal to the Denver & Rio Grande and Western Pacific roads, with which it is closely allied.

Another feature, in this same connection and which affects the local market, is that strenuous efforts are being made by the Gould interests, to build up a traffic for the Western Pacific, and that the California coal business is being worked to the limit in order to give the road the long haul from Utah to California points.

Salt Lake dealers are all using about 75 per cent. reserve-stock coal in order to fill their orders, which are not big, owing to mild fall weather.

San Francisco

The arrivals for the past week have been as follows:

	Tons
Coal from British Columbia	15,110
Coal from Washington	2,590
Coal by rail	300
	18,000

Our anticipations, as expressed last week, are now being realized. The retail trade is taking advantage of the good weather conditions that prevail, and the storage of coal for winter use is now the order of the day. The market is in a good, healthy condition, and we are looking forward to a brisk demand and profitable business during the next five months, which are included in our wet season.

The deliveries by rail are not up to the usual quota for this season of the year, which is doubtless due to a continuance of the railroad strike and the fact that the Northwest is drawing from our sources of supply, to replenish stocks that have been exhausted because of the strike in the Crows Nest (Canada) district.

There is no change in prices from those of last week.

Spokane, Wash.

Reviewing the local situation E. F. Waggoner, president of the Union Fuel and Ice Company, said, Oct. 9, "There seems to be plenty of coal available to take care of immediate demands." Prices for best domestic lump and nut, \$8.25@9; steam coal, \$6.25; Pennsylvania anthracite, \$17.50. These quotations are lower than for September and October, last year. Dealers are storing very little coal, and no shortage is anticipated here during the coming winter.

The demand for coal by Western railroads is less than during the year previous, as many of the roads are using oil burners. This has given larger available supply for domestic and steam purposes.

C. A. B. Jackson, of Toronto, Ont., formerly a coal-mine operator at Frank, Alta., said, on returning from Crows Nest district, that the strike of the miners is about over. Operators informed him they expect the men to return inside of two weeks on the open-shop basis, and the international union is reported to have stopped all strike benefits. The smaller mines are working full capacity.

Portland, Ore.

The weather is such that there is little demand for coal just now, the winter prices having gone into effect Oct. 1., which means an increase of \$1 per ton over those quoted prior to that time. Coal dealers here say that the consumers are gradually becoming educated to the fact that they can save \$1 per ton by placing their orders during the summer or fall months of July, August and September and that as a result a great deal of coal is being put in during those months. The great advantage of this is, as every coal dealer readily realizes, that during the cold winter spells it relieves them of an avalanche of business during a few weeks with nothing to do part of the year. It is said that this summer more consumers placed their orders than in any previous year.

The weather is almost spring-like here, balmy breezes and clear days, with occasional showers, and as a result the consumer who buys half a ton or a ton of coal at the time, has not yet made his appearance to any marked extent.

British Coal Market

Tonnage arrivals were again very scanty, and the market is easier for prompt shipment. Quotations are approximately as follows:

Best Welsh steam coal	\$3.96
Seconds	3.72
Thirds	3.60
Dry coals	4.02
Best Monmouthshire	3.72
Seconds	3.60
Best Cardis small steam coal	1.98
Seconds	1.86

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage, and for cash in 30 days, less 2½ per cent.

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COAL AGE

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COAL AGE

Vol. 1 NEW YORK, OCTOBER 28, 1911 No. 3

"Aff agin, on agin,
Gon agin, Finnegan."

Such an oft reiterated story as the one given under the above title hardly needs repeating.

Some years ago when railroad equipment left the rails, with frequency because of—well, because there wasn't any provision to keep it on, the railroad authorities called for reports from the road foremen.

Some of these, being neither machinists nor engineers, and having no great skill in the writing of essays on track mismanagement, resented the literary effort demanded of them, though it must be conceded that they knew a lot about mishandled track; in fact, it might be succinctly stated that they didn't know about any other kind of track, for mismanagement ruled the day.

There was one, Patrick O'Finnegan, who firmly believed "the divil put the cars aff and 'twas Patrick put them on agin" or incinerated them if they were beyond salvage.

Said Patrick had a derailment on his section; he retracked the cars, wetted the point of a pencil and proceeded to write his version of the wreck on the elaborate form provided by the company, in the exact language of the heading of this article,

And Pat was satisfied, believing his last duty was done; he was surprised, therefore, when the "White Shirts" in New York returned his reply for further elaboration. The cars were off, he had them back on the track, and "divil a bit was there then to be said."

—o—

Now if Pat had been working underground, not 25 years ago, but today, it's probable that not only Pat, but the "White Shirts" in the main office would have felt all was done that should be done.

Derailment in the mine rarely takes a life, but it does destroy the track and cars and wastes valuable time. Again and again it will occur at the selfsame place, and the foreman says it can't be helped, puts the cars back on the track with a pry, a few blocks, much grunting and a pinched finger or two. "Well, they're on again," and when he sees the superintendent, he explains his loss in tonnage by saying: "Another wreck. I'll do better tomorrow."

—o—

There're too many Finnegans in charge underground who ought to be sextons in cemeteries or janitors in county court houses. There's no job in the mines where they're needed.

Be sure, Mr. Foreman, you inquire where, why and how that car was detracked and remedy the evil.

You say you have too many miles of track to watch. Perhaps you have; probably that's your fault. But I doubt if you've got so many it wouldn't pay to have them clean, ballasted, lined up true, free of humps, with even joints, perfect gage and no sharp curves.

Look at your equipment. Have you heavy, well spiked rails, supported by good ties, joined by fishplates? Are all the unnecessary frogs and switches ripped out?

And the cars. Do they run on three wheels and carry the fourth like a pointer on a hunt? Are they prone to knuckle up or down, right or left? Have they straight axles, true wheels and correct gage?

—o—

Oh! by the way, hang this colliery note in your den, "DERAILMENTS—A PREVENTABLE DISEASE."

Electrical Machinery for Coal Mines

By Sydney F. Walker*

The shunt-wound continuous-current motor and the three-phase induction machine are described and compared. Particular reference is made to their government and speed regulation in connection with various classes of colliery work.

*Bloomfield Crescent, Bath, England.

When electricity was first applied to the working of coal mines, continuous-current, or direct-current apparatus, as it is often termed, was employed, because it was the only apparatus on the market. In those days, although alternating currents were in use for town lighting, it was only single-phase currents that were employed, and the single-phase motor was not then suitable for mining work. The single-phase motor has been enormously improved during the last 15 years or so, and at the present time there is a keen struggle between it and the continuous-current motor, in regard to the driving of electric locomotives for urban and inter-urban traffic.

It is claimed by the advocates of the single-phase motor that it is more economical, and possesses certain other advantages over the continuous-current motor. On the other hand, it is very much more complicated in construction than either the continuous-current motor or the three-phase alternating-current motor that has come largely into use for coal-mining work; and so far as the writer is aware, no attempt has yet been made to adopt it in mining work of any kind. It may be mentioned, by the way, that the single-phase alternating-current motor is merely a modification of the continuous-current motor. It is a continuous-current motor, having the familiar commutator and also a special arrangement for delivering alternating currents to the coils of the motor, and special windings which enable it to perform, with single-phase alternating currents, the service ordinarily required of continuous-current motors.

Recent Gain in Popularity of Three-Phase A. C. Motors

During the last 10 to 15 years, three-phase alternating-current apparatus has been gradually displacing continuous-current apparatus. There are several reasons for this, but the principal one is the absence of the commutator which forms such an important part of the continuous-current motor and generator. The modern forms of continuous-current and three-phase alternating-current motors, are very similar in outward appearance. In each of them there is an outer containing cylinder, sometimes of magnetic steel, sometimes of wrought iron, sometimes of cast iron as shown in Figs. 1 and 2.

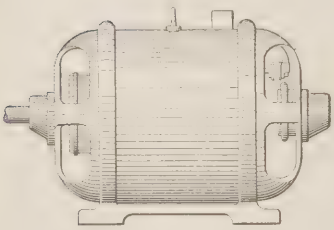


Fig. 1. Continuous-Current Motor

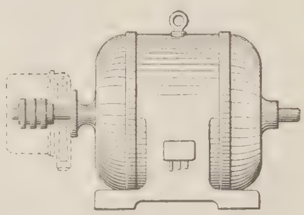


Fig. 2. Three-phase Induction Motor

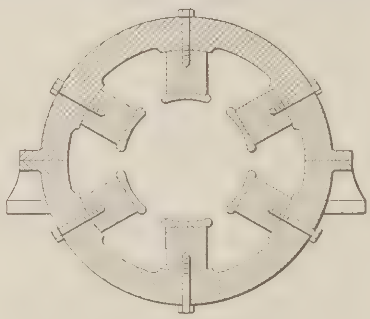


Fig. 3. Vertical Section through Field of D. C. Motor

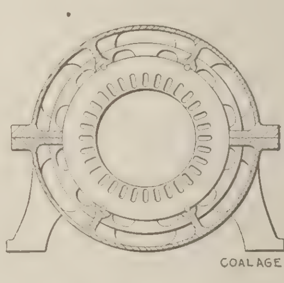


Fig. 4. Sectional View A. C. Motor

In the continuous-current motor, the electro-magnets which create the magnetic field in which the armature revolves, project radially inward from the containing cylinder, as shown in Fig. 3. Their cores are constructed usually of laminated iron, held in various ways to the containing cylinder, sometimes cast in the cylinder, sometimes held by other mechanical means. The coils containing the wires which create the magnetic field, are slipped over the cores of the field magnets, as they project inward, and crescent-shaped pole pieces are attached to the inner ends of the cores. These pole pieces more or less completely inclose the cylindrical space in which the armature revolves.

In the three-phase alternating-current motor, there are a number of thin disks of either wrought iron, or mild steel, or some form of iron or steel that will readily receive and give up magnetism, built up on the inside of the containing cylinder, so as to form a drum. Slots are made in the disks before they are placed on the inside of the cylinder, to hold the wires which carry the alternating currents. The drum formed by these disks incloses the cylindrical space in which the rotor, which corresponds to the armature of the continuous-current machine, revolves as shown in Fig. 4.

Similarity of D. C. Armature and A. C. Rotor

The armature of the continuous-current motor, and the rotor of the three-phase alternating-current motor, are also very similar up to a certain point. Each is built up of a number of thin disks of either soft iron or steel, material that will receive and give up magnetism quickly. The disks are slotted for the reception of the wires, which will cause the revolution of the armature or rotor, when the machine is working. The disks of the armature, the rotor, and the stator, as the drum inside of the containing cylinder of the three-phase alternating current motor is called, are all insulated from each other by being dipped in an insulating varnish before being strung together.

In both the continuous-current armature, and the three-phase alternating-current rotor, wires are laid in the slots. In the case of the continuous-current armature, however, the wires are in certain lengths and the ends of adjacent lengths, or coils, are connected to the segments of the commutator. The coils are all of the same length, are all placed in the slots and on the drum in the same way, and are insulated from each other, and from the iron in the slots of which they lie. This is shown in Fig. 5.

In the three-phase alternating-current rotor, there are two arrangements of the wires or conductors, known respectively as the squirrel cage and the wound rotor. In the squirrel-cage rotor, the conductors which lie in the slots of the iron or steel drum, are usually bars of copper, sometimes laminated. The bars are insulated from the iron and from each other, and

they are connected at each end to a ring of copper; the whole arrangement of the conductors, when viewed free of the iron drum, being similar to the well known cage in which squirrels are made to perform. Fig. 6 shows a section of such a rotor.

In the wound rotor, the conductors are usually smaller, more of them are laid in the slots, and they are wound on very much the same lines as the armature coils of a continuous-current motor except that there are three sets of coils instead of one set. The special feature of the wound rotor is the arrangement that is made to insert electrical resistances in the circuits of the coils, during the starting period. For this purpose, rings of copper are carried on the rotor shaft; carbon brushes bear upon the rings, and the arrangement is such that during the starting period, a connection is made between the coils of the rotor and certain resistances provided for the purpose. These resistances are cut out as the machine gets up speed, and when the speed is normal, the brushes are thrown off and the arrangement of the coils becomes practically the same as that of the squirrel-cage rotor. Fig. 7 shows a longitudinal section of a wound rotor with slip rings.

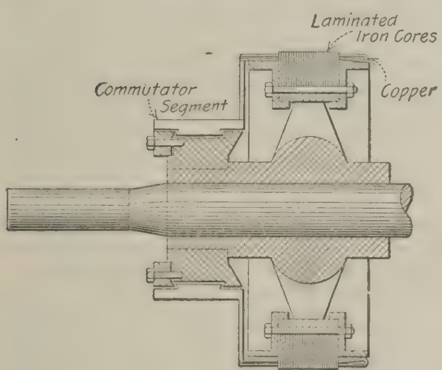


Fig. 5. Sectional View of Continuous-current Armature

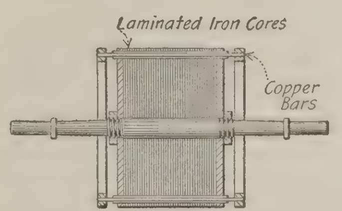


Fig. 6. Sectional View of Squirrel-cage Rotor

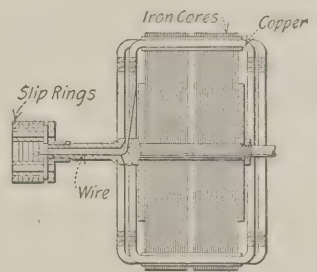


Fig. 7. Sectional View of Wound Rotor

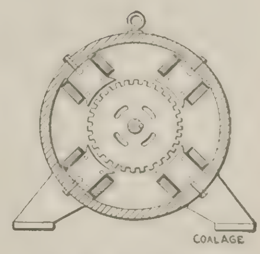


Fig. 8. Sectional View of D. C. Motor

Operation of the Two Types of Motors Compared

The working of the two machines is quite different, though the effect is the same. In the continuous-current motor, brushes bear upon the commutator. The commutator is a cylinder built up of segments of copper, insulated from each other by mica; the individual segments, as explained above, being connected to the ends of adjacent coils on the armature. The coils of the armature are so arranged that there is a continuous path or, as it may be termed, a continuous loop through all the wires by way of their connections to the segments of the commutator.

When the continuous-current motor is running, current is delivered from the electrical service to the brushes, from them to the segments of the commutator, and thence to the armature coils. Current is at the same time delivered to the coils surrounding the field magnet cores. The two sets of currents, that passing in the armature coils and that passing around the coils of the field magnets, create magnetic fields in the cylindrical space in which the armature revolves, of such a nature that attractions and repulsions are set up between the two and the result is that the armature turns in a certain direction, and continues to turn in that direction, as long as the current is flowing.

In the three-phase alternating-current motor, the slots in the drum formed on the inside of the containing cylinder, carry coils which receive the three-phase currents from the electrical service. There are three sets of coils, each set of coils receiving current from its own conductor, representing a particular phase. The delivery of the currents to the coils in the stator, as it is termed, is so arranged that currents are induced in the coils on the rotor, whether it be of the squirrel-cage or wound-rotor form, in such a direction that attractions and repulsions are set up between the two sets of magnetic fields, those created by the currents in the stator coils, and those created by the currents in the rotor coils, so that the rotor commences to revolve in a particular direction, and continues to revolve as long as currents are supplied to the stator coils.

Distinction Between the Magnetic Fields

The broad distinction between the magnetic fields created in the cylindrical space in which the armature of the continuous-current motor revolves, and those created in the cylindrical space in which the rotor of the three-phase induction motor revolves, will be noted. In the continuous-current motor, there is one magnetic field, of definite strength and of definite direction, created by the currents in the field magnet coils. There is another magnetic field created by the currents in the armature coils; and the motion which is given to the armature is due to the interaction of these two fields.

In the three-phase alternating-current motor, there are several magnetic fields created by the currents passing in the stator coils, and there are several magnetic fields created by the currents in the rotor coils. As mentioned above, there are three sets of coils, and three sets of currents in the stator. Each set of coils receives its currents in succession. Those connected to, say, No. 1 phase, receive their currents first; a little later those connected to No. 2 phase; and a little later again those connected to No. 3 phase receive their currents. In each set of coils, the currents are rising and falling and reversing, and all of these operations are taking place in succession in each set of the coils; the result is that what has been termed a revolving magnetic field is created within the cylindrical space in which the rotor revolves.

An eminent American electrical engineer has compared the action to that of a cat chasing its tail. A magnetic field of a certain strength arises at different points all round the cylindrical space in which the rotor revolves; the strength of the magnetic field so arising gradually increases, then gradually decreases, dies away and then reverses. Meanwhile the currents of the next phase commence to create another field just in front of the first, which increases in strength to a maximum and dies away just as the first did; then the third set of currents takes up the running, creates another field in front of the second, and so on.

The currents which arise in the coils of the rotor are really due to the same cause as in the static transformer. It is the rise and fall and reversal of the currents in the stator coils, which induce currents in the opposite direction in the rotor coils. These currents rise and fall and reverse in exactly the same order.

Simple Construction of the Squirrel-Cage Motor

It will be seen that the squirrel-cage form of the three-phase alternating-current motor, is simplicity itself. There is only the containing cylinder, the stator drum with its coils on the inside of the cylinder, and the rotor with its shaft and coils. There is nothing in the nature of

a commutator; there is no electrical connection between the rotor and the stator. The question of starting squirrel-cage rotors will be dealt with separately; but when the squirrel-cage motor is running, there is, or should be, nothing to get out of order.

On the other hand, with the continuous-current motor, the commutator and the brushes require frequent attention. With modern machines the attendance is very much less than was required in the early days, but nevertheless, the commutator is a solid disadvantage, when compared with an apparatus of the squirrel-cage type, which has no commutator and nothing that can be compared to one.

Disadvantages of the Commutator

The commutator may be said to have two disadvantages. Even the best forms of the latest construction require truing up from time to time, and brushes require renewing and regulating. The more serious objection, in the case of coal mines, is the possibility that an explosive mixture may be present in the neighborhood of the commutator. From experiments which have been made, it would seem that it is not easy to fire an explosive mixture at the commutator, but such a thing may happen, and at many collieries this possibility has led mining engineers to look askance at commutating motors for driving coal-cutting machines, etc. In the coal-cutting machine, the motor is necessarily inclosed, the commuutator being out of sight, while at the same time it is difficult to prevent coal dust finding its way to the surface of the commutator and where coal dust is present, it may lead to wear of the surface of the commutator, and to sparking.

There is also another and perhaps more serious danger in this connection. The brushes are held upon brass spindles attached to some part of the framework of the machine. It is necessary that the spindles shall be insulated electrically from the framework, or whatever they may be attached to. If they were not insulated, a short circuit would be created from the positive to the negative brush, and no useful work could be done by the motor. The insulation consists usually of rings of various materials, micanite being a favorite. In the early days of dynamos and motors, vulcanite and vulcanized fiber were used. Whatever the substance may be, there is always the danger of a deposit of coal dust, of carbon dust from the brushes, and of copper dust from the commutator, forming upon the surfaces of the insulating rings. A film of dust formed in this way, may lead to a dangerous arc. Nothing usually happens until a certain quantity of dust has been deposited, and then suddenly when the current is switched off, or when a large portion of the load is thrown off the motor, a spark may pass across the surface of the insulating ring, burning up the dust and causing a flash, which may possibly be followed by an arc.

The Induction Motor also Has Disadvantages

On the other hand, the three-phase induction motor has certain disadvantages. In the ordinary squirrel-cage form, with heavy copper bars, the starting torque, that is, the effort which the rotor is able to exert at starting, is small, and hence it is necessary to start upon no load, or to provide special arrangements, which tend to complicate the machine. In the case of coal-cutting machines, for instance, it frequently happens that heavy starting torque is required. With bar and disk and chain machines alike, it is more convenient if the machine can be made to start up in the cut. The ordinary squirrel-cage motor will not do this.

In addition, it often happens when cutting along a coal face, that a piece of very hard strata is met with. The continuous-current motor will exert practically any amount of power that may be required. It is a good natured horse, and will go on striving to deal with the load in front of it, even to the point of burning itself up. With the three-phase induction motor, a certain amount of additional work may be got from it by slowing up, and it necessarily slows up when faced with additional resistance, but there is a limit beyond which the motor will not go. It is an open question whether this is an advantage or disadvantage. It is very annoying to have the machine stop just when it is most wanted to put forth its best work. On the other hand, it is very annoying to have the machine put forth its best work, and to be useless afterward, as the continuous-current motor may be.

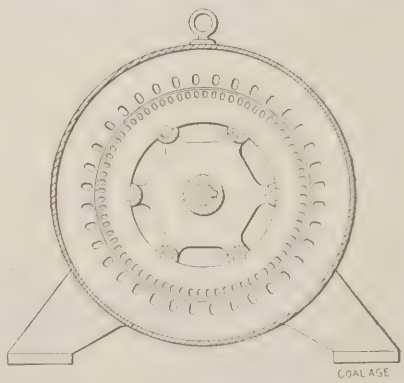


Fig. 9. Sectional View of Induction Motor

The Necessarily Small Air Gap a Disadvantage of Induction Motors

There is a further drawback to the use of the three-phase induction motor. In order that a high efficiency may be obtained, that is, in order that the largest possible proportion of the electrical energy delivered to the motor shall be obtained as mechanical energy at its axle, it is necessary that the rotor shall run very closely indeed to the stator drum. With every class of motor, whether continuous-current or alternating, it is an advantage for the moving parts to run very close to the stationary parts; but with continuous-current apparatus, the result of allowing greater space between the fixed pole pieces and the moving mass of the armature has not such a great effect upon the efficiency, as has a similar clearance between the stator drum and the rotor of an alternating-current machine.

With the continuous-current motor, a clearance of 1/16 in. is quite common, 3/32 in. is also often employed, and I much prefer as much as ⅛ in. With the three-phase induction motor, 1/32 in. is as much as can be allowed. This means that a very trifling wear of one bearing, or both bearings on one side, owing to a tight belt, for example, will cause the rotor to rub upon the iron of the stator, with the result that the machine is broken down. Figs. 8 and 9 show the difference between the clearance in a continuous-current motor and a three-phase motor.

In subsequent articles, I propose to deal with other points in connection with this subject.

Immunizing Coaldust by Water and Ground Rock

A brief report of the conclusions of the *Comité Central des Houillères de France* from experiments at the Lièvin gallery, printed in the *Annales des Mines*, September, 1910, page 227, contains among observations which are, by this time, trite reflections of mining men, a few important considerations.

A naked flame or electric arc, in the absence of firedamp, is less likely to start an explosion than a blown-out shot of a non-permissive explosive.

The amount of water needed to render coal-dust inexplosive is a weight of the former equal to the weight of the dust which it is designed to render immune from explosion. When it is purposed to immunize by the use of powdered rock, not less should be used than half as much rock as of coal dust, which it is desired to render inert. The dust of coal as referred to in the above is defined as being all fine coal, 2 mm. (0.078 in.) in diameter or finer. The dust for immunizing should be of extreme fineness and in estimating it, the ash of the coal should not be considered, as its action is uncertain. To stop an explosion in a wet zone, the admixture of water should be four times the weight of the coal dust to be rendered inert.

Preparation of Anthracite Coal

By M. A. Walker

Methods used in the Panther Creek region where there is much large rock present in an otherwise singurlarly pure coal.

In this section of the anthracite field the dominant factors in the preparation of coal are the presence of a large quantitiy of rock, in pieces often running up to as high as 800 lb. in weight, and comparative freedom from "bone" in the coal as it comes from the mines. The high proportion of big rock in the run of mine coal is responsible for a style of breaker construction which does not obtain in the northern and middle fields. The low proportion of "bone" practically reduces the problem in many instances to one of eliminating the rock.

In general, the preparation plants here consist of two distinct buildings: The head house and the breaker proper. The function of the head house is to remove all the large pieces of rock and as much small rock as possible down to and including that of steamboat coal size; also to render the coal of suitable size and condition for reception into the breaker. The head-house product is carried to the breaker as a rule by conveyers of either the scraper or carrier type. These are often inclined in order to gain the necessary hight at the breaker end and frequently 250 to 300 ft. in length. All jigging, final sizing and picking of the coal is confined to the breaker.

A Typical Plant

Fig. 2 is a diagram showing the run of coal in a scheme of preparation typical of this region. Tables 1, 2 and 3 are compiled from data relating to the Lehigh Coal and Navigation Company's breaker at Coaldale, Penn. This is a modern plant which has been in successful operation for nearly two years and may be taken as representative of the locality. It has a demonstrated capacity of 1350 mine cars per day from which it prepares about 3500 tons of coal with 118 men at a labor cost probably not exceeding 10c. per ton. From 10 to 12c. a ton is an average labor cost for this region which compares with 6 to 8c. in the Wyoming region, where large rock is not a factor.

It will be noted from Fig. 2 that the scheme of preparation in the head house is in general as follows: A disposition of the mine rock is made, when necessary, at the dump by means of a by-pass gate *A* in the bottom of the dump chute. The coal stream from the dump is passed over the platform shakers *C* having 6-in. round mesh, and a consequent separation made into two streams, one of lump size, the other of mixed steamboat and smaller sizes. Following first the lump-coal stream, it is seen to descend to the picking tables *D*, which are about 20 ft. long and have a pitch of 2 to 2¼ in. in 12 inches. Here all the rock is removed and the cleaned lump coal which passes off is broken down in the crushers *H* to steamboat size and smaller. Steamboat size is removed by the shakers *F* which have a 4½-in. round mesh, and is subsequently rebroken. All of this stream goes to that one of the two conveyers which is devoted to cleaned coal.

Following next the second stream, which consists of everything passing through the 6-in. mesh of the platform screens, it is found to be led over the shakers *E*, having a 4½-in. round mesh. The steamboat coal thus made is hand picked, then crushed and taken to the clean-coal conveyer. Everything passing through the mesh of the shakers *E* is led directly to what is known as the "dirty" coal conveyer, to distinguish it from its partner.

Fig. 1. Coaldale Breaker, Lehigh Coal and Navigation Company, Coaldale, Penn.

Preparation in the Breaker

There are thus two streams of coal passing up to the head of the breaker; one cleaned, the other not cleaned, and both a mixture of broken and all smaller sizes, except when it is desired to ship steamboat size, which is done by omitting to break down that size in the head house. The clean-coal stream is usually sized over two sets of shaking screens similar to those listed in Table 1, and is passed from them directly to the pockets with more or less examinatron in the chutes.

The dirty-coal stream is sized over four sets of shakers, or as a rule, double the number used for the clean coal, similar to those listed in Table 2. Broken size from these screens is usually cleaned by spiral pickers or some other mechanical device, supplemented more or less by

hand picking; occasionally it is jigged. Egg, stove, chestnut and pea sizes are usually led directly from the screens to the jigs. It is the practice in some breakers, however, to spiral or otherwise mechanically pick these sizes on their way to the jigs, and it depends a great deal on local conditions whether or not a profitable percentage of pure coal can thus be deflected to the pockets. Buckwheat size is jigged in a number of cases, but more often it passes directly from the screens to the pocket, as do also the rice and barley sizes.

Table 3 gives data relating to jigs of the "Lehigh Valley" plunger type, shown in Fig. 3, which are replacing other styles in a good many instances. The jigged coal is thoroughly examined and occasionlly resized before passing to the pockets. The usual provisions are, of course, made for breaking down the material rejected at the jigs and various picking places and for resizing and cleaning the same.

Rehandling Condemned Coal

There is today a very marked tendency toward more rigid standards of inspection at the collieries and a consequent prominence to the subject of rehandling condemned coal. Exact figures of general interest in this connection are hard to obtain, but it may be easily observed that rehandling condemned coal is liable to be a very expensive operation unless it is possible to pass it through the breaker while at the same time working on coal from the mines.

The disposition of refuse is a particularly important part of the subject in this locality for the reason that, as already observed, there is a large quantity of rock in the coal as it comes from the mines, of which a very considerable portion is in pieces of great size and also because the topography of the region makes it necessary to deposit all this material on the mountain sides, frequently at a considerable hight above the breaker.

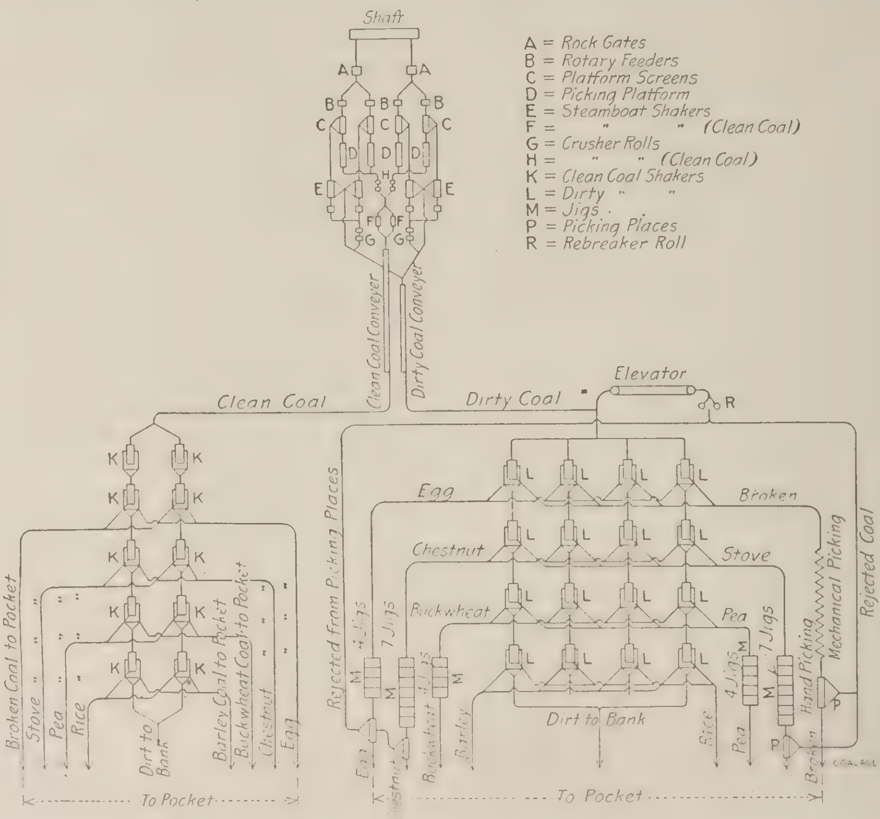


Fig. 2. Diagram Showing Run of Coal

TABLE NO. 1. PURE COAL SCREENS

Number	Size Coal Passing Over	Round Mesh	Total Area, Sq.Ft.	Tons per Hour	Tons per Sq.Ft. per Hour	Revolutions of Cam Shaft
2	Broken	$3\frac{1}{4}$ in. dia.	90	6.28	0.070	150 to 165
2	Egg	$2\frac{5}{16}$ in. dia.	90	7.08	0.078	
2	Stove	$1\frac{5}{8}$ in. dia.	90	10.97	0.122	
2	Nut	$\frac{7}{8}$ in. dia.	90	17.25	0.192	
2	Pea	$\frac{9}{16}$ in. dia.	120	9.91	0.083	
2	Buck	$\frac{5}{16}$ in. dia.	120	13.20	0.110	
2	Rice	$\frac{3}{16}$ in. dia.	120	10.57	0.088	
2	Barley	$\frac{3}{32}$ in. dia.	120	4.21	0.035	

TABLE NO. 2. MAIN SCREENS

Number	Size Coal Passing Over	Round Mesh	Total Area, Sq.Ft.	Tons per Hour	Tons per Sq.Ft. per Hour	Revolutions of Cam Shaft
4	Broken	$3\frac{1}{4}$ in. dia.	180	25.12	0.139	150 to 165
4	Egg	$2\frac{5}{16}$ in. dia.	180	28.30	0.157	
4	Stove	$1\frac{5}{8}$ in. dia.	180	43.88	0.244	
4	Nut	$\frac{7}{8}$ in. dia.	180	69.01	0.383	
4	Pea	$\frac{9}{16}$ in. dia.	240	39.75	0.165	
4	Buck	$\frac{5}{16}$ in. dia.	240	52.78	0.220	
4	Rice	$\frac{3}{16}$ in. dia.	240	42.30	0.176	
4	Barley	$\frac{3}{32}$ in. dia.	240	16.86	0.070	

TABLE NO. 3. JIGS

Number	Size Coal	Size Perforations in Grates	Total Grate Area	Revolutions Plunger Shaft	Tons per Hour	Tons per Hour per Sq.Ft. of Grate Surface
4	Egg	$\frac{7}{8}$ and $\frac{5}{8}$ in. dia.	64 sq.ft.	85	28.3	0.442
7	Stove	$\frac{7}{8}$ and $\frac{5}{8}$ in. dia.	112 sq.ft.	85	43.88	0.392
7	Nut	$\frac{5}{8}$ and $\frac{1}{2}$ in. dia.	112 sq.ft.	90	69.01	0.616
5	Pea	$\frac{3}{8}$ and $\frac{5}{16}$ in. dia.	80 sq.ft.	100	39.75	0.497
4	Buck	$\frac{3}{8}$ and $\frac{5}{16}$ in. dia.	64 sq.ft.	100	52.78	0.824

At one plant the head-house rock and the breaker refuse are brought together by conveyers to a pocket which loads a skip hoist or "gunboat." This travels on an inclined plane and discharges into a pocket at the top from which are loaded trips of dump cars. The latter are then conveyed by a steam locomotive along the summit of the rock bank and dumped.

Disposition of Rock

Generally, however, it is found possible to omit one or more links in this series and the usual plan for handling refuse is to have two large rock chutes in the head house, each of a capacity sufficient for at least a half-day's run, and discharging into dump cars which travel to and from the rock bank. It may or may not be necessary to elevate these cars to the summit of the rock bank; in case it is, this is usually accomplished by an inclined plane and "barney" car. The breaker refuse is usually delivered to the same dump cars that take the head-house rock by means of a conveyer discharging through a loading pocket. In general the disposition of refuse adds a labor charge of from 3 to 4c. to each ton of coal shipped.

A matter which is probably receiving more attention than any other one thing in connection with the subject of coal

preparation in this district, as well as in other parts of the anthracite field, is the prevention of breakage in the chutes. Nearly all of the larger companies are continually experimenting on different forms and styles of chutes with various results and varying degrees of success.

One of the chief difficulties in connection with the building of a permanent chute, is the fact that the quality of the coal is likely to vary from wet to dry and from clean to dirty, in the sense that a large proportion of fine coal constitutes dirt as well as a large proportion of impurities. The same pitch of chute is not suited to both conditions, and in consequence the clean, dry coal is liable to go down with a bang, while the wet, dirty coal lags on the way.

To a limited extent, this difficulty has been overcome here, as elsewhere, through the use of retarding chutes, which operate on the principle of allowing the pieces of coal to expend their acquired momentum at frequent intervals by sliding up a slightly adverse pitch. These chutes are constructed in zigzag fashion, with comparatively short straightaway runs, and when built with enough pitch on the straight runs to suit the slowest coal likely to traverse them, they have here been giving excellent results within certain limits of application.

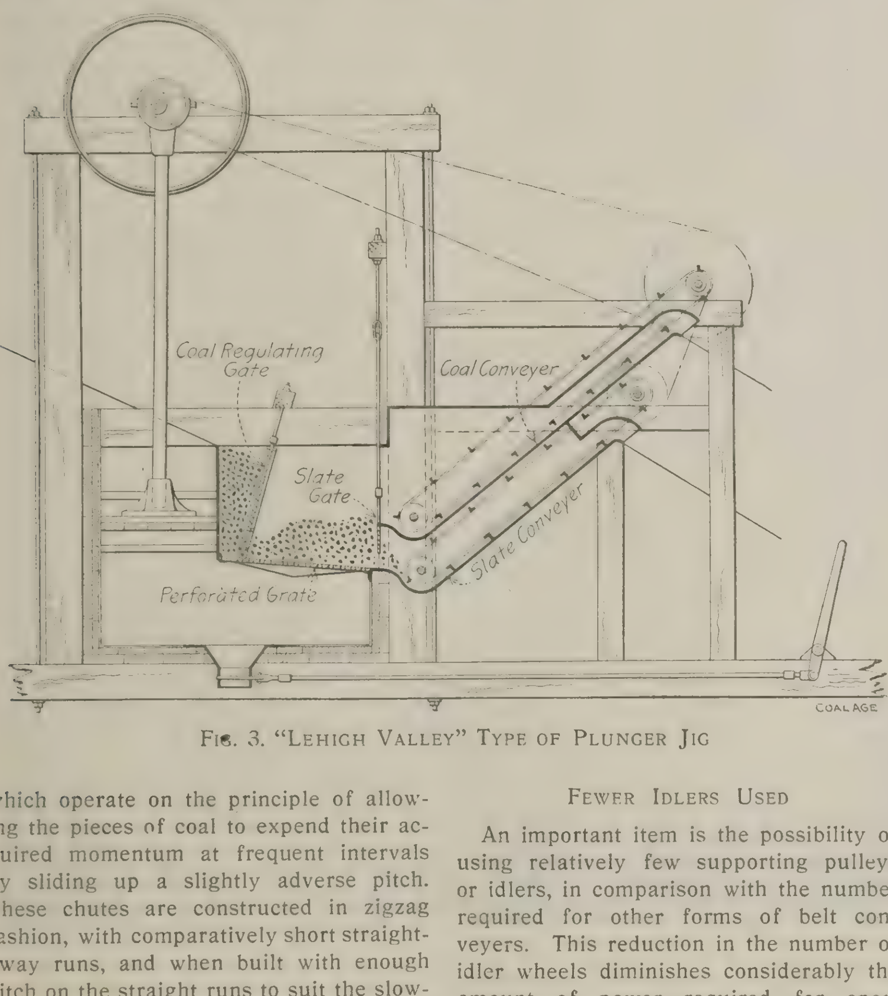


FIG. 3. "LEHIGH VALLEY" TYPE OF PLUNGER JIG

The modulus of elasticity of a hoisting rope varies during its working life, being small at first and afterward increasing to nearly the value of the modulus of the wire itself. If the rope is kept in use long enough, it will decrease. When this decrease is observed, the rope is deteriorating.

Steel Belt Conveyers

After several years of experimenting, a Swedish steel company has succeeded in manufacturing a steel-belt conveyer, which has given most satisfactory service in various plants of northern Sweden.

These steel-belt conveyers are made in lengths of 100 m. (328 ft.) and are 200 to 400 mm. (8 to 16 in.) broad, and 1 to 1½ mm. (0.04 to 0.06 in.) in thickness. To obtain a special length or width, two or three of these standard sizes are riveted together. They are made of high-grade charcoal steel, possess a high resistance against wear and tear and are extremely flexible.

These conveyers are used for transporting all kinds of material, and it is said are cheaper to manufacture and install than high-grade belts of other material.

Fewer Idlers Used

An important item is the possibility of using relatively few supporting pulleys or idlers, in comparison with the number required for other forms of belt conveyers. This reduction in the number of idler wheels diminishes considerably the amount of power required for operation. The maintenance cost of these conveyers is low, and repairs are easily made by riveting on a new piece of the required size.

A troughing of the belt itself is impracticable, and it is made to run in a guide channel or trough, which may be of steel, or wood covered with steel. The sides of this trough should be inclined at a slight angle to the plane of the belt. A longitudinal elevation of these conveyers as they are installed shows the upper or carrying run to be slightly convex. This is done to keep the belt in the guide trough in the event of material piling up along the conveyer.

Ordinary wooden pulleys, the faces of which are covered with a ⅛-in. to ¼-in. layer of rubber, give excellent service as driving wheels. When cast-iron wheels are used their faces should also be covered with rubber. The bearings of the tail wheel must be made adjustable, each side independent of the other, and a range of 4 to 6 in. is usually found sufficient.

The distance between supporting pulleys or idlers is made about 32 ft., and the last one of these is kept not more than 10 ft. away from the driving wheel. These idler pulleys are made of cast iron, or preferably wood, and have a diameter of 16 to 20 in. The various belt pieces are riveted together with lap joints, using two rows of ⅛-in. rivets, 1¼ to 1½ in. apart; the end connections are usually lapped about 2½ in. The inside, or pulley side, of the belt is given a thorough coating of paint.

Usual Speed and Power Required

The usual speed of these belts is 164 ft. per min. or thereabout. They may, however, be run at a considerably higher velocity. The proper breadth of the belt is governed by the character of the material to be carried. For boards, logs and other materials of great bulk, one and one-half times the average width of the stream should be allowed for the belt. For coal, ore, etc., the breadth should be sufficient to allow carrying the material without having it come in contact with the sides of the guide channel or trough to any great extent.

The amount of power required for running these conveyers, of course, depends on the material transported, inclination of the conveyer, and to some extent on weather and other conditions. At one installation a belt 394 ft. long, center to center of turn wheels, and 16 in. wide, which is carrying 1766 cu.ft. of charcoal per hour at the rate of 164 ft. per min., requires, including gearing, about 3.6 electrical horsepower when running empty, and 5.1 h.p. when running full capacity. Of this amount 2.1 h.p. are consumed by the motor and gearing alone.

Another installation consisting of two 12-in. belts, 492 ft. center to center of turn wheels, running parallel, carries 3500 cu.ft. of charcoal per hour, at a velocity of 164 ft. per min., and when running empty requires 6.3 h.p., against 9 h.p. when running full capacity.

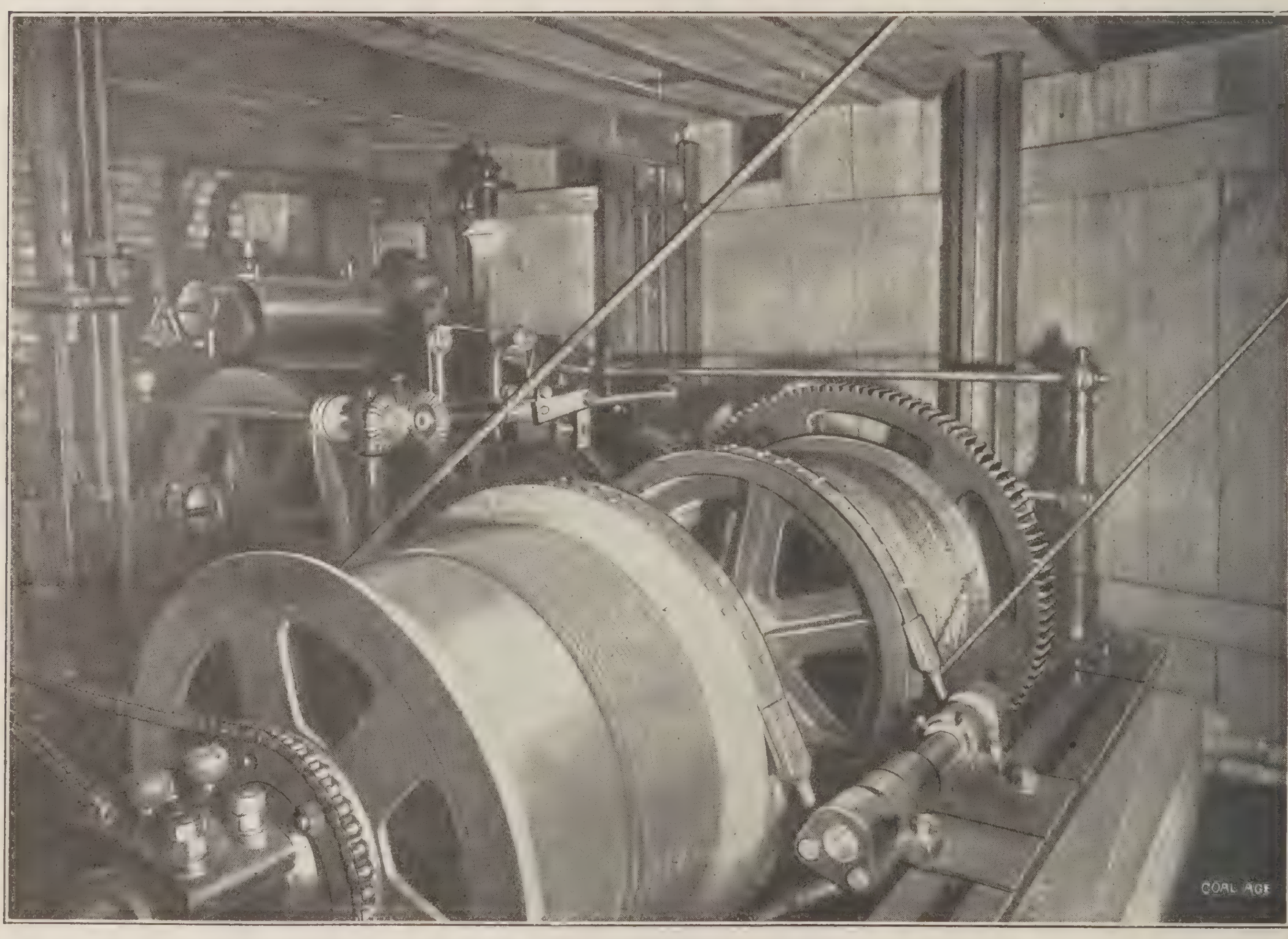
The best results are obtained from a shaker screen when the ratio of the length of the hanger to the travel of the eccentric is from 14 to 15 to 1.

Oil Engines in Coal Mines

Special Correspondence

European experience favors the use of oil motors, not only for haulage but also for general power purposes within the mines. No objectionable gases enter the mine air and the practice of using oil as a prime mover is on the increase.

At first sight it would appear that the underground working of a colliery is hardly the most appropriate place for an explosion engine, but, as a matter of fact, such engines have been adopted for locations of this description, and have proved in practice most useful and safe prime movers for the work which they have to do. In Europe, and particularly in Germany, the practical development of the gas and oil engine has proceeded with amazing rapidity in recent years, and there appears to be no end to the useful applications of these engines. Prominent among the firms who have participated in this progressive movement is the Gasomotorenfabrik Deutz, of Cologne, who are now building oil engines of both the stationary and the locomotive types for mine work.



UNDERGROUND HOIST DRIVEN BY OIL ENGINE, AMBERG, BAVARIA

Oil Motors for Mechanical Haulage

It is a well known fact that an appropriate mechanical motive power for the conveyance of small loads at moderate speeds has been wanted until recent years. This deficiency, which is especially troublesome in the working of mines, induced the firm mentioned to design a locomotive driven by an internal-combustion engine, as had been suggested by members of the mining industry. The trials made proved at the outset that the locomotive offered considerable advantages over other means of conveyance from an economical point of view, and the firm has already produced over 630 locomotives, aggregating 7000 h.p. As compared with steam motors, the advantages of the oil-driven locomotives are those of quick starting, attendance by one man only, no consumption of fuel when not running, no supervision of boilers, no risk of fire or explosion, no smoke nuisance, less dead weight to be carried than with steam locomotives, which require a large supply of coal and water, and, in combination with high efficiency, a small cost of upkeep, on account of economical consumption and the little attention needed.

Compared with the electric locomotive taking the current direct from overhead mains, the oil-driven locomotive secures independence of a central station; it is not subject to interruptions through absence of current; the first cost of the plant is considerably smaller, and there is no risk from contact with non-insulated overhead mains. Again, as compared with the electric locomotive driven by accumulators, time is not wasted in recharging, there is lighter weight, lower first cost, and less depreciation of important parts. For these reasons, the oil-engine locomotive has won for itself a definitely useful place in German mine practice.

The attention of mining engineers has, during the past year or two, been focussed largely on the relative merits of steam-driven and electric winders for collieries, but for capacities up to at least 20 h.p., the oil engine appears to have a good case. The illustration shows a 12-h.p. hoist driven by an oil engine at work underground, which was installed by the Royal Mining Administration of Germany, at Amberg, in Bavaria. The oil engine used is of the horizontal type in which an explosive mixture of liquid fuel and air is sucked through a conduit into the working cylinder on its suction stroke, the oil being introduced, intimately mixed with the air, in the form of a spray. At the end of the suction stroke, the valves are closed, the mixture is compressed on the return of the piston and ignited or expanded on the third or power stroke, the subsequent return motion scavenging the cylinder.

As the engine works on the Otto cycle, the cylinder is closed at one end only. Ignition is effected by means of a magneto. The drive from the engine to the winding drums or windless is effected through gearing, the engine and winder being mounted on an iron-frame bedplate, common to both.

Operations Consolidated by One Man

The spur-wheel transmission is seen in the figure, and note must be taken of the bevel gearing and rods and of a handwheel, which is fixed in the driving position, by the combined means of which the starting and reversing of the drums is effected through the medium of friction clutches. When these clutches are in their mid-position, both drums are free and at rest, the engine running light. A movement of the handwheel in either direction throws one or the other of the drums in gear. The brakes, which consist of a steel band passing around either drum as shown, are operated in this case, directly by foot pedal, although a handwheel and spindle may be utilized for the purpose. All the operations are under the control of one man, who need not move from his position either to attend to the engine or the winder. In some cases these gears have been fitted with the Koepe pulley, which is so often used in German mines.

It was at first conjectured that oil engines working underground would cause an offensive smell from the exhaust, but the waste gases in the Deutz machine are condensed so as to eliminate smell, and it is not found that any inconvenience is caused from this cause. For small underground haulages, either on the level or on gradients, these engines, from their self-contained character, appear to develop a new field of possibility which deserves careful attention, more especially as crude benzol or tar oil, petroleum, alcohol or gasolene can be utilized as fuel.

Coal Mine Inspectors and Their Appointment

In the various coal-mining States of America, it has frequently been urged, in the interest of safety and to make the inspectorate attractive to high-grade technical men, that the mine inspectors should be appointed in a manner similar to that used in Great Britain. In order that the question may be considered in its true bearing and from a point of view strictly uptodate, it may be appropriate to set forth the scheme of examination revised last month (September) by the Home Secretary with the advice of the Civil Service Commissioners.

The appointments are filled after a competitive examination, limited to candidates nominated by the Home Secretary. Applications for nomination should be accompanied by testimonials based upon personal knowledge of the candidate, indicating what experience he has had in mines, and giving information as to his character and fitness for the appointment. In their own interest candidates are particularly advised not to seek political or social influence, which will prejudice rather than assist their candidature.

In addition to the chief inspector and the electrical inspector, there are divisional inspectors (salary £750 to £1000); senior inspectors (£500 to £700); junior inspectors (£300 to £450). The divisional and senior inspectorships are filled by promotion, and vacancies for new appointments arise only in the ranks of the junior inspectors.

Every candidate must hold a first-class certificate under the Coal Mines Regulation Act, and must, within five years previous to his application, have been employed for two years as manager or under-manager of a coal mine or in some other responsible capacity, requiring regular attendance underground in a coal mine. Practical knowledge and experience of metalliferous mining and quarrying is also taken into consideration. Candidates must be between 23 and 35 years of age at the time of examination.

An inspector upon first appointment is subject to two years' probation. He must give his whole time to the official duties assigned to him. His tenure of office, increments of salary, promotion and pension, are dependent on good conduct and efficient service. Inspectors may be called upon to retire at 60 years of age, and retire in any case at 65.

Nature of the Examination

Already in possession of a first-class or colliery manager's certificate, the candidate is required to undergo examination in the following subjects:

English—Includes composition, the writing of reports and precise writing, but does not include indexing. Attention is paid to handwriting and spelling in this as in other subjects:

Elementary Mathematics—Will include arithmetic, algebra to quadratic equations, plane geometry, and plane trigonometry to the solution of triangles.

Elementary Geology—Outlines of physical geology, including the physical characters, chemical composition and description of rocks; elements of stratigraphy with special reference to the British isles; the construction and interpretation of geological maps and sections; the occurrence of coal, stone and metalliferous minerals. (In this subject there will be a laboratory test in addition to the written one.)

Coal Mining—Theoretical and practical; includes systems of sinking and working, methods of supporting roofs and sides, mechanical engineering as applied to coal mining, theory and practice of ventilation, surveying and making of plans, use of explosives, mine gases and their analysis, prevention of accident, rescue work, and the restoration of mines after explosions and fires. Mining hygiene.

Ore and Stone Mining—Theoretical and practical, including methods of sinking and working, methods of supporting excavations, mechanical engineering applied to ore and stone mining, ventilation of metalliferous mines, prevention of accidents. Ore dressing. Mining hygiene.

Electricity in Mines—Installation and use of electricity in mines, including the practical units of measurements and the use of simple measuring instruments; transmission and use of electricity by alternating and direct currents; the construction of cables and the jointing and testing of cables; earthing; the rules as to the use of electricity in mines and the prevention of accidents.

Law Relating to Mines and Quarries—Knowledge of the Coal Mines Regulation Acts, the Metalliferous Mines Regulation Acts, the Quarries Act, and the Rules and Orders made thereunder.

Oral Examination—Questions may be asked on coal mining, ore and stone mining and electricity.

Chemistry[1]—The principles of inorganic chemistry and the study of the occurrence, modes of preparation, and properties of the principal elements and their more important compounds. Questions may be given on the chemical principles involved in the commercial preparation of important inorganic substances. Elementary organic chemistry. (Also a laboratory test which will include the preparation and analysis of inorganic substances.)

Physics[1]—Will include heat, light, sound, electricity and theoretical and applied mechanics. (Also a laboratory test.)

[1]Chemistry and physics are optional: the applicant may take either one.

Anthracite and Bituminous Mining

By Eli T. Conner *

In the western-middle and southern anthracite coalfields, the inflow of surface water from extensive caving makes mining expensive. The coal of the southern field is friable and extensive briquetting may result. The third of a series of articles by Mr. Conner.

The Western-Middle anthracite-coal basin lies in Schuylkill, Columbia and Northumberland counties. It is 36 miles long, by four to five miles wide. For comparison with the deposits before described, there is incorporated a typical cross-section of this basin, from which it will be noted that the measures are distorted and the margins of the basin turned up so that the coal beds generally stand on steep pitches. This cross-section is taken from the second geological survey of Pennsylvania.

On account of the geological formation, the methods of attack, development and operation in this field are practically the same as in the Lehigh region, with such modifications as local variations have made necessary. Most of the older developments in this field were by slope on the coal bed from the outcrop, such as heretofore described, but on account of the cost of maintaining slopes in the Mammoth bed, there have been some notable departures from earlier developments by sinking shafts of large area and capacity at or near the center of the basin, and it is probable that future developments for the winning of the deeper lying coal must be by shaft.

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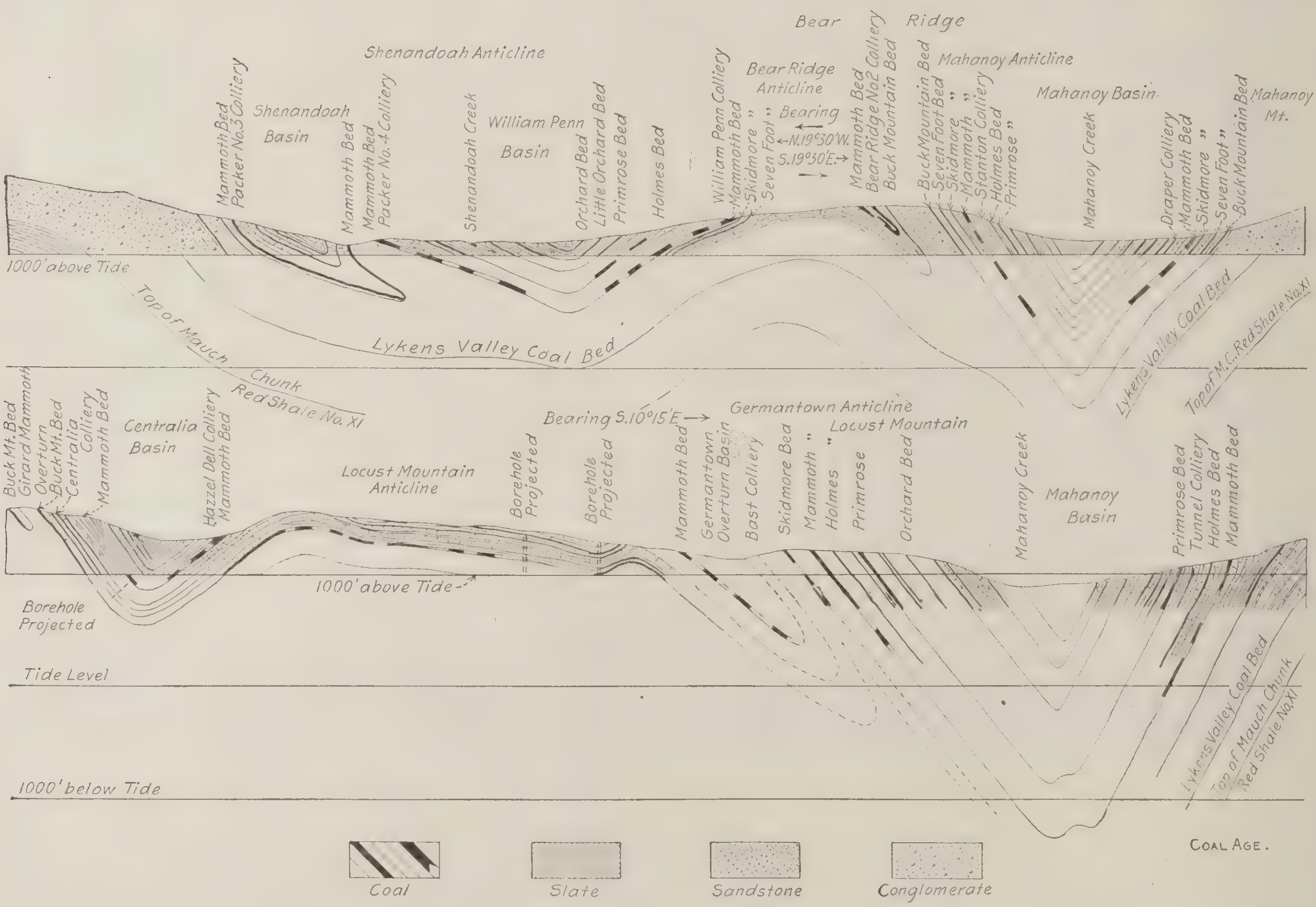
The Mammoth Bed Is in Many Splits

In the easterly half of this basin, the Mammoth seam is similar to the same seam in the Lehigh region, but west of Mt. Carmel, this great bed of coal is found split into three and sometimes into four distinct and separated beds, which vary in thickness from 4 to 12 ft. This splitting of the seam, I believe, is a decided advantage, for if the workings are properly projected, and care is exercised to columnize pillars, in the several beds of coal, a better average yield from a given area is attainable than where the Mammoth seam is found all together, in one bed, 30 to 50 ft. thick.

The mining methods in this field being quite similar to those of the Lehigh region, they need not be further described, but I would like, in this connection, to call attention to the excellent paper by D. Bunting, on "Chamber Pillars in Deep Anthracite Mines," Bull. Am. Institute Min. Engrs., September, 1911; p. 739.

In this region, as in the Lehigh, the difficulties of operation and the consequent cost have been greatly enhanced by reason of the enormous crop fall, caused by the mining in the Mammoth seam, and by the running of chambers through to the surface at the outcrop. These tremendous surface openings admit large quantities of water to the mine workings, during the wet season, and necessitate the installation of large pumping plants. There have been many instances of the drowning out of collieries in which large amounts of money were invested.



Cross-section Western-Middle Anthracite Coal Basin

Large Influxes of Water during Floods

A notable experience of this character was in December, 1885, and January,

1886, when there was a long period of excessive rainfall, following a heavy snow. At that time I was superintendent of the Harleigh colliery, two miles north of Hazleton. On account of the terrific floods nearly every colliery in the Lehigh region was drowned out in the lower levels, and Big Black creek, which has its source near Eckley, flowing westward over the center of the coal basin, became such a raging torrent that its banks were overflowed on the Harleigh property, and the whole stream flowed into a crop hole leading from a chamber in the Mammoth bed. At that point, the center of the basin is overlaid by a considerable depth of marl and sand, so that in a remarkably short time the stream had cut a channel 20 or 25 ft. deep, at the edge of the crop hole.

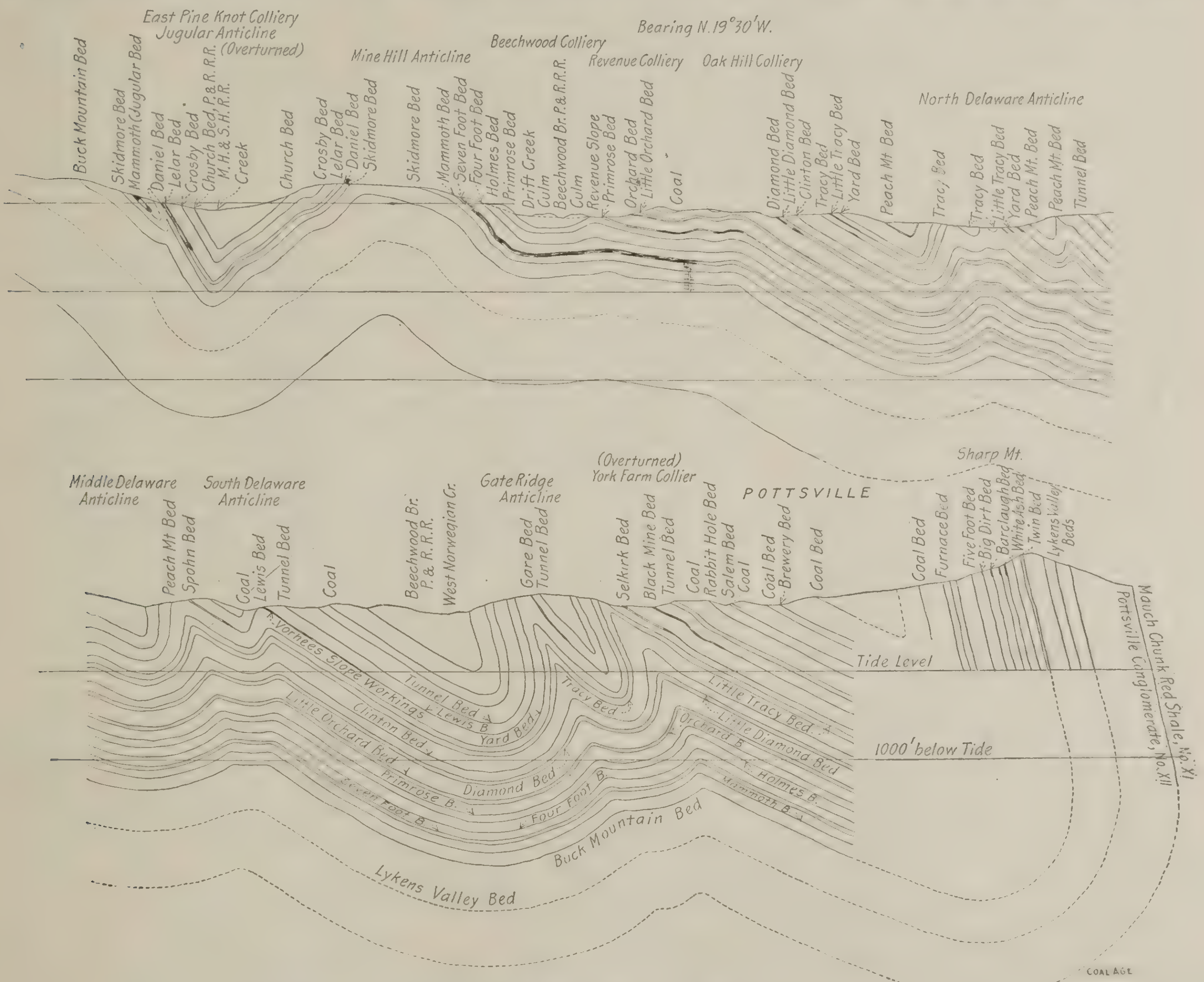
Strenuous efforts were made to direct the creek into a partially completed canal, constructed for the purpose of carrying this stream away from the coal basin, but before this was accomplished, the lower levels in Harleigh colliery and in Ebervale colliery, adjoining, which were connected by holes through the barrier pillar, were drowned. The continued rain in January caused a second break in the canal before mentioned, letting enough water into the mine to drown the pumps at both collieries. These two mines filled with water, and it was deemed impracticable to unwater them by ordinary methods.

The land owners and Messrs. G. B. Merkle & Co., operating the Jeddo collieries, who acquired possession of the property (Harleigh and Ebervale collieries), constructed from Conyngham valley a drainage tunnel about five miles in length, which tapped the workings in the Mammoth bed, near the basin on the Ebervale property. This tunnel has since furnished drainage outlet, not only for the two collieries originally drowned out, but also for the Jeddo collieries to the eastward.

Similar drainage projects have been completed at other points in these two coalfields, notably, at Beaver Meadow, by Coxe Bros. & Co.; at Centralia, by the Locust Mountain Coal and Iron Company and leasing landowners. Several others of lesser importance have been constructed. At the present time, a long and expensive drainage tunnel is in course of construction by the Lehigh Coal and Navigation Company, for drainage of its Panther Creek collieries.

Water Hoisting in Self-dumping Tanks

In the Western-Middle field, within recent years, several large shafts have been sunk by the Philadelphia & Reading Coal and Iron Company, the Lehigh Valley Coal Company, and mining companies under the control of the Pennsylvania railroad, for the sole purpose of handling water concentrated from several connected collieries. In these shafts, the water is hoisted in tanks by first-motion steam engines of large capacity located at the surface. This method of handling large volumes of water in the flood season presents advantages that strongly recommend it, under certain conditions, but detailed comparisons between the hoisting and pumping systems would be out of place here.



Cross-section of Southern Anthracite Coal Basin at Pottsville

(The lower section is a continuation of the upper)

It will be apparent from what has been said that the continued successful operation of collieries in these two fields means the investment of a large amount of capital, greatly in excess of what was necessary in the earlier days of the industry, when most of the operations in this field were developed by comparatively small companies and individual operators.

It is probably true that there are many collieries, which, considered purely as mining propositions, are unprofitable, and were it not for the freight profit accruing to the transportation companies controlling these collieries, they could not be continued in operation.

Elimination of Rock and Preparation of Coal

In the matter of preparation of the coal for market, after it has reached the surface; while the principles are the same in the southern field, as further north, the plant and equipment necessary differ materially. On account of the excessive pitch of the coal beds, most of the refuse in the seams of coal, together with roof rock that may fall, must be loaded into the mine car and brought outside. To handle this large quantity of rock, ample facilities must be provided at the head of the breaker. Recent new plants constructed by some of the large companies include a capacious head house provided with large platforms where preliminary separation of rock from coal can easily be accomplished, before sending the coal to the main breaker.

The Lehigh Coal and Navigation Company constructed a new breaker on these lines about two years ago, which has shown exceptionally good results and which is fully described in a paper prepared by the mechanical engineer of the company, Charles A. Straw, for publication in the transactions of the American Institute of Mining Engineers.

On account of the conditions described, and the manner in which the coal must be handled before it reaches the mine car, in these two fields, the average colliery produces much less prepared or domestic coal and a greater percentage of the low-priced steam sizes, than is produced in the Northern anthracite field, and consequently the average price realized for the total marketable product is lessened. In addition to this, by reason of what I have before said, there are many operations where from 40 to 50 per cent. of the raw product reaching the breaker is waste, either in the form of rock, slate, bone or culm.

It is obvious that it costs as much per ton to handle all this waste material as though it were a marketable product. All the cost of this refuse must naturally be charged against the going output. The conditions described largely account for the fact that the cost of production and consequently the operating profit in the Lehigh and Schuylkill regions cannot be as satisfactory as the average in the Northern anthracite field.

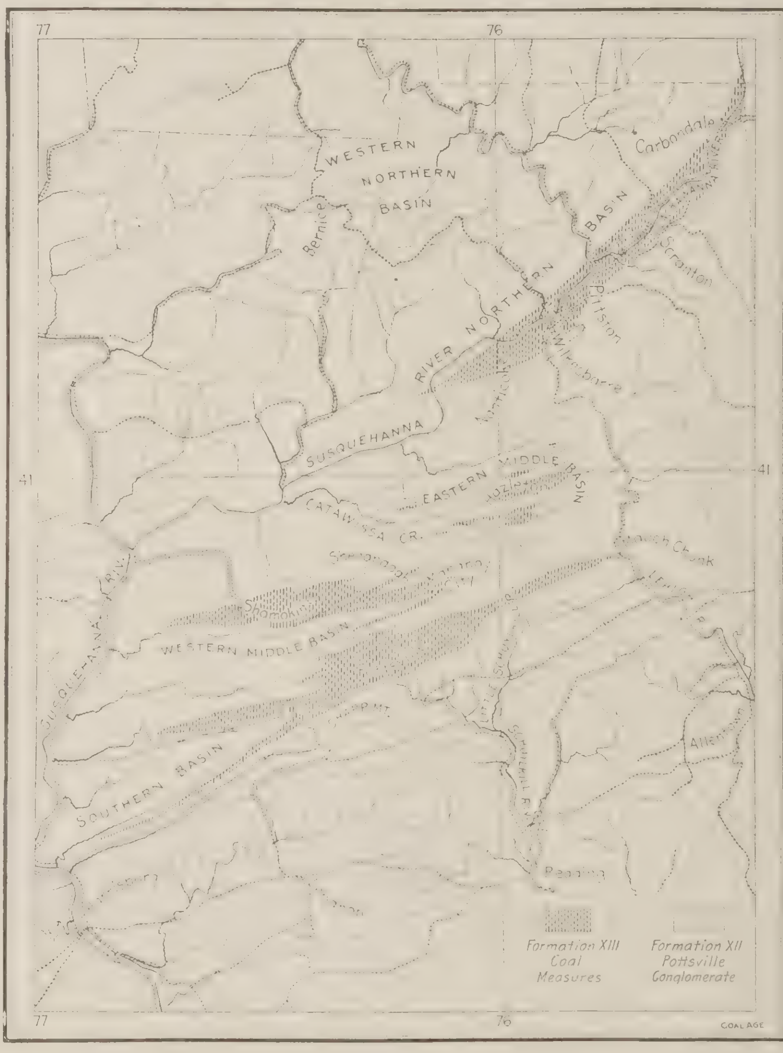
The Southern Anthracite Field

This is usually known as the Pottsville basin, and extends from Mauch Chunk, on the Lehigh river, nearly to Dauphin on the Susquehanna, a total length of about 70 miles, with a maximum width at the widest point of about seven miles. It consists of a number of connected basins, which increase in depth from north to south, culminating along the foot of Sharp mountain, in deep and greatly contorted measures, as will be noted from the cross-section herewith, which is taken from the second geological survey of the State of Pennsylvania. While this basin is usually termed the Schuylkill region, or Pottsville basin, the eastern end from Tamaqua to Mauch Chunk, controlled by the Lehigh Coal and Navigation Company, is generally classed as in the Lehigh region. The large number of coal beds underlying this basin and its great extent indicate an enormous quantity of untouched mineral. While it is true that there have been many developments made in this region, there is a larger reserve here relatively to its area, than in any other of the anthracite fields.

On account of the great distortion of the measures in this basin, it is frequently found that the coal is so crushed and soft as to produce in preparation an excessive amount of steam sizes, and culm waste, with a correspondingly small yield of prepared or domestic sizes. This is notably true at all of the collieries that have been developed under Sharp mountain. This condition has been the cause of the commercial failures of a large proportion of the operators who have made developments along the southerly side of the Pottsville basin, from Tamaqua westward.

The Eastern Part of Southern Field

East of Tamaqua, the character of the beds is somewhat better in regard to softness and friability of the coal. The same remarks, relative to the mine rock and refuse coming to the surface in the mine cars, apply in the major port of this field, as in the Western-Middle and the

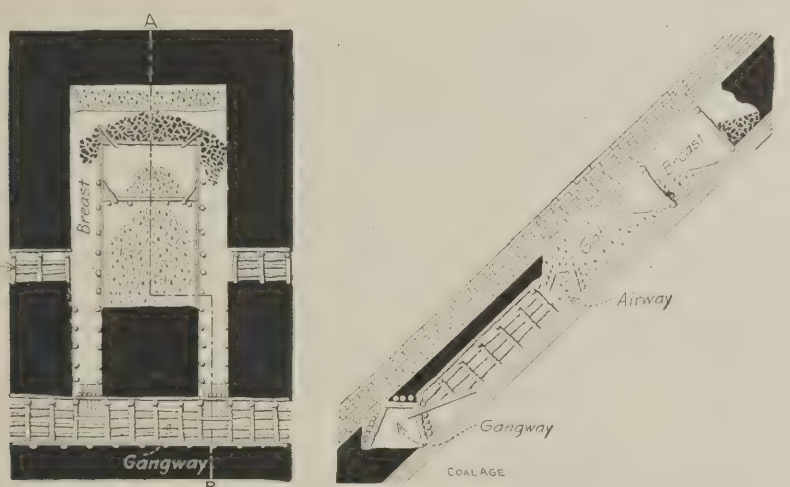


Map of Anthracite Coal Basins in Pennsylvania

Lehigh regions, but there is a larger percentage of culm in most instances, and consequently a lower yield of marketable sizes. Many operations in this field produce as low as 40 to 45 per cent. of domestic sizes, as compared with 55 and over in the two other fields and 65 and over in the Northern anthracite field.

It would appear then, that the only way to make profitable such operations as described, is either to secure a better average price for the output, or to find some means of converting the large amount of culm produced, into a marketable product.

To accomplish the latter, means must be found of burning dust in the form of a jet, which has been attempted by many people, but up to the present without marked success. Another solution will be found in briquetting the culm. This method has been perfected and two or three successful plants established, within recent years. The Lehigh Coal and Navigation Company has conducted extensive experiments, at Lansford, and recently completed a briquetting plant which is accomplishing good results. This plant is well described in an article by Charles Dorrance, Jr., which has been published by the American Institute of Mining Engineers.



METHOD OF WORKING PITCHING COAL WITH EXTRACTION OF REFUSE

BRIQUETTING COAL DUST IN ALBERTA

In connection with the subject of briquetting anthracite dust, I was privileged while professionally engaged by the Bankhead Mines, Ltd., of Bankhead, Alberta, to inspect thoroughly a briquetting plant which has been in service there for several years. This company has developed several beds of anthracite coal which, in geological condition, strongly resemble those found in the Pottsville basin. The coal is so soft that when prepared in a breaker, quite similar to those of the Pennsylvania anthracite regions, only about 22 per cent. can be recovered in sizes larger than chestnut, and only about 50 per cent. of the raw product of the mine will pass over a 3/32-in. round mesh, so that it will be seen that there is a large quantity of dust to be wasted. To utilize this material, and avoid the commercial failure of the proposition, a briquetting plant was installed, which, when I visited the operation, was producing about 500 tons per day, I was informed that some difficulty had been experienced in finding a market for the product, but these difficulties have been overcome, and all that can be produced is readily disposed of, at prices somewhat less than realized for prepared sizes of coal, but yet sufficient to make the briquetting plant a profitable operation, after paying to the mine $1 per ton for the dust, and bearing a cost of $1.75 per ton, of finished product, for the pitch used as a binder.

From these observations, I am convinced that such culm as is going to waste or being flushed into the mines in the anthracite fields of Pennsylvania, should be made into briquets now, or so deposited upon the surface, that it can in the future be utilized for this purpose. It would probably be impossible to find a market for all that could at present be produced, but as the culm banks deposited on the surface in the past are rapidly becoming exhausted, the market for briquets can, in all probability, be steadily developed.

SUBSTITUTION OF SAND FOR CULM

I think it is an economic mistake to flush culm into the mines where it cannot thereafter be recovered. The benefits of flushing for the recovery of pillar coal and the support of the overburden, should be secured by the use of other flushing material, as before mentioned.

In connection with the ultimate recovery of pillar coal, especially in basins where valuable improvements have been erected on the surface, and where it is found profitable to strip the outcrop of the coal beds, I think that instead of depositing the earth and rock at considerable expense on spoil banks, this material should be pulverized and flushed into the mine workings.

By this means, if properly deposited, the remaining pillars will be recoverable without serious rupture of the overlying strata, providing that as each pillar is extracted, the space from which it is removed is immediately filled with sand as has been customary with culm.

Water to Take the Place of Coal

INDIANA CORRESPONDENCE

A prediction that water power may come into extensive use in Indiana, to take the place of coal, is made by W. M. Tucker in the 35th annual report of the State geologist, which came from the printer recently. Mr. Tucker is engaged in a State survey of the water power derivable from rivers in the State of Indiana for the State Geologist Edward Barrett. He says that if fuels in Indiana and the country at large become exhausted as soon as it would appear from the rapidity with which they are disappearing, the lowlands along White river, the Wabash river and other streams will be condemned and used for storage basins from which water power will be developed for use throughout the State.

Mr. Tucker dilates on the problem of fuel supply in this and neighboring States, and shows how water power eventually may be necessary. He asserts that only about 10 per cent. of the water power of the State has been utilized by commerce.

ENORMOUS SAVING POSSIBLE

The State geologist asserts that if the State of Indiana could substitute steam-driven engines rated at 50,000 h.p. by water turbines of equal capacity, it would result in a saving of 500,000 tons of coal per year, in addition to a reduction of $12 for each horsepower saved by the substitution.

Water power is inexpensive and perpetual and requires less attention than any other power, when it is once installed. A proper development of the water power of Indiana would bring about several other important results. The navigation facilities would be greatly increased; the increased storage would tend to purify the streams and the reservation of water in the storage basins would tend to lessen the damage wrought by floods. The three problems—water power, navigation and protection from floods—are closely related. The great problem in each case is to bring about a regular stream flow. Immense reservoirs could be constructed in Indiana, and the water utilized for power, thus saving a large tonnage of coal each year.

Electrical Details at W. Va. Plant

By Henry D. Jackson*

> *The motor described was devised for driving a mine ventilating fan from a high voltage power circuit. Interesting features of the wiring installation at the plant of the McKell Coal Company are also described.*

Recent additions to the electrical equipment of the McKell Coal and Coke Company, Glen Jean, W. Va., are two new substations and an electrically driven fan. One of the substations, that at Tamroy, is similar in general construction and equipment to the previous installation.

At Kilsyth is an underground substation in the Kilsyth mine, about a mile and a quarter in on the main entry, and approximately 350 ft. underground. The high-tension lines to this substation are carried overhead to a shelter which is shown in Fig. 1. At this point a 6-in. hole was bored directly down into the airway just outside the substation. This bore hole was then fitted with an iron pipe approximately 3 in. in diameter, through which the cable was lowered. The interesting feature of this installation is the simple method employed for supporting the cable.

There were no means of supporting the cable in the pipe, and it was deemed necessary to arrange it so that it could be readily withdrawn at any time. The cable consists of a 10,000-volt, three-conductor No. 4 stranded wire, insulated with varnished cambric covered with lead 5/32 in. in thickness, and armored with No. 4 gage galvanized wire, the whole weighing 266 lb. per 100 ft. To support the cable, an iron ring made of metal 1 in. in diameter was slipped over the armor, the armor then bent over this ring, firmly wrapped about the cable and tied so as to form an annular branch near its end, and thus support the weight entirely by the armor.

The cable was then threaded through a hole in a steel plate 6x18x2 in. in dimensions, the hole being approximately 2½ in. in diameter, and large enough to allow the cable and the wrapping after it has gone around the ring, to fit snugly into it, so that the entire weight of the cable is carried by this steel plate, which in turn rests upon a concrete pier, as shown in Fig. 1. This enables the entire cable to be easily supported and readily removed.

At the top of this conductor, are installed the lightning arresters and choke coils to protect it and the machinery in the substation underneath. The method of bringing in the high-tension wires is more distinctly shown in Fig. 2, which is the layout for the wiring and the motor foundations at the fan, the second item of interest.

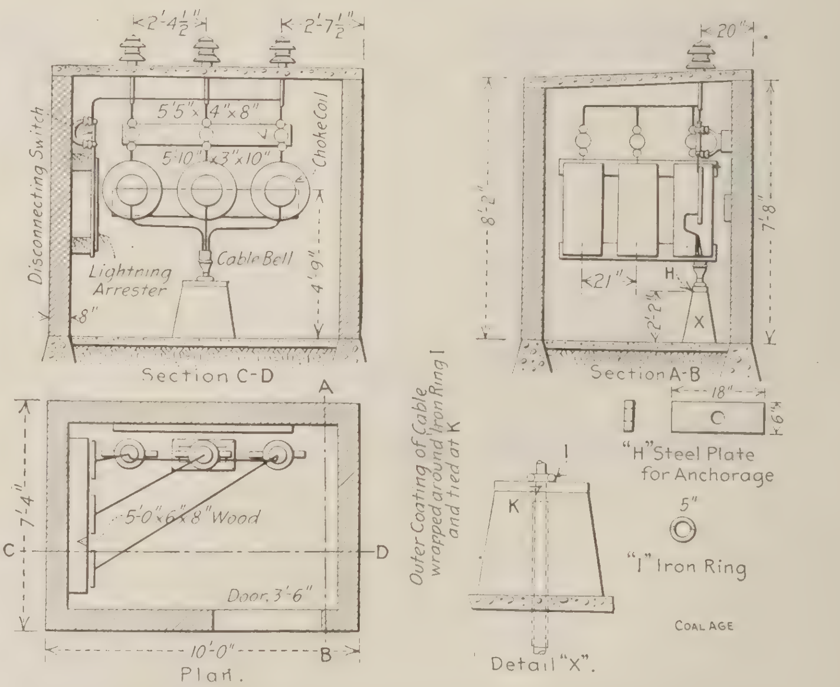


Fig. 1. Shelter over Bore Hole and Details of Support for Hanging Cable

The Fan Installation

The fan installation is of interest, because of the use of a special type of motor, and also possibly because of the use of a chain drive. When the question of the installation of this fan came up, it was carefully considered whether it would be advisable to use an induction motor of sufficient capacity to handle the fan during the early stages of the mine development, and increase the size of the motor as the development of the mine necessitated; or put in a motor which would be capable of handling the fan at its maximum capacity, varying the speed of the fan as conditions required, by means of changing pulleys.

The conditions at the plant were such that the power factor of the system as a whole was low, and it therefore seemed wise, if possible, to install a synchronous motor of a capacity equal to the capacity of the fan, utilizing the excess capacity of the motor during the early stages of the mine's development as a condenser, and thus raise the power factor of the entire system, improve the regulation and incidentally, a very important item however, obviate any necessity for installing an additional engine and generator in the main power plant, as the low power factor and the addition of the two new substations and the proposed fan would bring the current load on the generator considerably over its rating although the load on the engine was by no means up to its capacity.

The ordinary synchronous motor has a very slight starting torque, only sufficient to start itself without load, and owing to the generally severe operating conditions in coal mines where the employees are by no means well trained or careful, it was deemed unwise to use a clutch between motor and fan, as there would be always a possibility of wrecking the clutch or stopping the motor by too sudden application. This consideration, then, required a permanent connection between fan and motor, and made it imperative that the motor should be capable of starting the fan and bringing itself up to synchronous speed, thus requiring a type of motor which up to this time had not been successfully built.

It was quite possible to reduce the total load on the fan motor when starting, to approximately 75 per cent. of its full load power, by means of closing the inlet and outlet doors of the fan; but even this load was far beyond the capacity of any previously built self-starting synchronous motor. Further, the conditions of the installation were such that it was necessary to limit the starting

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current on the motor to not over 2½ times normal current at full load. This in itself is a condition which is rarely attained in the best designed types of induction motors.

It required a great deal of correspondence, much urging and a number of interviews with the salesmen of the electrical manufacturers, to convince them that such a motor could be built, we feeling that there was no good reason why a combination motor could not be built which would have the characteristics of a high-resistance rotor induction motor, and a synchronous motor in one machine. The alternating-current side of the machine could be the same as for a synchronous motor, and the two windings, those of the induction motor and the field windings of a rotary field synchronous motor, placed upon the same shaft. Further, we felt that the marked poles of the synchronous motor field would act as anchor points, as it were, to hold the synchronous motor in synchronism at intervals during the rotation of the rotor, while acting as an induction motor.

A Unique Type of Machine

Two companies only would bid upon the work, these being the General Electric Company and the Westinghouse Company. The contract was awarded the Westinghouse Company, who built the motor shown in the illustrations, Figs. 3 and 4, it being a 250-h.p., 25-cycle, 6300-volt, 500-r.p.m. machine, provided with induction motor windings on the rotor, for starting.

The motor is started by means of two switches; the main-line switch when thrown upward connects the motor to half-voltage taps from the auto transformers; when the machine reaches full speed at this voltage, the second switch is opened, throwing an inductance in series with the machine. The first switch is then thrown down, sending the full line voltage on to the machine with the inductance in series, these inductances preventing a great rise in the current. When the motor reaches full speed under these conditions, the second switch is closed, short-circuiting the inductance, and leaving the machine on full voltage. The field rheostat is then adjusted to the excitation desired, and the machine automatically locks in step or synchronism.

During the test at the Westinghouse works, this motor pulled 95 per cent. of its full-load rating into synchronism, and the instantaneous current rise was less that 2½ times normal full load running current. It is to be noted that this test at the Westinghouse works was somewhat less severe than would be the condition under actual operation, as the test load was a direct-current generator, the current from which was carried through a fixed resistance, so that the load came on as the square of the speed. Under the conditions of operation, that of driving a fan, the load would come on as the cube of the speed.

The installation of this motor proved very satisfactory. The power factor was raised approximately 30 per cent., bringing the total load on the main plant considerably under the generator's rating and improving the operating conditions to a marked extent.

Owing to the limited space at the location of the fan, a belt drive was out of the question; and the idea of gears was eliminated on account of the noise, so that a chain drive was installed for the work. The final installation will require a chain 16 in. in width, and a speed of the fan of 210 r.p.m. The present installation uses a chain 4 in. in width and a fan speed of approximately 50 r.p.m., the power being approximately 30 kilowatts.

Under these conditions, if an induction motor had been used, the power factor of the system would have been approximately 55 per cent. At present, the power factor is between 85 and 90 per cent.

The success of this motor has led to the building of a large number of motors of similar character by both the Westinghouse and the General Electric companies for work of a similar nature. It is a type of motor exceedingly well adapted to coal-mining installations, inasmuch as it

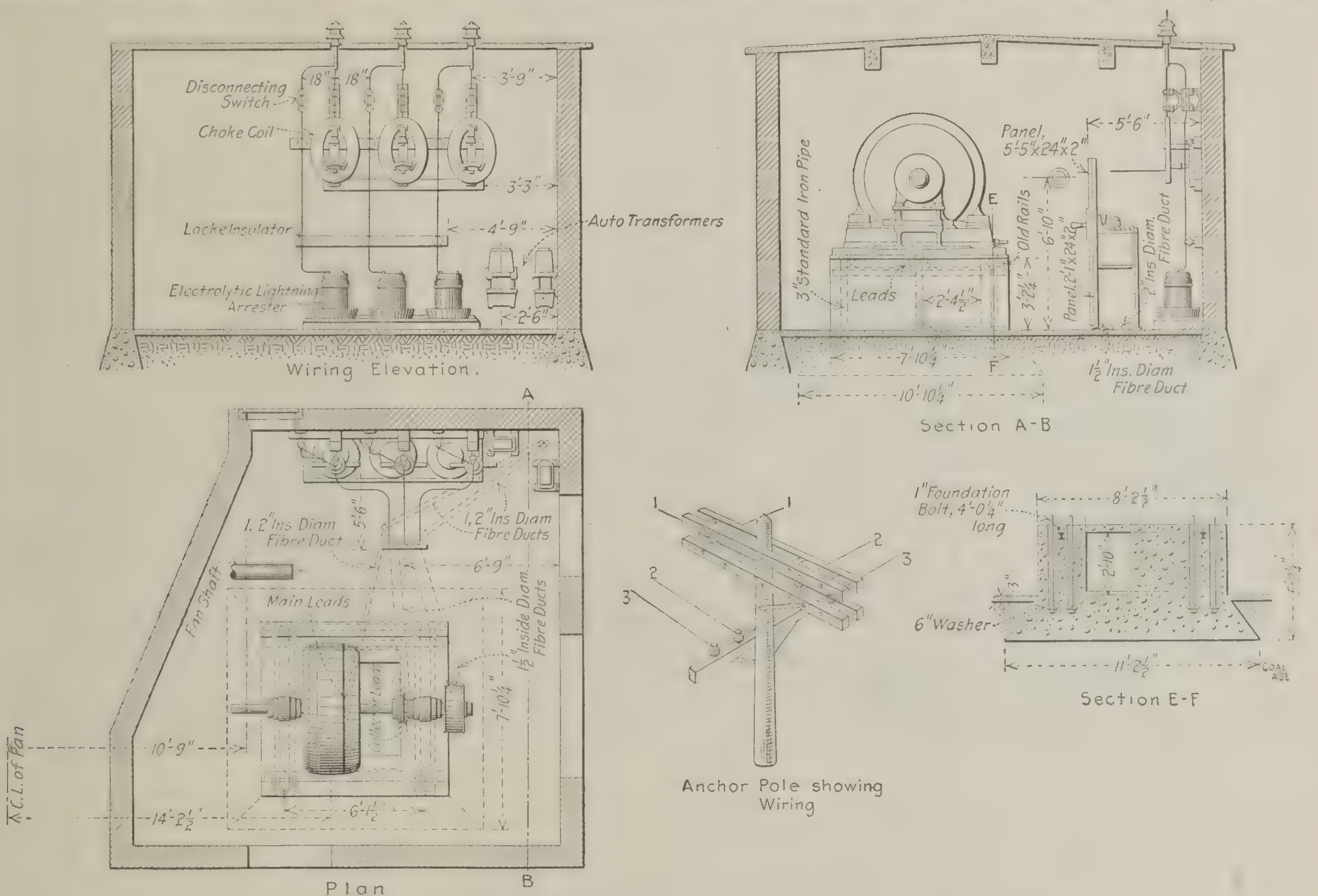

Fig. 2. Motor Room of Fan House, Showing Wiring Details

entirely obviates the necessity for clutches, and allows of the power factor on the alternating current circuit being kept high and the regulation of the system made good, a condition of affairs which cannot be accomplished where induction motors are used entirely, unless the motors are loaded to their full capacity.

It is well known that a motor of this type is likely to give more or less trouble in case of an accident to the prime mover or a short circuit on the line, owing to the fact that the inertia of the air in the mine and the inertia of the fan will keep the motor moving, and the motor, because of its exciter, will then act as a generator, turning back power into the line and supplying current to apparatus which the generator originally supplied before its circuit breaker opened. This sudden reversal from motor to generator may pull the motor off its foundation, unless means are taken to prevent such an occurrence. In the present installation this is accomplished by means of a reverse current relay, which, immediately upon reversal of the direction of current in the line, opens the switches and cuts the motor off the line.

Method of Bringing Wires into Motor House

It may be of interest to note the method of bringing in the high tension wires to this motor. This is shown quite distinctly in Fig. 2. The main wires are brought to a dead end at an anchor pole, and then are dropped to the insulators, which are cemented into the concrete roof of the fan house. These insulators are of the strain type, and therefore have a hole directly down through the center. The top of this hole is covered by means of a brass cap, which weighs approximately 3 lb. The wires are brought directly to this cap. A solid brass rod is screwed into the bottom of the cap and extends down through the hole in the insulator. This rod is fastened to a three-way connector, as shown in the drawing. In order to increase the sparking distance, this rod is covered by a porcelain tube, which extends well up into the hole in the insulator. This method of installation has proved very satisfactory, and allows the wires to be brought in without the necessity of open places, which would allow birds and insects to fly in and out of the substation and motor-house.

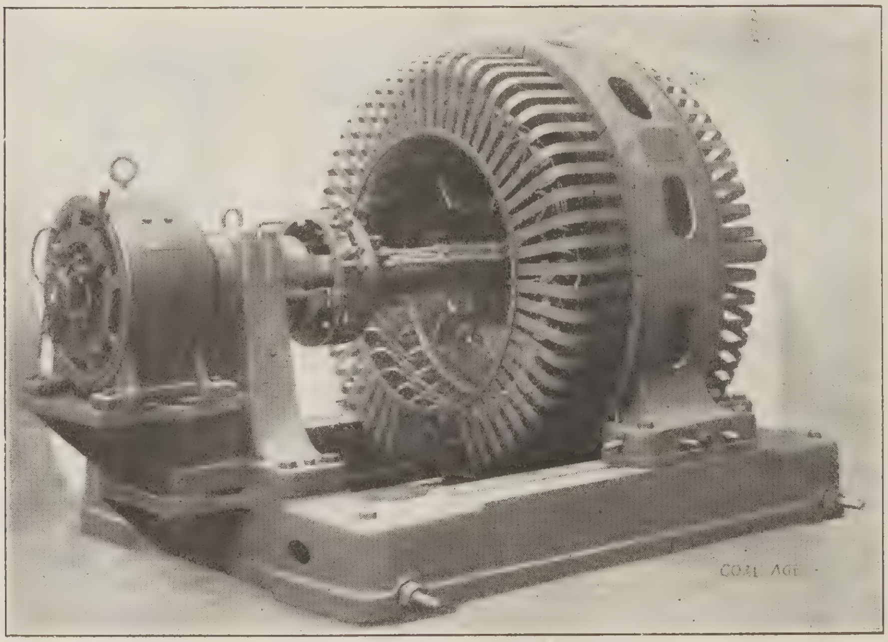

Fig. 3. Self-starting Synchronous Motor at McKell Plant

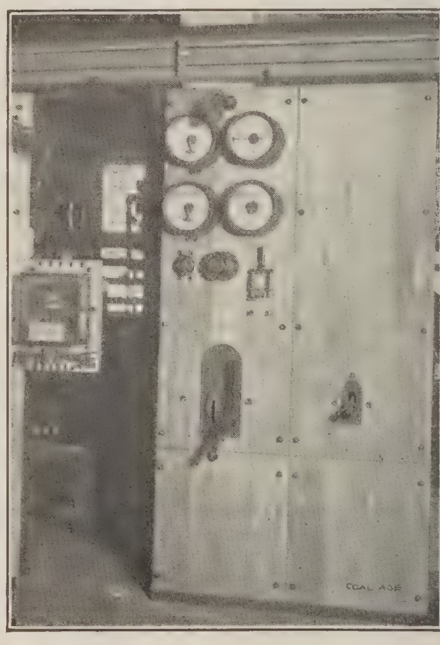

Fig. 4. Switchboard, McKell Coal Co.

Exhaust Steam Turbines

The recovery of power from exhaust steam, by means of exhaust-steam turbines or mixed-pressure turbines is a subject which has come prominently forward during the past few years. The success which has attended the introduction of such turbines into various manufacturing and other industrial plants has led to their recent installation in connection with a group of English collieries.

Heretofore engineering effort in connection with extracting the energy from exhaust steam has been directed chiefly toward the use of condensers and feed-water heaters. The application of these to engines having rapidly fluctuating and intermittent loads has often been attended by marked difficulties, and as a result, the majority of colliery hoisting engines and large haulage engines are still exhausting into the air.

The scheme of the English installation referred to was based on an existent grouping of eight pit centers or mine openings within an area consistent with electrical distribution. At three of these centers were large hoisting engines having possibly 500 kw. in exhaust steam going to waste, and the conversion of this into electrical energy for distribution among members of the group, and thereby eliminating small isolated boiler plants, was the object sought.

It is claimed in this connection that even were the application of condensers to hoisting engines a comparatively easy and commercially safe matter, the turbine would still possess decided advantages as an extractor of power from exhaust steam.

Two Constituent Compounds in Coal

Recent experiments by M. J. Burgess and R. V. Wheeler, regarding the volatile constituents of coal, lead the experimenters to believe that coal can be separated mechanically into two distinct substances, and they hope to compare the results of destructive distillation of these substances, as regards both their liquid and gaseous products, with those produced by the action of heat on cellulose and its derivatives, because they feel justified in assuming that one type of compound in coal is a degradation product of cellulose.

Their experiments have already shown that two more or less distinct compounds exist in coal; one decomposes easily at a comparatively low temperature and yields the paraffin hydrocarbons; the other more stable compound is found to decompose rapidly at a temperature between 700 and 800 deg. C., and yields principally hydrogen, together, possibly, with oxides of carbon. The latter and more important compound they hope to identify as cellulose or one of its derivatives.

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This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

Fireproof Breakers

That anthracite breakers should be of fireproof construction if at all compatible with the expected life of the colliery, is a conclusion which has been definitely reached, to judge from the best of the recently completed and proposed new construction.

Over 20 years ago, Eckley B. Coxe built the Drifton breaker of cast and rolled metal throughout. In recent years the Reading, the Delaware, Lackawana & Western, the Erie and the Lehigh Valley companies have all erected breakers of fireproof or partially fireproof construction. The only valid objection is expense. Whether or not the additional cost is justified is a matter that must usually be worked out for each case on its individual merits; however, for new plants which have an expected life of 20 years or more, fireproof construction should be preferred.

Opinions differ considerably, however, as to whether steel, reinforced concrete, or a combination of concrete incasing steel members is the best medium for securing this result. Of structural steel it may be said that it is a well known quantity. Those familiar with its use can proportion a framework to its loading with an accuracy which practically eliminates that waste of material so often met with in heavy timber construction. It makes possible a light, strong frame which takes up a much smaller proportion of the housed-in space than either concrete or timber, and while not so elastic as timber, it is immensely more so than concrete.

On the other hand a steel frame has comparatively little mass, and unless given ample weight and a liberal supply of diagonal bracing, is liable to be seriously affected by vibrating machinery of the kind found in most breakers. In this connection, however, it may be remarked that much can yet be done toward reducing vibration by the proper balancing of the machinery. Some apprehension must also be had in regard to effectively protecting steel against the action of acid water. Certain special paints have given good results in this respect, but they must, of course, be frequently applied and the structure designed with this fact in view.

Reinforced concrete is a quantity not quite so well known as steel, and for a structure built along the lines of the usual wooden breaker, it is likely to prove exceedingly expensive. Some of the advantages of this type of construction are those which pertain to a rigid monolithic structure of sufficient mass to absorb the shock and vibration brought to it from the supported machinery, but unless so designed as to unquestionably secure this result, the outcome seems to have a rather dubious aspect.

Another advantage of concrete construction is its great durabiliy and consequent low cost for repairs. On this score, as with steel, apprehension need only be had regarding the effect of the acid water. Ordinary concrete is easily permeated and itself more or less disintegrated by such water, and the danger consequent upon acid attacking the inclosed steel is immensely increased by the fact that it cannot be kept under observation. There are on the market certain waterproofing compounds which may be able to give adequate protection in this respect at a price which is not prohibitive, and others are likely to develop, but so far the effectiveness of none has been finally demonstrated under the conditions which obtain in most breakers.

In regard to a steel framework protected by incasing with concrete, it may be said to offer an admirable and conservative, albeit expensive, type of construction, in which the known strength and reliability of steel is combined with the mass and durability of concrete. But unless the fact is indubitably established that the inclosing concrete will effectually protect the steel against the possible inroads of acid water, this type of construction should scarcely be considered for wet breakers.

On the whole these several types of fireproof construction all have their spe-

cial advantages, as has also that of heavy timber, the prevailing type at present in breaker construction. One thing obviously to be avoided in the design of new work is coming to an unalterable decision upon any one certain type of construction, and then merely for the sake of building something "all steel" or "all concrete," as the case may be, sticking to it even to the extent of using such construction in places for which it is absolutely or comparatively unsuited.

Concrete has its field in this work apparently close to the ground, where massive construction is easily possible and particularly desirable. Steel is admirably suited for the superstructure, and there are numerous places where nothing will do quite so well as a few sticks of timber or a plank flooring. In short it would seem that the desired end of a suitable breaker structure of fireproof character will best be attained by combining these various materials of construction in such way that each will constitute that part of the completed building to which it is peculiarly adapted.

Limitations of Shaft Output

The constant demand for greater outputs from shafts is met with a blunt *non-possumus*. While 4000 tons is frequently reached from easy slope- and drift-openings, such a tonnage is well-nigh impossible from a shaft. When a large output is desired, two or more hoisting shafts must be sunk and even then such tonnages as have been mentioned are difficult to obtain. The cars must be increased in size and two cars must be caged end for end. There are obvious objections to both these methods of circumventing the dilemma. Large cars demand large and high roadways and wide gage. Two cars set tandem, if not of equal weight, are said to put the cage so appreciably out of balance that it crowds the guides. Decking the cage involves stoppages which are undesirable in deep shafts and which render decking useless in shallow ones.

The tendency in mine haulage is toward the endless rope, traveling continuously in one direction. Slow speeds are possible with large tonnage where the haulage is not reciprocating because the outward flow of coal is not obstructed by the inward travel of empties.

But it is in shafts that reciprocation reaches its limit. Each car or pair of cars must be caged, the signal be given to raise, maximum speed be reached and almost immediately reduced. Then the cars must be landed and empty cars caged or else the cage must stop the length of time necessary for self-dumping, however short that may be. The reciprocation involves engines of great power acting only a small percentage of a full day and wasting much available energy in brake friction.

We may never see the abolishment of cages in shafts where coal is fragile and the market disposed to call for large lumps. But with the increasing sale for small sizes, there may well be a time when the demand may come to produce coal regardless of dimension. Even now small coal is preferred where it is produced for coking purposes, and in at least one field, the size of the fuel is not regarded as affecting its sale.

It is possible, then, that in a few years, we may see conveyer lines raising continuously up a shaft, buckets, skips, or even whole cars of coal, and dumping them automatically. It is easy to point out difficulties. There never was an innovation which did not involve them. But modern progress in conveying machinery will hardly fail at some time to solve these problems. There is still too much uncertainty in conveyer machines, especially in places where they are subject to corrosion from mine air, mine water and atmospheric moisture.

Furthermore, the weight of the coal to be kept in motion will be considerable and will furnish some difficulties. But the chief difficulty is to be found in the weight of the lengthy conveyer chains or ropes, yet even this is not insuperable. A German inventor by the name of Schwidtal in Silesia, has patented the interposition of sprocket-wheels in between the head and foot sprockets of a conveyer drive. These sprockets actuated by separate motors would serve to relieve the links and sprocket teeth from any weight except that of the chain, the buckets and bucket loads between one sprocket and the next below.

Coal Land Laws

No single detail of the coal-mining industry has received the national attention given the formation of adequate coal-land laws. The unfortunate Alaskan episode, together with Mr. Roosevelt's promulgation of an active conservation policy, has brought this topic home to all coal men generally.

The hue and cry is for laws favorable to the "poor prospector," and the exclusion of corporate interests. Few people appreciate the fact that in the West, as a rule, only the largest corporations are in the coal business—and these companies only because they are forced into it. The large railroads and metal-mining corporations are compelled to maintain their coal departments for the reason that there is not sufficient coal in the open market to meet their requirements. A cursory examination of a list of Western coal operators will show that only a small percentage of coal is mined by interests not connected either directly or indirectly with the large corporations. The obvious conclusion is that Western coal mines have not, as a rule, proved to be a profitable investment. To one familiar with the Cretaceous coals, also the geology and the topography of some of the Rocky Mountain States, this needs no explanation.

A law to be effective to the interests of the man of moderate means must be something on the order of the leasing system. To acquire a section of land at, say, $50 per acre (an average or even low price for land available to transportation facilities) requires an almost immediate expenditure of $32,000, not to mention the cost of prospecting and developing. Under these conditions the ordinary prospector must immediately enlist the aid of capital, thereby sacrificing a large share of his interest.

More Daylight

It is said that a sailor will build himself a house like a ship's cabin, but it would probably be considerably overshooting the mark to suggest that the coal-mining fraternity build their surface structures in simulation of conditions below-ground. Nevertheless, there are certainly some breakers, dark enough, dirty, damp and devious enough to give body to the idea, and nearly all colliery buildings suffer to some extent from the lack of light and space.

It is well to remember that daylight is usually about the cheapest thing that can be put into a building and has a wonderful earning power. Space, it is true, is likely to be expensive, but so is the necessity for having men climb, crawl, duck and dodge about their work instead of going easily, directly and confidently.

COLLIERY NOTES and COMMENTS

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

English authorities are inclined to favor a stoppage of the fan after an explosion, so that poisonous gases are not spread through the mine.

Explosives should not be taken into the mine in a frozen condition as they are then very susceptible to shock and require extra care in handling.

A long exposure to humid conditions, it has been found, renders coal dust moist and inert, but the presence of moisture in the air at the moment of explosion is not sufficient to prevent an explosion; that is, not enough moisture is carried by the mine air to reduce materially the temperature of the flame.

It has been ascertained that fuses having a normal rate of burning of 27 sec. per ft. may, under the influence of pressure alone, burn as fast as 8 sec. per ft. On the other hand, conditions of temperature may cause it to burn as slowly as 70 sec. per ft. It is suggested that accidents may arise owing to the liability of explosives to exude nitroglycerin from cartridges.

The advantages of the endless-rope method of haulage are regularity of delivery and low speed. This latter need not exceed 2 to 2½ mi. per hour, which means fewer runaway cars and other accidents, reduced cost in wear and tear on the road bed, longer life of the rope (four times that in main and tail haulages), and not so much power required because the empties can be run in by gravity.

Pine and red or black oak commonly used in mines, each have their own destructive fungi. *Fomes .annosus* .attacks pines and *Polystiaus versicolor* is confined to the oaks. The germs may enter the timber before or after cutting, but usually decay is contracted in the mines from nearby decayed timbering; hence the importance of removing timber as soon as it shows signs of decay.

When it is desired to secure an approximate idea of the movement or velocity of an air current that appears almost stagnant, and if an anemometer is unavailable for immediate use, a heavy rag, or a piece of brattice cloth charged with dust will prove a ready means of making the test. A rap of the hand on the rag or cloth will raise a cloud of dust which the air current will carry away, allowing the observer to form an estimate of the velocity.

The fumes from colliery waste banks may constitute a danger to the crops of surrounding farms and fields. For instance, the fumes from a waste bank, in Yorkshire, were blown on to a field of turnips. The effect of the fumes was to cause sulphuric acid to settle on the ground, kill the bacteria in the soil and stop the growth of the crops. The crop of turnips was short by ten tons and the farmer sued the colliery company, which was fined and made to pay costs.

At the Whitburn colliery, in Durham county, the mine ponies are fed with a mixture of 35 per cent. chopped hay, 29 per cent. crushed oats, 27 per cent. crushed maize and 9 per cent. crushed beans. At the week end they have occasional bran mashes. Each stableboss looks after an average of 15 ponies, and each pony is provided with a separate set of harness. During the week, a stableboss is on duty in the stables during practically the whole of the 24 hours.

The only absolute cure for what is known as the "clinkering" of a poor coal is said to be low-temperature combustion. This clinkering is due to the presence of calcium, iron and sulphur. It has not been definitely ascertained in what proportion these elements may be present without causing clinkering, but Brost's formula is generally applied, namely, the fusion temperature rises as the alumina increases, and falls with the increase of the other elements, but it cannot be relied upon for any particular ash.

The native miner in India is usually accompanied by his wife, who conveys the coal from the working place to the main road where the cars are kept. The man cuts the coal and the woman carries it out in a basket on her head. The Hindoo will not work in a mine where he cannot stand straight up with a basket on his head. Some of the seams in the Iharia district are 30 ft. thick, and in the average working day a man and his wife will fill two cars. The rate of pay is from 10 to 12c. per car, and a man can keep his wife and family on about one-third of his earnings.

Nystagmus is a disease common among miners. It is claimed that it is much increased with the increased use of safety lamps. The miners put this forward as an argument against the use of the safety lamps, maintaining that these should never be used while it is possible to so thoroughly ventilate the mines that naked lamps can be employed without danger of explosions. This indicates one of the difficulties which have to be contended with in introducing safety appliances in the mines. In some cases, English miners are paid from 2 to 4c. a ton more when they use safety lamps.

Speaking from a practical point of view, R. R. Smith considers that its excessive speed is an objection to the turbine pump in collieries, especially in the event of a breakdown occurring. Makers claim that a turbine pump cannot break down, but motors can, and it is very necessary to be in a position to put on another motor quickly. Motors, however, are not often made for the higher speeds of from 1500 to 2000 r.p.m., and he, therefore, considers that gearing or a belt drive should be arranged so as to allow of a low-speed motor being used.

A memorandum of the Manchester Steam Users' Association explains that dense smoke indicates either that a boiler is overworked, that the draft is insufficient, or that the stoking is badly done. Light smoke indicates efficient stoking. With poor draft the fires should be kept thin and level by firing frequently and at one side of the grate at a time. If necessary, keep the air grids in the fire doors slightly open just after coaling, but a continuous admission of much air is wasteful; it spoils the draft and merely dilutes the smoke. When low water is discovered, cool the furnace plates from both sides as quickly as possible.

The average life of a pony underground varies a good deal. At the Harton collieries, in Durham county, it is slightly over six years, but in many cases the actual working life is very considerably more. The general manager of these collieries says that ponies under four years old are not sent underground. Recently three ponies were drawn out of these pits, which had been at work below ground for 15, 17 and 22 years, respectively. The one which had been at work 22 years was still fit and fresh and had both his eyes, but he was getting a bit stiff. To the foregoing we may add that in July at the New Hawne colliery, Worcestershire, a pit pony died which had worked in coal mines for 40 years, during 12 of which it never saw daylight.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

Working Coal in Dips

In a certain butt heading there is a continuous dip from the top of the hill at *A* to the bottom of a small basin at *B*. The dip to the basin is so steep and the measures are so saturated with water, that from the top of the hill to the center line of the basin, the rooms when started would have to be widened to the left. The roof is very weak. How should the coal be worked so as to provide for adequate drainage for the rooms and for the safety of the men in drawing pillars? It is assumed that the ordinary room-and-pillar system has been adopted up to the point marked *A*.

MINE FOREMAN.

It is assumed that, as the roof is weak, a break can be secured anywhere so that it is not necessary to carry on the break obtained in the first rooms of the heading. It is permissible, therefore, to lay plans to obtain a new break in rooms near the dip. The rooms should be marked off, on the heading rib from the last already turned to the end of the heading. The first of these rooms so marked off should be set at the regulation distance, plus the standard widening of a room, added to 10 ft., so as to permit of a reversal in the widening of that room and an increase of pillar width in order that a skip may be taken off one side of it. All the other rooms down to the dip should be regularly spaced, but in the bottom of the basin the width between two of the rooms should be reduced by the amount of widening of one room.

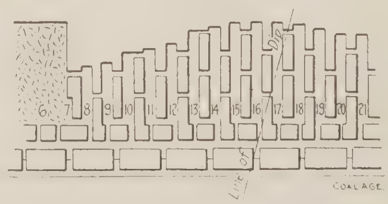
The rooms should be started first at the bottom of the dip and in due order other rooms should be opened to the left and right of the same. Those to the left of the dip should be widened to the left; those to the right should be widened in like manner to the right. It is assumed that the roof in the first section has already broken down. When the last room in the dip section on the left, marked for recognition as Room 8, is driven half way up, a track should be laid through a crosscut to the next room (Room 7), and a skip taken off the side of that room all the way up to the face.

The accompanying illustration shows the status of the working, when the skip is just commenced.

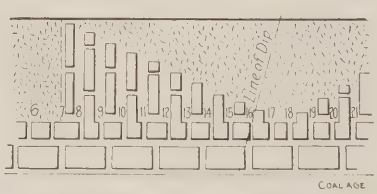
The pillars of the rooms at the bottom of the dip should be first attacked, following with those to the right and left. The order of progress in starting and drawing the room pillars should be a continuous recession from the center of the dip. The room made out of the skip off Room 7 should be drawn back when its turn comes. The figure following illustrates the manner in which the pillar drawing should proceed.

This method of work only satisfies mining conditions where the roof is weak. If the rooms up to and including No. 7 had not caved well, the skip could not be taken with any safety, for it would be involved in the ultimate fall of the first seven rooms. If, again, a large area was being upheld, because fracture did not occur, it would be wrong to attempt to try to create another fracture at Room 7, because the pillars between rooms 7, 8 and 9 would probably be lost, if more were not involved. As a general rule, where the roof is good, it is not well to arrange to use such strategy that pillars have to be drawn between two falls. Moreover, where the roof is sound and gives plenty of warning of its caving, some variance from accepted method can be safely permitted. It is customary in strong roofs to drive rooms 40 to 50 ft. wide, with a road on each side. The miner, who is removing the coal on the side nearest the fall, whether that fall be actual or anticipated, is situated in what would be considered a very perilous position, were the roof weak. On the other hand, if the roof be weak, especially if it be also broken, the system set forth in the illustrations would necessarily be used to safeguard the miner.

BEFORE ROOMS ARE DRIVEN



DRIVING OF ROOMS AND SKIP



PILLAR DRAWING

Size of Shaft and Fan Required

We have a 1500-acre tract of coal land underlaid with a 5-ft. seam of bituminous coal, gaseous and lying flat. If a capacity of 2000 tons per day is desired, what should be the size of a double-compartment shaft, and what size of fan would be required to furnish the air for this mine, in accordance with the Pennsylvania bituminous-mine law?

PENNSYLVANIA OPERATOR.

This is a large daily output to obtain from a shaft with one car to a cage and working only 10 hours per day. Practically, the size of the hoistways is determined by the necessary dimensions of the mine cars, which again are determined by the required output per hour, the speed of hoisting, and the conditions in the mine with respect to the thickness of the seam or the available headroom and width of mine roads.

In the absence of actual data, it may be assumed here that the coal (5 ft. thick) is overlaid with an 18-in. drawslate, which is allowed to fall, a few feet behind the face. The total hight in the passageways and rooms is then $5 \times 12 + 18 = 78$ in. Using 18-in. car wheels and allowing 12 in. for ballast, ties and road; 3-in. car axles, and 13½ in. for crossbars, clearance and creep, gives $78 - (12 + 9 + 1\frac{1}{2} + 13\frac{1}{2}) = 42$ in. for allowable depth of coal in car, including topping.

Assume the track gage is 4 ft. Calculate the cross-section of the mine car as follows: $g = 4$ ft., $d = 18$ in. Then: Lower section, $42 \times 9 = 378$ sq.in.; middle section, $\frac{56 + 42}{2} \times 7 = 343$ sq.in.; upper section, $56\,[42 - (7 + 9)] = 1456$ sq.in. Total sectional area $= 2177$ sq.in. $= 15.12$ square feet.

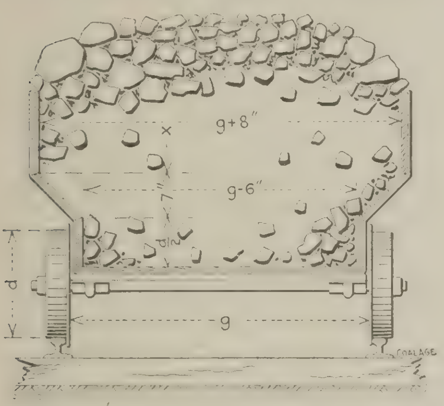
To find the length of the car it is necessary, first, to find the weight of material per hoist and the cubic contents of the car; thus, assume, for this depth of shaft, that the maximum speed of hoisting is 40 ft. per sec., and allow 30 sec. for starting and stopping each trip and dumping car. The time of hoisting one trip is $\frac{400}{40} + 30 = 40$ sec. Now, allow 30 min. for unavoidable delays each day of 10 hours, making the actual time of hoisting coal

$10 \times 60 - 30 = 570$ min. The total number of hoists per day is then $\frac{570 \times 60}{40} = 855$ hoists. The weight of material per hoist is then $2000 \div 855 = 2.34$ tons, or $2.34 \times 2000 = 4680$ lb. Average bituminous coal (run-of-mine) may be estimated as occupying 40 cu.ft. per short ton (2000 lb.) The cubic capacity of a mine car, including topping of coal, must be, then, $4680 \div 40 = 117$ cu.ft. To have this capacity the inside length of the car must be, in this case,

$$\frac{117 \times 144}{2177} = 7.74 \text{ ft., or } 7 \text{ ft. } 9 \text{ in.}$$

Allowing, say 21 in. for end-boards and bumpers and 18 in. for clearance at the two ends, the necessary width of the shaft should be 11 ft. The inside width of the car is 4 ft. 8 in., and allowing 2 in. for side of car, 4 in. clearance, 4 in. for exposure of guides, 8-in. buntons, and a pumpway and manway 6 ft. wide, makes the length of the shaft 20 ft. in the clear. The size of the shaft is, therefore, 11x20 ft. inside dimensions.

It is only right to add that as miners in the bituminous parts of Pennsylvania work only eight hours, with considerable deductions at both ends of the day, coal being relatively scarce in the early morning and late at night, it is not well to look for a production of 2000 tons from a single shaft with a one-car cage, even if the hoisting should continue 10 hours.



Capacity of Mine Car

On many days the delays will much exceed an aggregate of 30 min.; also holidays, their approach and their aftermath, cut a wide swath on the exact results of mathematical calculation, for even if men are plentiful, the absence of a few will disturb the balance arranged between headings and diminish tonnage. The problem, however, excludes a larger car than that proposed and does not seem to warrant a five-compartment shaft with two hoisting engines, nor a double-deck cage carrying two cars on one deck. It would seem better to meet a problem involving only 1500 acres of 5-ft. coal by preparing an equipment which might produce 2000 tons, but which might fail to reach that tonnage by a few hundred tons.

In regard to ventilation, the revised bituminous mine law of Pennsylvania requires the circulation of 200 cu.ft. of air per min. for each person employed in a gaseous mine. The records of the past nine years show that the average daily output of coal per man employed underground is as follows:

Pittsburg Coal Company	3.7 tons
H. C. Frick Company	6.2 tons
Monongahela River Consolidated Coal and Coke Company	4.2 tons
Berwind-White Coal Mining Company	3.5 tons
Average	4.4 tons

Taking this average as a basis of calculation, the number of men employed below ground in a mine putting out 2000 tons of coal a day would be $2000 \div 4.4 = 454$ men. It would, therefore, be amply sufficient, as far as the mine law is concerned, to estimate on air for, say 500 persons, or a circulation of $500 \times 200 = 100{,}000$ cu.ft. per min. However, the practical needs of this mine, which is gaseous, may require, in emergency, more than double this quantity of air; and the normal working of the mine may even require more air than the law demands.

Estimating Size of Fan

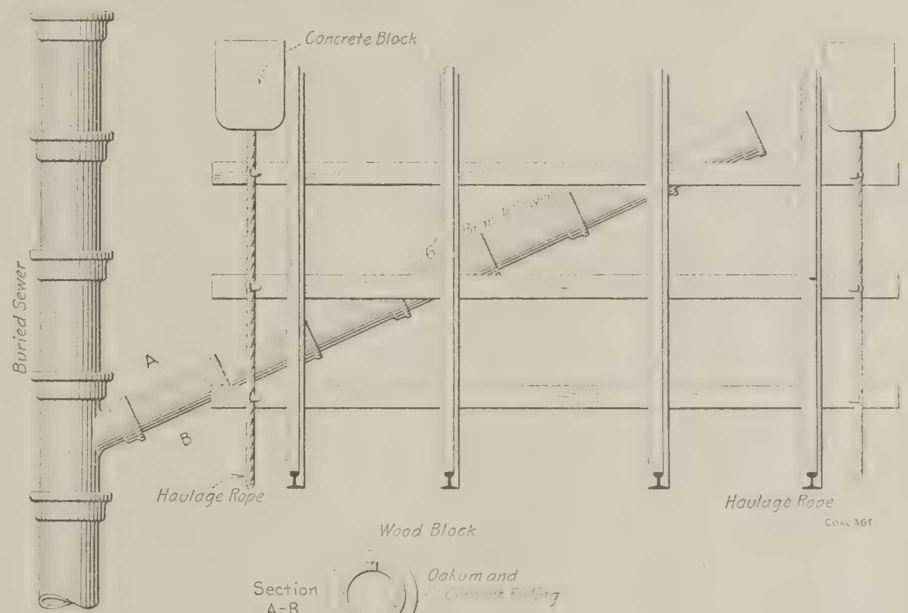
For this reason, in estimating the size of fan required for the proper and safe ventilation of the mine under all conditions, it should be designed to pass, say 150,000 cu.ft. of air per min. against a 2-in. water gage, at a moderate speed of, say 100 r.p.m., requiring for this service an indicated horsepower of the engine of, say 80 h.p. This would be the normal working condition. The engine driving the fan, however, should be capable of increasing the speed to 190 r.p.m., at which speed the fan would deliver about 250,000 cu.ft. of air, and, for the same mine conditions, the water gage would be increased to about 5.5 in. This would require about 360 i.h.p. The fan for this service should be 15 ft. 10 in. diameter, 5 ft. 7 in. wide, with a central opening 8 ft. 11 in. diameter. This makes the radial depth of blade 3 ft. 5½ inches.

Anchoring Gravity Planes

I have much trouble with a steep gravity plane which is always washing out; I cannot keep the ties in place. Please recommend a cheap remedy.

Roadman.

Your best plan is to lay a line of tile on one side of the track with properly cemented joints. All the water you can divert from the head of the plane should be passed down this drain. Several wyes should be put in the line and 6-in. branches run from these under the track. These branches should be cemented on the under half. The upper half should be left uncemented so as to drain the roadbed. Cover the ditches in which the branch pipes are laid, with broken stone.



Draining a Gravity Plane and Securing It By Haulage Ropes

Some planes are laid with anchored wood-sills into which the cross-ties are notched. The notching results in speedy rotting of the timber and the expense of such a method is considerable. The use of long ties common to both tracks is to be recommended, but perhaps the best security and the cheapest is the use of a spiked haulage rope at the end of ties secured to a heavy timber, masonry or concrete support at the head of the plane. If the plane is long, two or three of these may be necessary so as to divide up the expansion from heat. Old, disused ropes will do, and a heavy coat of tar will prevent them from rusting away, this coat being applied before and after their attachment to the ties.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Electric Lamps in Mine Rescue Work

The use of portable electric lamps in mines is rapidly becoming general. In gaseous mines. the portable electric lamp has been used effectively in so many instances to replace the ordinary so called safety lamp as to call properly for its classification as a safety lamp.

In the meaning of the anthracite mine law an electric lamp is not a safety lamp. Indeed, the law needs revision in this respect. When the present law was passed there were only two general types of safety lamps in use, the Davy lamp and the Clanny lamp. These laws, however, are now obsolete in respect to many present methods of mining anthracite coal, and we can but hope that the new law when drafted will provide effectively and intelligently for these changed conditions of mining, and treat specifically the new methods and new devices introduced since the old law was made.

Not long ago the government rescue car visited our coalfield, and trained men in the use of electric lamps in gassy mines, in connection with rescue apparatus. In the strict meaning of the mine law the electric lamp is not a safety lamp. I firmly believe in the electric lamp as the lamp that can be most effectively used in mine-rescue work; because where this lamp is carefully used the chances of ignition of gas are reduced to a minimum, and because the lamp gives a good light, which is very necessary.

A short time ago there occurred a heavy cave, in a mine, along the gangway road, in a steep-pitching (80 deg.) seam. An entire pillar of coal came down on the gangway, as shown in the accompanying sketch. Two men were working in the face of the gangway at the time of the cave, and their escape by that road was completely cut off. The ventilation was also cut off by the cave, and gas began to accumulate rapidly in the workings beyond. Soon a fireboss with an ordinary safety lamp reached the point marked *X* on the airway, but could go no farther. At this point, the gas was so thick that it extinguished the light. There was no way to reach the entombed men except through the airway or monkey heading above the gangway. Two ladders were brought in and placed in the manner shown in the sketch. Two men, each provided with rescue apparatus and electric lamps, traversed the fall by means of the ladders, and reached the entombed men in the gangway. These men were found in a very weak condition, at the point marked *X X*. The two rescue men were unable to take them out, so one rescuer returned for help while the other stayed with the men. The man who went out brought in another rescue man and two sets of rescue apparatus, which they put on the unfortunate men. The three rescuers then took the men out, one at a time, thereby saving these two men who were almost at the point of death. They would have perished had the electric lamps not been used.

This incident illustrates one case where the electric lamp was used effectively in saving life, under conditions that rendered the ordinary safety lamp useless. The question may be asked here, however, if anything had happened to the rescue party or the men through the use of these lamps, would those responsible for their use in a gaseous mine have been held accountable to the mine law?

Should not the electric lamp be classed in the mine law as a safety lamp? The true aim of the law is to protect lives and property, but when a law becomes obsolete it is then a menace rather than a safeguard, and should be changed to meet the changing conditions.

A RESCUE FOREMAN.

[EDITOR'S NOTE—The term safety lamp is a misnomer, and too often misunderstood by miners; particularly by those who are unacquainted with the use of the safety lamp. This misunderstanding may and often does lead to serious accident, because the one using the lamp has the idea that it is *safe* under all conditions, and cannot pass flame or cause trouble.

This is a grave error. The so called safety lamp is safe only when properly used by one who understands the principle of the lamp and the properties of mine gases, as well as the dangers to which he exposes himself and others by a careless use of the lamp. As a matter of fact, no lamp, however well protected, is safe under every condition of mining, and therefore, care and intelligence are necessary on the part of the person using the lamp.

Our correspondent has drawn attention to a very important point and one that is growing in importance every day. Portable electric lamps are rapidly coming into general use in the mines. We think the day is not far off when they will entirely displace the lamps and torches now in use. Mining law should take cognizance of this fact and special reference should be made to the use of such lamps. The electric lamp has the same right to classification as a safety lamp, as the present types of so-called safeties now in use.

The determining feature of the safety lamp is the more or less complete isolation of the flame of the lamp from the surrounding atmosphere. In the incandescent lamp the carbon filament of the lamp is more completely isolated from the outside atmosphere than is the flame of any oil-burning safety lamp. The glass globe of the incandescent lamp needs to be protected, but is not so apt to be broken as the glass cylinder of the mine safety lamp is liable to be cracked and broken by the heat of the flame and gas burning within the lamp.

The disadvantage, thus far, of all electric lamps, for mining use, is the fact that, as constructed at present, they do not reveal the presence of gas. It is to be hoped, however, that even this difficulty may be overcome and that some device will soon be found that will supply this lack.]

Siphon vs. Gravity Drainage

The accompanying sketch shows a mine in skeleton, with the elevations of the rail and ditch above tide. When the mine was first opened, there was much water at *A*, which was handled by a small hand pump, but later this water drained through crevices in the limestone measure below and no more trouble was experienced till the workings in the headings beyond *B* and *C* were reached. The further developments gave so much water that a sump was established in a low-lying room, as shown, and the water was removed by a siphon, much dissatisfaction resulting from its irregular service. It might be noted that the drawing is more of a diagram than an actual plan. This was necessary to avoid making too large a drawing. The obvious criticisms that it would be better to shoot the dip and to disregard the accumulation of water to the right of the drift mouth would not be obvious nor even applicable to the actual mine.

The following method was suggested for improving the drainage system:

By drawing a dotted line on the map, representing all the area in the mine above the elevation of the highest point of the drainage ditch, we obtained the area which could be drained if we constructed another ditch in the mine fol-

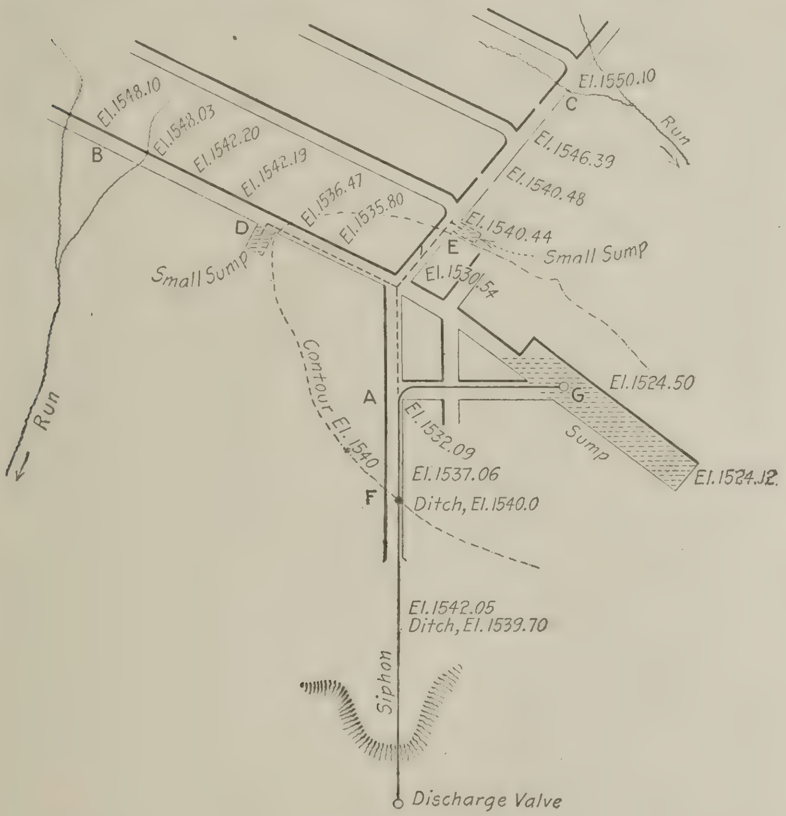
lowing that line, with ditches leading leading thereto. It was apparent in the early development work that all water originating below that line would pass away through the creviced substrata. What originated above the dotted line could, for the most part, be led to the several adjacent headings and run down to points *D* and *E* and piped from those points to the surface, by stringing pipes from *D* and *E* to the siphon line at *A* and connecting thereto. This suggestion was followed. The flow of water then depended not so much on the vacuum at the summit *F* as on the pressure of the water in the pipe, driving it forward and eventually upward to its own level. The custom of leading all water immediately stored at *D* and *E*, in order that it would not be necessary to drain the upper part of the mine continuously.

Preparations were made for using the old siphon, priming it with the water in the higher part of the mine. A valve *H* was put in the water line just above *A*, where the siphon line and the high-level branch join. A valve was located at the point of discharge *I*. By closing the valve *I* and removing the plug at *F*, all the air could be driven out at that high point. When the plug *F* was replaced and the valve *H* closed in the order named and the valve *I* opened, then as both legs of the siphon were fully primed, the siphon began working and continued to pass the water through the line till the

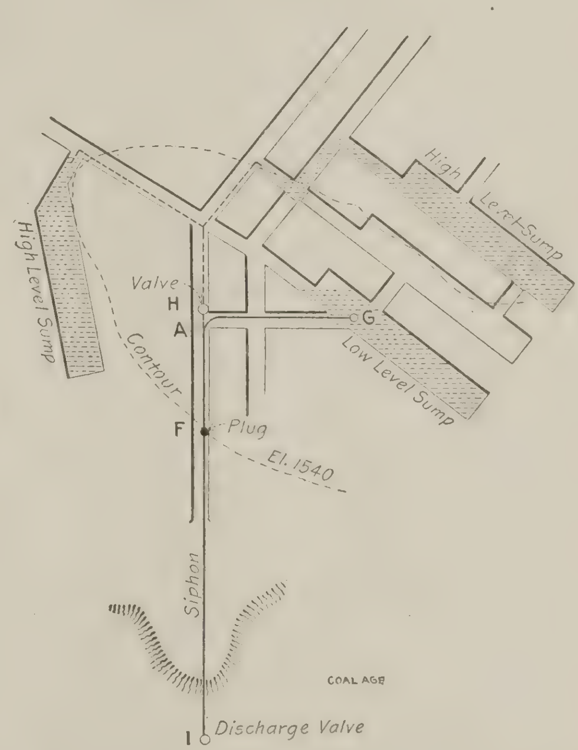
For 12 months inquiries and investigations have been in progress to determine the best sites for the shafts and, in July, Mr. Edden obtained permission to introduce a bill giving legislative authority to acquire lands and establish mines.

The scheme is to have a mine in the north, one in the west and another in the south, one of the proposed shafts to be in the neighborhood of Lithgow. When successfully launched these three mines will supply all the requirements of the government railways, street railways, brickworks, steam vessels, etc. Any surplus coal will be sold to private consumers.

At present the railway department has contracts with 24 collieries from which it



SYSTEM OF DRAINAGE WITHOUT USE OF SIPHON



SYSTEM OF DRAINAGE BY BOTH GRAVITY AND SIPHON

to a common sump situated at the lowest point in a mine and thence laboriously lifting it out is a common and deplorable source of waste of energy. A check valve was placed at *G* to avoid the discharge of water into the original sump. The water was accelerated in the pipe by occasionally opening the plug in what was once the high spot in the siphon, viz., *F*. When the flow of water was reasonally continuous, no air accumulated at that point.

Later, the crevices in the floor proved insufficient to drain the area below the contour line 1540, partly because of leakage from higher levels, the drainage of which could not be controlled after the pillars were drawn. Provision was then made so that water could be temporarily

low-level sump was empty. As soon as that occurred the valve *H* was reopened and the drainage of the upper area continued as before, for the check valve *G* prevented any water running down to the low-level sump. The siphon, being rapidly and efficiently primed under that system, gave better satisfaction and had less water to handle than it did before.

Chicago, Ill. A. O. BURT.

Government Coal Mines

COAL AGE readers may be interested in a plan of the Minister for Mines in New South Wales. He has in hand a project by which the government there will supply all its own coal requirements from its own collieries.

obtains approximately 840,000 tons of coal per anum. The Minister of Mines estimates that by owning its own collieries the state will effect a saving of half a dollar on each ton of coal, or roughly $420,000 on the total yearly supply.

The idea of state-owned coal mines is not a new one. New Zealand and Victoria own mines with, it is claimed, satisfactory financial results. It may also be recalled that in Germany, France, Russia and Belgium the various governments have their own mines for railway purposes, and in the United States and Canada certain large private companies have found it a paying proposition to own and run their own coal mines.

R. L. BERESFORD.

Sydney, N. S. W.

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

Liquor Problem in Mining Communities

By C. L. Fay*

One of the curses of the mining town is the "beer wagon." A superintendent of one of the large anthracite companies said recently: "It would be a forward step if we could stop the sale of intoxicating drinks which are hauled in by teams and peddled through our 'Patches.' It is against the law and if it could be stopped, I believe good would result. If the men had to order liquor or go after it, they would not use nearly as much as when it is hauled to their doors. In the 'Patches' where the beer wagons do not visit there is the least trouble, and the men do not lose so much time from work." Quoting further: "At one of our collieries, I never saw a beer wagon enter and I have never had complaints from there regarding quarreling or fighting; at one of our other mines, they are never without drink and the people are always in a 'scrap' about something—one lawsuit after another—there the women drink almost as much as the men."

Another official of the same company says: "Some time ago I went with the paymaster on payday and saw the beer wagons standing on the public roads selling beer at 5c. per bottle, or six bottles for 25c. I am told they do not do this now, but that they sell it by the case right from the wagon, which also is a violation of the law."

The "speak-easy" reveals the fact of the need of law enforcement.

In one county, officials in a position to speak with authority, say that there are as many illegal selling places in the county as there are licensed saloons.

In the last issue we saw the outcome: Here we have an illustration of an interpretation of law preventing an industry from minimizing the drink evil and here also we have a lack of enforcement of law, which permits the increase of liquor consumption to the detriment of an industry which is the support of the community.

While both the interpretation of the law and lack of law enforcement may act as obstacles to dealing with the liquor problem on the economic basis, there are also local conditions that add to the difficulties.

*Secretary, Coal Mining Institute of America, Wilkes-Barre, Penn.

Note—This is the third article discussing the above subject.

Brewery Stock for Moral Support

A mine superintendent, in discussing this phase of the problem, said that the brewing company in his district offered him a block of stock in the brewery syndicate at 50 per cent. less than par value. He did not accept the proposition and the stock was then offered to him at 25 per cent. of par value. Again he refused the offer. The agent of the brewery then told him that he (the superintendent) was a "key man" in that district, and that the brewery syndicate desired his good will, and that they would make him a present of the block of stock. The superintendent again refused to accept the offer. One of the chief officials of that brewing syndicate told me that the same year they paid a dividend of 66 per cent. on every dollar's worth of stock.

Surely a tempting investment for a mine superintendent or foreman. But when officials of coal companies hold stock in a liquor syndicate and that stock pays large dividends, effective measures to reduce the sale of liquor in the communities they control will be out of the question, even though the coal company may lose in tonnage every month.

But the industries are asking, "How shall we deal with the problem?" and that is significant. In the meantime, before a satisfactory answer is given, several large operating companies are projecting various plans in an effort to mitigate the demoralizing conditions.

One of the largest holding companies in West Virginia has written into all leases to operating companies the following article: "The lessee shall not sell or knowingly permit the sale or introduction of any intoxicating liquors upon the above described tracts or parcels of land or any lands adjacent thereto."

In a letter dated Sept. 28, 1911, the general manager of one of the largest railroads in this country says: "In our book of rules and regulations governing employees, we have the following rule with reference to the use of intoxicants, etc. 'The use of intoxicants by employees while on duty is prohibited. The habitual consumption or the frequenting of places where intoxicants are sold is sufficient cause for dismissal.' It is the duty of our division officials to see that this rule is enforced.

"Our superintendents, trainmasters, master mechanics, road foremen of engines and other officials, whose duties require them to be on the road a considerable part of their time, are in a position to observe whether or not the employees are violating the rule, and when they discover a case of this kind it is the usual practice to caution the offenders and give them good advice; then if they persist in violating the rules, the penalty is enforced by dismissing them from the service.

"While, of course, with the large number of men employed on a railroad it is impossible to get at every case, we believe we are fortunate on our road in keeping the infraction of this rule down to the minimum, as the number of men dismissed for intoxication, is a small per cent. of the total."

A Law Unto Themselves

As society progresses, the leaders of any period may discover the conditions that ought to be maintained in society and industry. Such leaders are a law unto themselves—and by making conquest and planting their flag on the advance line, they gradually draw other leaders to that line, then the law is brought up to the same mark and the law brings up the mass.

When society and industry demand another forward step, leaders blaze the way till finally a new advance line is established. Again the law is gradually brought to that line, causing the masses to struggle toward that new advance line and thus the wheels of progress go round and round, but what a "sprag" in the wheels is nonenforcement of the law!

Enforcement of law reveals its strength or weakness, whether good or bad, whether or not it is equal to the needs of the times and the demands of the present advance line of progress.

In the succeeding article on the "Liquor Problem in Coal-Mining Communities," I will describe what is, perhaps, the best method in operation at this time for minimizing the drink evil in mining camps.

First Aid Movement in Hard Coal Region

During the past six weeks the First Aid Corps of the mines which have organized these helpful institutions have been holding contests throughout the anthracite regions, and remarkably interesting and instructive these have been. The contests have now become annual events in most mining localities in northeastern Pennsylvania. The men who are engaged in these contests take a personal

pride in the efficiency of the corps to which they belong.

During the time that these contests have taken place, exhibitions have been given in various centers, generally in the vicinity of Scranton, Wilkes-Barre, Pottsville, Shamokin, Mahanoy City, Carbondale and occasionally in the neighborhood of mining settlements. The contests are not competitions in the conventional sense. Although medals are sometimes distributed among the winners of a contest, the men are for the most part indifferent to the honor conferred by these, and to their intrinsic value. Indeed they seem almost to deprecate their institution as awards.

About two hundred corps have taken part in these contests during the time that they have been in progress. It is no exaggeration to say that first aid to the injured, scientifically administered, is now as much a part of the machinery of the anthracite mines as any other department of the executive administration of the colliery. Each mine with a first-aid corps has its dispensary at the foot of the shaft, fully supplied with such appliances as are immediately needed in any ordinary emergency.

While distributing medals at one of these contests recently an old clergyman declared, with considerable truth, in the presence of the men and officials of the two collieries between which the contest was held, that within his own recollection, some 35 or 40 years ago, the lives of the mules in the anthracite mines were much more carefully guarded than those of the miners, it being accepted as a managerial axiom that the loss of a mule was estimated at $3 a day for the period of its working life, while the life of a miner was of no economic value, no material difference in the profit and loss account of the working of the mine resulting by his accidental death.

Marriage

By F. A. Boag

The conditions of the gold-mining camps of the West are being duplicated in the coal camps of the country, near and far. The unrestrained wildness of the erstwhile inhabitants of the gold diggings was due mainly to abnormal earnings, the lack of home restraint and the absence of the matrimonial curb. True! the earnings of the miners do not appear extravagantly large to Americans, though they are larger than is commonly supposed. But to peasants from Central Europe they seem so bounteous that to spend the balance after their frugal appetites for food are appeased, demands frequent carousals. The new environment acts as new wine in exciting their spirits. But more obvious than all is the effect of the lack of family ties.

The same adventurous spirits of a like people went to the Dakotas and to Colorado. But the Oregon adventurers were quiet homemakers, were married and peaceable. The Colorado men, on the other hand, prided themselves on their wildness and wooliness. They had, no less than their neighbors, the qualities of good citizenship, but the rewards being high and the restraints weak, a wild period intervened between settlement and steady development. The governors and mayors of the West have not been unmindful of the strife-assuaging virtues of marriage and have from time to time sought to restore the uneven balance of male and female by assisted or encouraged immigration of the latter. Moreover, today, a trip west to the region of the Rockies of an Eastern maid almost invariably spells matrimony, usually under the most favorable auspices.

Two Ways to Meet Problem

There is but little question but what marriage would make a healthy improvement in the foreign population of our mining villages. The difficulty is to find a way to increase it. The immigration authorities, dreading the already too great advance of the white-slave traffic, would not favor any activity toward increasing the immigration of females even if the law permitted it. There are two ways by which the difficulty might be met: The operator can always discriminate in favor of married men, and Congress, which is always discussing the restriction of immigration, might provide for the exclusion of unmarried foreigners who did not meet certain other important requirements, leaving the bars a litle lower for married men.

Occasionally we read of a lifelong romance. An Italian peasant girl comes to America to marry an acquaintance of boyhood days, on money furnished by her future husband. Such accounts furnish good headlines, but, as a matter of fact, the Italian laborer unable to find a countrywoman in his new home, and too undesirable to be able to cross the race line for a wife, recalls an unmated girl acquaintance of earlier days and sends for her. Without thought of love, she recalls the fact that there is a living for her in America, a chance to escape an enforced diet of *polenta*, with hard stone-picking and burden-carrying in the fields, and joyfully she comes over to meet her *promessi sposi!*

Brawls, the Outcome of Celibacy

One does not wonder that an American-born Italian woman is in many cases a chattel for profitable sale and barter, so many are the would-be husbands, so few the would-be brides. Nor can we wonder at the fights and jealousies engendered when five kegs of beer and one woman are together in a house where there are as many as 14 boarders; for though statistics prove that the Southern European is more chaste than the American or Briton, his lust for revenge and the temptations of liquors to which he is unaccustomed, more than overbalance his other moral qualities.

It sometimes appears to me that more urgent than a reduction of white slavery, is the need for a suppression of white lawlessness in the mining centers. It is a need, moreover, deeply felt that, more and more, Europeans who come here should be naturalized and stay, leaving their wages here, not sending them abroad. Furthermore, we desire to be saved from the trouble of nationalizing continually new influxes of strangers who come, develop a little and leave, to be replaced by others equally needful of the action of the American "melting pot," to quote Israel Zangwill. Marriage is the hobble that will effectually hold such men. Without marriage, life is essentially incomplete and the lack of it always makes man a wanderer.

Mine Safety Demonstration

The National Mine Safety Demonstration takes place Monday and Tuesday, October 30 and 31, at Pittsburg, Penn., the board of managers comprising H. M. Wilson, representing the Bureau of Mines; Dr. M. J. Shields, the American National Red Cross Society; S. A. Taylor, the coal operators of the United States; Francis Feehan, the United Mine Workers of America; John Laing, the State mine inspectors; and Thomas B. Dilts, the industrial department of the Y. M. C. A.

On October 30 a meeting, commencing with an address of welcome by Director J. A. Holmes, at 9 a.m., will be held at the arsenal grounds. Following the address the visitors will be shown the various buildings and the nature of the work being conducted in them.

For the afternoon an inspection is arranged, at the Bruceton mine, followed by an explosion in the same with a further inspection later.

The Tuesday meet is to be held at the Forbes field, beginning with ten first-aid problems open for solution to teams from all over the United States. Then will follow tests in a dust gallery, where similar experiments will be made to those made at the arsenal on the previous day, but with coal dust present and with gas entirely absent. A demonstration of the action of afterdamp on birds will be a feature of this meet.

The prizes for first-aid work will be presented by President Taft and addresses given by John K. Tener, governor of Pennsylvania, Walter L. Fisher, Secretary of the Interior, of whose department the Bureau of Mines is a part, and Miss Mabel Boardman, of the American Red Cross Society.

A parade of 19,927 miners, each of whom represents one of the 19,927 men killed in the coal mines of the United States in the last twenty years, will impress on the spectators the terrible toll of life taken by the coal industry.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Suggested Questions

Strike, Dip and Pitch

Ques.—Explain the meaning of the terms *strike, dip* and *pitch*, as they relate to coal seams or "veins."

Ans.—These terms all describe certain lines or directions in inclined seams. For example: The *strike* of an inclined seam may refer to any level line in the seam, or it may refer to the direction of such a line. The strike line, or the line of strike, is always a level line, and may have any position in the seam. The outcrop of an inclined seam on a level surface is a line of strike. The term *dip* relates to the inclination of the seam. Any line drawn in the seam at right angles to the strike is a line of "full dip" or "full pitch" according as it is drawn to the rise or to the dip of the seam. The terms *full pitch* and *full dip* of the seam describe the same lines drawn in opposite directions. Any line in a seam drawn in a direction oblique to the strike or to the full dip of the seam has a dip or a pitch less than that of the seam. By the dip or pitch of a seam is meant its *full* dip or full pitch.

Direction of Slant Road

Ques.—In what direction must a slant road be driven in a seam having an inclination of 5 deg. in order that the road shall have a grade of 3 per cent.? The direction of the full dip of the seam is S 34 deg. 30 min. E.

Ans.—In an inclined seam the ratio of the tangent of the grade angle of a road driven across the pitch, to the tangent of the angle of full dip of the seam, is equal to the cosine of the angle the road makes with the line of pitch. Calling this angle *a*, in this case,

$$Cos.\, a = \frac{0.03}{tan.\ 5\ deg.} = \frac{0.03}{0.08749} = 0.3428;$$

and a = 69 deg. 57 min. Therefore, the angle between the road and the full pitch of the seam is 69 deg. 57 min. But the direction of the full pitch of the seam is N 34 deg. 30 min. W, and since the required slant road may be driven either to the right or the left of the full pitch, its direction may be either N 35 deg. 27 min. E, or S 75 deg. 33 min. W.

Ventilation in Anthracite Mines

Ques.—How is ventilation produced in mines in the anthracite region?

Ans.—In the anthracite mines of Pennsylvania, ventilation is most commonly produced by mechanical means. The larger mines are mostly equipped with different types of centrifugal fans. Many mines are still operating the old style of 14-ft., open-running fan; and some disk fans are in use. The modern type of mine ventilator, however, now being generally installed, is the large centrifugal fan inclosed in a spiral casing, and having its blades curved to conform to the conditions at the mine. This type of mine fan when designed to run normally at a fairly moderate speed of, say 150 r.p.m., gives the best service and the highest efficiency. In case of need the speed of the fan can then be increased at will to supply a larger volume of air.

Mine Ventilators Compared

Ques.—What are the comparative merits of the several appliances for producing ventilation in the collieries of the anthracite coalfield? Give reason.

Ans.—The mine ventilator that is designed to meet as far as possible all the conditions that are liable to arise in the operation of the mine is the ventilator having the greatest merit. Owing to the widely varying conditions in mines, no absolute rule can be given. There is, however, a growing preference among mine operators for the large centrifugal type of fan, designed to run normally at a speed that can be increased or decreased as the requirements of the mine may demand. Such a ventilator possesses a greater margin of service than the small, high-speed types of fan, which are better adapted to the work of blowing air against a considerable water gage.

The open-running type of fan, still in use at some mines, is very inefficient, because it discharges the air at a high velocity all around the circumference of the fan, which means a great loss of energy. Closed fans having a tight-fitting casing are also inefficient, because the air is only discharged from a small portion of the fan-wheel at one time. The spiral casing, on the other hand, permits the discharge of air almost completely around the circumference.

The disk fan is not an efficient type of mine fan, except for the ventilation of small mines. It is a convenient form of ventilator, however, when it can be used, for the reason that it admits of reversing the air-current in the mine, simply by reversing the engine driving the fan. The necessity for reversing the air in a mine frequently arises.

Blowing versus Exhaust Fan

Ques.—Give your opinion as to the advantage, if any, of a forcing fan over an exhaust fan working under the same conditions.

Ans.—Both of these types of fan are equally advantageous under the particular conditions to which each is adapted. The blowing or forcing fan is adapted to the ventilation of a non-gaseous mine where the main-return airways can be made the haulage roads. In a gaseous mine, however, haulage must generally be performed on the intake airways to avoid the danger of the ignition of gas by the lamps of the drivers. In this case, in order to avoid the use of doors on the main haulage roads, at or near the shaft bottom, it is necessary to adopt the exhaust system of ventilation and use an exhaust fan.

This much is offered in explanation of the proper use of the exhaust fan. For the same conditions, however, the forcing fan is the more efficient ventilator, because it is operating on the cooler outside air and under the mine water gage or pressure, while the exhaust fan is operating on the generally warmer mine air and under atmospheric pressure only. The forcing fan, therefore, by virtue of its position in the air-current is always operating on denser air than the exhaust fan, which gives it a higher efficiency under like conditions in the mine or airway.

In the mine, the forcing or blowing system of ventilation possesses a greater advantage over the exhaust system, because the gases generated in the old abandoned workings of the mine are forced out, in this system of ventilation, through any crevices or openings extending to the surface. They are not drawn into the mine as they are necessarily in the exhaust system. If there is a breakdown, however, and the fan must be stopped suddenly when the men are in the mine, there is greater danger of the outflow into the mine airways, of the gases accumulated in the old workings, in the blowing system than in the exhaust system of ventilation.

Opening a Colliery

Ques.—It is proposed to open a colliery on the following workable seams: Buck Mountain, 10 ft. thick; Skidmore, 8 ft. thick; and Mammoth, 25 ft. thick, pitching respectively 30 deg., 35 deg. and 38 deg. On which seam would you sink your slope; where would you place your

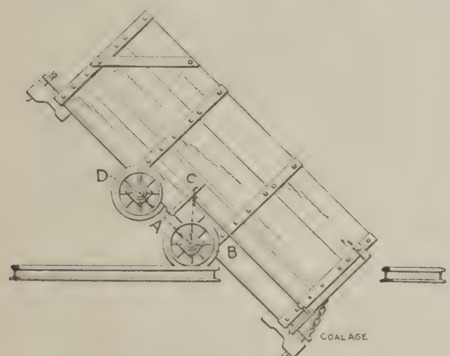
fan; and what kind of a fan, in your opinion, would give the best results, a forcing or an exhaust fan?

Ans.—Assuming that the conditions on the surface, at the outcropping of these seams, are equally favorable for locating the plant and for the loading and shipping of the coal, it would be generally preferable to drive the main-haulage slope in the thickest of these seams; namely, the Mammoth seam. This will give a good roof of solid coal while providing all the headroom desired in the slope. It would also afford easy access to the largest supply of coal. The other seams would be reached by driving cross-tunnels from the Mammoth seam, at the different levels. An exhaust fan should be located at the mouth of an airway driven in the middle or Skidmore seam. This main-return airway should be large enough to ventilate both the Buck Mountain and the Mammoth seams.

Balance Point of Tilted Car

Ques.—If the tilting of a car through an angle of 40 deg. puts it into balance on the front wheels so that no force need be applied to hold it in place, how far is the center of gravity located above the plane of the axles when the wheel base measures 2 feet.

Ans.—The accompanying figure shows a car tilted on the rails 40 deg. and the point marked *C* shown thereon is the arbitrarily chosen position



Balancing of Tilted Car

that is to be found. A line is drawn joining the centers of the two axles *B* and *D* and then from *C* a vertical is dropped to intersect *B D* in *A*. Join *C B*.

While the car stood on both wheels on a level track, *C A* was perpendicular to that track. Now *C B* is perpendicular to it or else the vertical line through the center of gravity must pass to the right or the left of the center of support (which is, of course, the axle of the car and the wheel tread beneath it). If it pass to the left, the car will fall back on the track, for there will be a gravity moment to replace it. If it pass to the right the car will fall forward, for there will be a gravity moment to upset it. But the terms of the question declare that at 40 deg. uptilt the car balances. Hence *C B* must be perpendicular to the track when *C* is rightly located. As the car has tilted 40 deg., *A C*, the original vertical, must form an angle of 40 deg., with *C B* the new vertical. *A B*, being half the wheel base, measures 1 foot.

$$AC = AB \times \textit{cotangent } 40 \textit{ deg.} = 1 \times 1.19 = 1 \textit{ ft. } 2\tfrac{1}{4} \textit{ in.}$$

Thus the center of gravity of the car, when standing on the track, must be 1 ft. 2¼ in. above the plane of the axles.

Example—A car has its center of gravity situated 9 in. above the plane of its axles, and has an 18-in. wheel base. Assuming that the car is symmetrical, how many degrees must it be tilted to balance on its front wheels?

Answer—45 degrees.

Glen Jean, W. Va., Examination

January 11-12, 1911

Fireboss Questions

Ques. 1—What are the qualifications and duties of a fireboss as required by law? What other qualifications should he possess which are not defined by law? State fully.

Ans. 1—The West Virginia mine law requires that a fireboss shall be a citizen of this State and have such knowledge of firedamp and other dangerous gases as to be able to detect the same with the use of safety lamps, and shall have a practical knowledge of the subject of the ventilation of mines and the machinery and appliances used for that purpose, and be a person with at least three years' experience in mines generating explosive gases.

In addition to the qualifications required by the mine law, the "fireboss" should be sober, reliable and a man of good character.

Safety Lamps

Ques. 2—(a) State in your own words the principle of safety embodied in the safety lamp. (b) How are safety lamps usually constructed? (c) Why are they usually made in a cylindrical form and within certain limits as to size and shape? (d) Under what conditions do they become unsafe? (e) What constitutes a good safety lamp? (f) Name six essential features of a good safety lamp for general work. (g) Are there any conditions under which the flame will pass through the gauze of a safety lamp?

Ans. (a) The safety lamp depends for its safety on the cooling effect of the metal gauze on the flame when an ignition of gas takes place within the lamp.

(b) They are usually constructed with an airtight glass surrounding the flame, the gauze being above it, in the upper part of the lamp. Where the air supply to the burner is brought into the lamp below the flame, there is usually a gauze below the glass also. The bottom of the lamp is usually the receptacle for oil, wick, igniters, etc.

(c) They are made in cylindrical form so that when an ignition of gas takes place in the lamp, the wires are all equidistant from the center or hottest part of the flame and all equally absorb, conduct and radiate the heat generated. It has been determined by experiment that if the diameter of the gauze is too great, the wires at the top of the gauze have more than their proportion of heat to dissipate, and for this reason a gauze cap is sometimes used, making, at the top, a double thickness of gauze.

(d) A safety lamp becomes unsafe, when an ignition of gas takes place in the lamp, and when it is allowed to stay in a gaseous mixture until the wires of the gauze are heated up to such a degree that they will ignite the gas outside the lamp, or, when the glass is broken, the gauze dirty, or the lamp unlocked or damaged in any way, or when a heavy current of air deflects the flame against the gauze. The safety lamp is also unsafe when it is placed in the hands of an ignorant, inexperienced, incompetent or uninstructed person. It should be constantly guarded against the possibility of breakage.

(e and f) Six essential features of a good safety lamp for general work are:

1. It must give good light and the glass should be of good quality and clear so as to make the utmost of the illumination.
2. It should contain oil enough to last a whole shift.
3. It should go out in a gaseous mixture.
4. The gauzes should be protected by a metallic shield.
5. The lamp should be strongly constructed.
6. It should have a lock that cannot be tampered with and the lock should show when it has been meddled with. The size of the lamp should be such as to admit of its being placed as near the roof as possible.

(g) The flame of a gas ignition will pass through the gauze of a safety lamp when the wires are sufficiently heated or when the lamp is placed in currents of high velocity.

Outburst of Gas

Ques. 5—If a large outburst of gas took place in your mine when all your men were at work, what would be your first consideration to prevent an explosion? Explain fully.

Ans. 5—All open lights should be extinguished and the men gotten out as rapidly as possible, through the intake airway. No one should be allowed to travel the return airway. The fan should then be "speeded up" so as to increase the quantity of air circulating in the mine as much as possible without causing a breakdown or disabling the fan.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

The Court of Commerce has begun consideration of the Hillsdale coal-car distribution case which has come up to it from the Interstate Commerce Commission, and already has had, on Oct. 11, an important hearing. In this case is involved the question of the distribution of cars to those coal companies which already own private cars.

The Pennsylvania railroad has had a rule that any company owning private cars should be given all its own cars available and that the number of these should be subtracted from the previously determined allotment to which the company's business entitled it. The Interstate Commerce Commission not long ago established a rule that private cars should be considered as railroad property. Thus in some cases the private cars of a mine would be taken away from it and given to another mine. Hence arose opposition on the part of the Pennsylvania company and of various private-car owners.

In the argument before the Court of Commerce it has been contended that the rule of the commission did not hurt the railroads and was intended to prevent discrimination as to the time and availability of coal cars at the mines. The railroad lawyers have argued that the commission had no right to establish a condition under its rulings, whereby cars would be taken away from their owners at any time and turned over to other competing operators for their use in shipping coal. It is believed that the Court of Commerce will attempt to deal with this subject at an early date.

Report from Bureau of Corporations

The Bureau of Corporations has just issued its complete report on the first section of its investigation of the iron and steel industry in the United States. In the course of the discussion of the United States Steel Corporation and its subsidiary concerns, considerable attention is paid to the question of coal holdings and coal values.

The purchases of coal made by the corporation are carefully surveyed. Since its organization, some substantial additions to its holdings of coal and coke property have been made. In December, 1901, it secured a lease of 50,000 acres of desirable coking-coal and fuel-coal property in the Pocahontas region.

Other important additions have been; the coal property of the Union Steel Company; 2650 acres in Fayette county, Penn., taken over with the Clairton Steel Company in 1904; 1200 acres of coking coal in the Connellsville region and 1072 beehive ovens originally belonging to the Hecla Coke Company; and 1766 acres variously acquired in the same region.

Coal Holdings of Tennessee Coal and Iron Company

In 1907 an enormous addition to the coal property of the corporation and an important addition to its coke property were made through the acquisition of the Tennessee Coal, Iron and Railroad Company. These properties are very extensive. The 1904 report of the company placed the total tonnage of coal at over 1,600,000 tons. The 1906 report stated that the coal reserves were, as computed by competent authorities, estimated to be 2,000,000,000 tons.

More careful estimates were made subsequently by agents of the Steel Corporation. The estimates of these agents grouped the resources in three classes, namely, "proven," "probable," and "possible." Their estimate of the coal property of the company follows:

	Proven	Probable	Possible	Total
	Tons	Tons	Tons	Tons
Coking coal	217,000,000	90,000,000	150,500,000	457,500,000
Steam and domestic coal	68,000,000	351,800,000	520,000,000	939,800,000
Total	285,000,000	441,800,000	670,500,000	1,397,300,000

In 1909 and 1910 the Corporation acquired extensive coal properties in Illinois and Indiana. An exceptionally important addition was made in June, 1911, through the purchase from the Pittsburgh Coal Company of about 7000 acres of coking-coal property, known as the Colonial Coke Company tract and also about 9000 acres of virgin or unimproved tracts of coal rights owned by the Monongahela River Consolidated Coal and Coke Company, the control of which is held by the Pittsburgh Coal Company. The total consideration was reported at approximately $17,800,000.

Value of the Steel Corporation's Coal Properties

The value of the original investment in coal and coke properties is estimated by the Bureau of Corporations as $80,000,000, although an estimate originating from a private source places it at $99,915,000. It is stated that the value of the coal lands has been materially increased by concentration of ownership. In consequence the Steel Corporation now estimates its coal property at about $47,000,000 more than does the Bureau of Corporations.

Alabama

Bessemer—Coal mines are again active throughout this district. Operators do not concede that there will be a falling off in production in Alabama this year.

Birmingham—On account of the increased demand for coal and coke, the Tennessee Coal, Iron and Railroad Company has started up the No. 6 Blue Creek coal mine, which has been idle for the last year.

The Tennessee Coal, Iron and Railroad Company has ordered from the General Electric Company eight motor-driven air compressors of the reciprocating type for its coke ovens at Corey. These will be used to raise and lower the coke-oven doors by remote control with compressed air.

Colorado

Denver—The sale of the Northern Coal and Coke Company to the Rocky Mountain Fuel Company, which has been pending for some months, has been announced here. The consideration was close to $2,000,000.

The sale included all the Northern Coal and Coke Company's mines, both in northern Colorado and in the southern part of the State.

As a result of the sale the Rocky Mountain Fuel Company will increase its stock to $8,000,000.

The American Fuel Company, with a capital stock of $1,000,000, has been formed to control eight mines in the northern fields with more to be taken over in the near future. The eight mines already controlled are in the vicinity of Louisville, Lafayette and Frederick.

Illinois

Peoria—The five self-appointed directors of the Wolschlag Coöperative Coal Company, who have for the past few months managed the affairs of the company, were ousted from their offices by the ruling of Judge Puterbaugh, Oct. 13, and the regular directors were reinstated.

Belleville—Nearly all the operators in the St. Clair county field appeared before the board of assessors recently and claimed a reduction in assessments, on account of the past unprofitable year.

Harrisburg—Eight miners were killed and eight others temporarily overcome by an explosion in O'Gara No. 9 mine, Oct. 23. The dead and unconscious were removed from the mine by rescuers, three of whom were overcome by gas, but were later resuscitated at a hospital.

The explosion occurred as the shifts were changing, and only 16 men were in the north entry, where it originated, although 360 had reported for work, but had not gone into the workings.

Two men were instantly killed, and six others, sent to the surface, died within an hour.

Indiana

Linton—The dullness of the coal market has caused the shutting down of mines Nos. 2, 4 and 21 of the Vandalia Coal Company. There are nearly 1000 men out of employment in the mines here. The strike at the Chicago and Indianapolis mine is still unsettled, the men having failed to arrive at a satisfactory agreement with the mine operators.

The Shirley Hill Coal Company is installing at its No. 3 mine a washer to clean coal for the market just as eastern coal is cleaned. This is the first attempt of the kind in the Indiana coalfield and the experiment is being watched with much interest by the other operators.

Brazil—Work on the new tipple at the Schrepferman Coal Company's mine south of this city has been completed and the mine will resume operation.

M. H. Johnson, who was appointed receiver for the Treager Coal Company, some time ago, has sold the mine and mining equipment to Oscar Schlatter and son. The new owners will begin operations at once.

A fire in the No. 8 mine of the Brazil Block Coal Company, Oct. 20, threatened the lives of 100 or more men. A rescue party, amounting to two cage loads, was organized and finally succeeded in extinguishing the fire. One member of the party was killed by a fall of rock; this was the only fatality.

Terre Haute—The Deep Vein Coal Company recently leased to the Deep Fourth Vein Coal Company the mine known as Deep Vein mine for a period of five years. The consideration specified is 10c. a ton for all coal mined and the lessee agrees to mine not less than 2000 tons of coal per day.

North Dakota

New Salem—The new machinery in the plant of the Dakota Coal Products Company at this place has been installed and is now in working order. The building and the mine are lighted by electricity. The first electric-power coal-cutting machine has been placed in use.

Kentucky

Louisville — The Consolidation Coal Company, of Baltimore, has under advisement the opening of two additional coal mines in the Miller's Creek district at an approximate cost of $600,000.

Barbourville—Two new coal mines are being opened on Brush creek. The Brush Creek Coal and Manufacturing Company is making an opening near Jones' trestle, on the Cumberland railroad. The incline is being graded and a siding put in. The Gibson-Carr Company, of Middlesboro, is putting in a plant on the Croley lease on Tye fork, and both companies expect to be shipping coal by the first of the year.

The Interstate Coal Company still retains the Brush Creek coal plant, which it leased some months ago and closed down.

The Greasy Creek Coal Company is opening a new mine on Greasy creek, near the Knox-Bell county line. A long extension track is being added to the Bell-Jellico railroad. The Continental Coal corporation is running all of its fourteen mines in Bell and is calling for more miners.

The Martin's Fork Coal Company has been organized recently in Bell county and will develop land held by it near the town of Harlan.

Ohio

Columbus—The tipple, power house and other buildings of the Black Diamond Coal Company at Amesville are nearing completion and when finished will make one of the best equipped mines in the country. All buildings are of reinforced-concrete construction, and perfectly fireproof. The management hopes to be mining coal by the first of November.

The Big Run Mining Company, of Bellaire, has been incorporated with a capital of $150,000 to mine and sell coal.

As a result of the agitation against the wholesale stealing of coal from the cars of the Big Four railroad while passing through Columbus several changes have been made lately in routing coal. The Norfolk & Western is now turning its cars for local business over to the Big Four at Urbana while the Hocking Valley is switching at the Mound Street crossing.

Pennsylvania

Bituminous

Pittsburg—It is reported that a merger of the interests of the Pittsburg Coal Company, Monongahela River Consolidated Coal and Coke Company, H. C. Frick Coke Company and the Ellsworth Collieries Company, owned by the Lackawanna Steel and Iron Company, is being arranged, and that these interests will be taken over by the United States Steel Corporation.

Government representatives are at work in the Irwin coal-mining field, gleaning information regarding the recent strike there which lasted 18 months and involved over 18,000 miners. They will make a report of their findings to Congress when it convenes in December and it is expected that some action will be taken by that body regarding the industrial struggle.

Engineers of the H. C. Frick Coke Company have made preliminary surveys of the coal and coke properties in Washington county, purchased recently from the Pittsburg Coal Company and the Monongahela River Consolidated Coal and Coke Company, preparatory to building additional ovens.

The Crucible Coal Company of Pittsburg is erecting 250 coke ovens and contemplates building 350 ovens additional at its mines and docks at Rice's Landing. A contract has also been awarded for the construction of three eliptical reinforced-concrete shafts, each 150 ft. in depth, two coal shafts and one air shaft. There will also be two railroad and one river tipples, the structural steel for which will be furnished by the American Bridge Company. Five new tow boats and 90 steel barges are in course of construction, which will be utilized in transporting coal from the company's mines, to Midland, Penn.

Anthracite

Wilkes-Barre—Carelessness on the part of an employee is given as the cause of a fire in the No. 9 colliery of the Lehigh & Wilkes-Barre Coal Company, at Sugar Notch, on Oct. 14, shortly after the men had left the mine. The fire was found within a short distance from the mule barn, and for a time it was feared that the blaze would develop into a serious mine fire.

Scranton—Work has been completed on the new concrete breaker of the Lackawanna Coal Company, at Taylor, and the officials are making plans for its opening within a few months.

The first meeting of the Pennsylvania State Anthracite Mine Cave Commission since its organization late last June, was held recently in Scranton. W. J. Richards, of Pottsville, presided, and George M. Davies was secretary.

The next meeting will be held the second week in November. It will be probably several months before the commission will have completed enough of its labors to interest the public, for much detail work must be done before anything definite as to remedial legislation can be formulated for the next legislature.

Pittston—The discovery of an expected cave-in on the tracks of the Delaware & Hudson railroad, saved a train from

plunging into a hole on the curve below the Cork Lane station. Officials of the Erie company had previously notified the Delaware & Hudson company that they were going to remove the pillars under the tracks and that a settling was inevitable.

Washington

Seattle—There seems now some prospect that the valuable deposits of anthracite discovered some years since in the neighborhood of Glacier, in Whatcom county, may at last be utilized in this State, where such a coal is imperatively needed. It is believed that the forestry service will consent to patents being issued to half a dozen claims. If this is done, a tramway four miles long will be constructed from the mines to the Bellingham Bay and British Columbia railroad at Glacier, and the coal can then be put upon the market.

There is apparently no doubt that the coal measures are large and unbroken. The coal itself is of good quality. It is the only workable deposit of hard coal of the kind in the State so far discovered, and the coal is badly needed here, where even the local soft coals are constantly advancing in price, with production never fully equal to the demand.

West Virginia

Fairmont—Fifty four-room brick houses have recently been built at the Annabelle mine of the Four States Coal and Coke Company, near Worthington, W. Va., and now are ready for occupancy. This is one of the best drained, ventilated and equipped mines in the State.

Grafton—The Maryland Coal Company, with mines located at Windell, has been reorganized, and a new board of directors and new officers have been elected.

Canada

Cape Breton, Nova Scotia—The Glace Bay mines of the Dominion Coal Company have this summer had the best season in their history. The company has now 12 collieries in full operation, and four in course of development. In the month of August the output was 387,927 tons, about 16,000 tons in excess of any previous monthly production. For September the output was 324,311 tons, making the total output for this year 2,973,791 tons, compared with 2,607,591 tons at the end of September, 1910.

The two years agreement which the Dominion Coal Company has with the Provincial Workmen's Association expires at the end of this year.

Alfred, Ontario—The mines department of the Canadian government has now about 1000 tons of peat fuel manufactured at its demonstrating plant, which will be disposed of at $3.50 per ton. The experiments have shown that in order to manufacture this fuel on a commercial scale, hand excavators will have to be replaced by mechanical excavators. The present cost is about $2 per ton.

Personals

S. K. Smith, formerly with the Vintondale Colliery Company, Vintondale, Penn., has opened an office in St. Louis, Mo., as a mining and consulting engineer.

Dr. C. W. Hayes, who last Saturday resigned as chief geologist of the U. S. Geological Survey, has left Washington for Tampico, Mex., to assume his new duties as first vice-president and general master of the exploitation department of the Compania Mexicana de Petroleo "El Aguila," at a salary of $25,000 gold per annum. For two years he has been in charge of the exploratory work of these oil interests, having taken leave without pay two months each year for this purpose. He, therefore, goes to his new work having a complete familiarity with the conditions under which oil productions must be carried on in Mexico.

In transmitting to Secretary Fisher the resignation of Doctor Hayes, Director George Otis Smith, of the Geological Survey, paid him high tribute, saying in part:

"I deem it my duty to bring to your attention my estimate of the loss which the public service sustains. As his associate for 15 years I know and appreciate the scientific attainment and the administrative thoroughness with which he has devoted himself to the Geological Survey, first as a field geologist, and later as its chief geologist, a contribution that has meant much in bringing the geologic work of the Survey up to its present high degree of efficiency. Doctor Hayes' standard of the highest attainable accuracy and his policy of absolute fidelity to scientific truths, whatever the consequences, have won for himself the respect of his associates, and for the work under his charge the confidence of the public."

Obituary

Eugene Nelson, for a number of years prominently identified with the coal trade of Boston and New England, died Oct. 16, at his home in Malden, Mass. Mr. Nelson was vice-president and sales agent of the Metropolitan Coal Company of Boston.

John R. Walsh, banker, publisher and railroad owner, died at his home in Chicago, Oct. 23. He was an important financial power in Chicago and the Middle West until 1905, when speculations in Indiana coal lands and railroads brought about a collapse of all his interests and led to his subsequent sentence to the Federal penitentiary for misappropriating the funds of the bank of which he was at the head.

Recent Coal and Coke Patents

United States

Mine-car stop; George W. Jenkins and Edward Lowry, of Nelsonville, Ohio. No. 1,004,652.

As shown in the sketch, Fig. 1, this device consists of two cams, mounted on shafts which lie parallel to and just outside of the rails. A spring tends to keep the cams in a vertical position where they act as car stops, the inside face of the cam being curved to suit the car wheel.

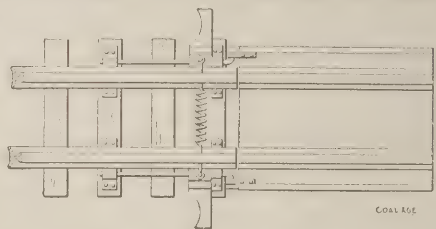


Fig. 1. Mine-car Stop

The cam shafts extend out into an elevator or cage way, and their projecting ends are given a right-angled bend. When the cage descends to a level with the landing, projections on it engage the bent-out portions of the cam shafts and throw the cams down toward a horizontal position, releasing the car.

Rail and rail-tie plate; Harry E. Haight, Marshfield, Wis. No. 1,004,778.

Signaling system for mines; Edgar M. Johnson, Hancock, Mich., assignor of one-half to Ross D. Blackburn, Hancock, Mich. No. 1,004,879.

Axle lubricator; George C. Benjamin and John C. Benjamin, Barre, Vt. No. 1,004,972.

Tie and rail fastener; William G. Lucas, McKeesport, Penn. No. 1,005,050.

Great Britain

An improved apparatus for quenching, screening and loading coke from byproduct coke ovens; J. Mackenzie, Middlesbrough, England. No. 24,086 of 1910.

Improvements in coal-washing machinery; A. Sheppard, Bridgend, Glamorgan, Wales. No. 29,307 of 1910.

Trade Publications

Jeffrey Manufacturing Company, Columbus, Ohio, Catalog No. 26-A, Mine Fans, 6x9 in., 36 pp., contains numerous illustrations and engineering formulas.

Roberts & Schaefer Company, Chicago, Ill., bulletin No. 24, Modern Coal Washing Plants, 6x9 in., 42 pp. A large number of coal-washing installations are described and illustrated.

Ingersoll-Rand Company, New York, pamphlet 6x9 in., 12 pp., descriptive of class "N E-1" power-driven single-stage air compressors.

Yarnall-Waring Company, Philadelphia, catalog 7½x9½ in., 12 pp., descriptive of "Lea" water-flow recorders.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The condition of the coal market is slowly improving as the season advances, and coal men generally appear to have optimistic views for the winter trade. The late season has no doubt seriously affected the market in most sections, but the tonnage reports of the large carriers are equal to or greater than those for the same period last year, which is encouraging.

In the Eastern market, trade is reported good almost without exception. While there is little demand for spot coal, contract is moving well and strike talk may cause an unusually active market this winter. The Lake shipment from Buffalo has been far in excess of any previous season, and demands for anthracite are, in some instances, becoming urgent.

Lake shipments in the middle East are about finished, and no improvement has appeared in the Pennsylvania market, especially the coke trade, which is unusually heavy. The demand for Ohio and West Virginia coals is increasing, with a consequent steadying of prices, and the tonnage report of the Chesapeake & Ohio railroad for August shows an increase of 14 per cent. above that for the same period last year.

The smallest car surplus, since Nov., 1910, is reported at Chicago, and it is said some mines on the Illinois Central have been unable to get cars because of the strike on that line. Trade continues unusually poor in Indiana, with apparently no hopes of improvement.

In the Rocky Mountain States the market is reported normal or active. The strike situation on the Harriman lines remains unchanged, and there is a serious car shortage as a result of which many mines are behind with their orders. The mild weather on the Pacific coast has left conditions unchanged with the market rather dull.

Boston, Mass.

Tidewater prices on bituminous are up, so far as deliveries alongside and on cars are concerned, but the net figures at the mines do not yet show the hoped for improvement. This is due to the volume of coal that is being applied on contracts, and to the continued shortage in water transportation. Current sales of cargoes are so few as to be negligible in amount, and the sharp advance in marine freights has not yet been made apparent to buyers less closely in touch with the market.

There is generally, however, a better tone than last week, and while the weather has been continuously rainy and mild, it is felt that we are now facing the seasonable demand that is always so welcome to the wholesaler. Inquiry for inland shipments is active and we shall soon be settling into a November market. With wise prophets pointing to the thick feathers on the birds, and salesmen making knowing remarks about strike prospects, it is fair enough to say that the fall season will be a good one, both in anthracite and bituminous.

The demand for anthracite is getting to be urgent, and there is delay with almost all the shippers. Barges have been moving very slowly along the coast, there having been just one day during the past week when there was any considerable tonnage arriving. With no longer any inducement in prices for anticipating their needs, many of the smaller dealers had postponed placing orders, with the result now that they are all insistent on prompt delivery.

All-rail bituminous is looking up, and prices are slightly better for spot coal. A good tonnage is coming forward on contracts. Georges Creek is being held at \$1.50 to \$1.60 at the mines, with the better brands of Cambria county, South Fork district, selling at from 10c. to 25c. less.

Pocahontas and New River have been advanced, on cars, Mystic wharf, Boston, and at other points in proportion, to \$3.43 and \$3.53, more nearly the level at which the spring prices opened, but these figures are really no better, from a coal standpoint, than were the prices of a fortnight ago, at 20c. less, that amount representing the recent advance in water freights. Coal, f.o.b. Hampton Roads, remains at or around \$2.50, or \$1.10 at the mines, less the selling commission, not by any means a remunerative figure for some of the mines.

Marine freights from the Virginia ports are now firm at 75c. to 80c., 2500 tons and upward, with very little tonnage offering. It rather looks as if there might be a still further advance, and if there is we are likely to see a more active bituminous market.

New York

Although there is no letup in the demand on contract, the standing tonnage at the New york piers is today somewhat above the amount of the normal supply, and the spot market shows some signs of weakness. As there has been no car shortage to restrict the output, and with the railroad movement prompt, coal is arriving here faster than most shippers are prepared to dump it.

There is scarcely any new business coming into the market at this time, and the trade has to look to contracts for disposition of accumulations. Contract business is heavy enough to keep the better grades of steam coal moving ahead of demurrage, but inferior steam coals, which are not contracted to any extent, are not in so fortunate a position, and shippers of these grades are experiencing difficulty in avoiding detention penalties. At some of the piers where accumulations have been heaviest, those shippers who have brought down more coal than they could readily provide disposition for, have been embargoed.

On the other hand, while the market is so weak for the lower grades of steam coal, it is noticed that some of the shippers of fancy grades of Pennsylvania steam coals are having all they can do to take care of the deliveries required of them on their contracts, and in some instances consumers buying of them have supplemented their supply by purchasing on the market.

Prices, except for free coal on demurrage, show little, if any, change from those ruling for the past two or three weeks, ranging from \$2.35, f.o.b., for West Virginia steam coals; \$2.55 for ordinary Pennsylvanias; \$2.65 fair-grade Pennsylvanias, and \$2.75 to \$2.85 for the better grades.

All-rail business in the territory adjacent to New York City is moving in good volume on contract, but as in the tidewater market, there is but little, if any, spot inquiry, owing, no doubt, to the fact that consumers are receiving from their regular suppliers all the coal needed for immediate use.

Buffalo, N. Y.

The demand for soft coal improves slowly from week to week and is now in a volume to be fairly satisfactory to the trade except for the low prices, which will hardly be likely to advance this fall unless there is a stir in iron, which is not looked for. Many iron manufactories are reporting a good run of trade, and this is enough to satisfy a very fair demand.

The complaint of poor business in soft coal is almost entirely on account of the

small margin of profit to the jobber and still smaller profit to the operator. There is much building on the expectation that the stocking-up demand, against expected labor troubles next spring, will begin soon after the first of the year. This keeps all members of the trade eager to maintain their present tonnage in order to be in close touch with the consumer the moment he begins to lay in a stock to hold till the labor difficulties are adjusted.

The prices of bituminous continue rather weak at $2.50 for Pittsburg three-quarter, $2.40 for mine-run and $2 for slack, with Allegheny Valley 15 to 25c. lower. There is no improvement in coke, which is quotable at former prices, $4.25 for best Connellsville foundry, down to $3.50 for stock coke.

The anthracite circular prices remain without change, but such is the natural demand for chestnut in excess of production that independent mine owners are already sending out notices that they expect to ask a premium for that size in a short time. At present the shortage is almost entirely in the stove size, with egg very plenty.

The Buffalo city market for soft coal holds up well, and there is a steady improvement in the demand for hard coal, though the activity of the natural-gas companies is cutting in on the anthracite trade, especially in the residence districts, where the extension of gas mains is going on at a rapid rate.

The heavy movement of hard coal by lake continues. With about 300,000 tons in excess of any former season to date shipped, the average loading is still more than 100,000 tons a week, which will continue till either the lake season closes or room on the upper-lake docks is exhausted. There is considerable delay in unloading coal at most of the docks on Lakes Michigan and Superior, but it is much more serious in the soft-coal trade than with hard coal as yet.

The movement of soft coal from the mines, which was somewhat interrupted by freshets, has been resumed fully. As a rule the filling of orders is much more prompt than it used to be, for which reason the consumer is carrying only a light supply as a rule, confident that he is in close enough touch with the mines to make this course quite safe.

Philadelphia

There has been practically no change in the retail situation since our last review. All the dealers report good business for the various sizes of coal. Stove is getting to be quite scarce, and dealers' orders are not filled as promptly as they would like. The past week, while not at all cold, at the same time has been damp and gloomy, and a small fire in the furnace has been necessary to keep the house in a good, dry condition. Taking it all in all, the anthracite trade is good.

In the wholesalers, the same optimistic spirit still prevails. All sizes of coal are moving off promptly, and the companies report large increases over their tonnage for the corresponding period of last year. Chestnut coal is moving in such large quantities that if the demand keeps up, stocks will soon be depleted, and the individuals will be asking a premium for their product. Prices, egg and stove, $3.75 at the mines; chestnut, $4; pea, $2; buckwheat, $1.50; rice, 90c. This last size is going to be very scarce this winter, from the present outlook, and it is understood that the companies are very chary about making any new obligations.

There is a slight improvement in bituminous circles, particularly with certain coals. It is understood that some coal was on demurrage at this point, and quite a sacrifice had to be made to move it off. However, this may be only an individual case, as most of the bituminous operators insist on having their orders in hand before shipping the coal down to tidewater, rather than taking a chance on placing the coal in the open market.

Pittsburg

Bituminous — Manufacturing demand for coal has shown no improvement, although at this season there is usually a slight increase in the movement, for the purpose of increasing stocks. Industrial conditions in this district are hardly as good as they were a month or two months ago. The domestic trade has also been slack, dealers buying with a great deal of reserve.

Lake shipments have been greatly curtailed. Instead of the spurt toward the close of the season, which has long been expected, the season is closing unusually early. Less difficulty in securing vessel room is being encountered than was expected, as the iron-ore movement is holding out quite well. Prices continue irregular, and the regular season prices are being uniformly shaded, sometimes to an extreme degree. Slack has not shown the strength which usually occurs at this time, owing to decreased production through the curtailment in shipments of ¾-in. in the lake trade. We quote ordinary market prices, which are below the nominal figures, but are sometimes shaded further: Nut, $1@1.05; mine-run, $1.05@1.10; ¾-in., $1.15@1.20; 1¼-in., $1.25@1.30; slack, 40@50c. per ton at mine, Pittsburg district.

Connellsville Coke—Purchases of odd lots of prompt furnace coke continue at the unchanged price of $1.50, which has represented the market for several weeks. The total turnover in the past fortnight in prompt furnace coke has been somewhat in excess of 5000 tons. Nothing has been done in contract coke, there being very little uncovered consumption for the balance of the year, and this being committed to purchases of prompt coke from time to time. The matter of contracts for the first half or all of next year has not been taken up yet. Furnaces are in no mood to buy, and producers are in no hurry to sell. They realize that it is practically impossible to secure any great advance over the present spot market, and some of them also appreciate that a continuance of anything like present prices will mean financial embarrassment to some of the operators. It is impossible to exist on $1.60@1.65 coke if the coal acreage is carried at the prices which some operations have paid, and in many cases a large proportion of the acreage price paid is carried in bonds. The situation has been growing serious and the outcome is not easy to foresee. There is no influence apparent to put up the price and there is no contract price quotable. Operators would like to obtain about $1.75 for first half, but buyers will not close in the near future at such a price. Foundry coke has been quiet, and remains quotable at $1.80@1.90 for prompt and $2@2.25 for contract.

The *Courier* reports production in the Connellsville and Lower Connellsville region in the week ending Oct. 14 at 310,205 tons, a decrease of 4000 tons, and shipments to Pittsburg, at 3728 cars, 4690 cars to points west, and 1059 cars to points east, a total of 9477 cars, which is a decrease of 150 cars.

	September 1911	Increase or Decrease	January 1 to September 30, 1911	Increase or Decrease
Anthracite coal, short tons	839,754	35,540	8,489,450	450,173
Bituminous coal, short tons	3,629,042	101,838	30,504,343	183,350
Coke, short tons	918,294	13,671	7,880,607	2,311,406
Total	5,387,090	123,707	46,874,400	1,677,883

Columbus, Ohio

The lower temperature which prevailed during the past few days had the effect of making the domestic trade in Ohio more active and brought the market out of the slough into which it was forced several weeks ago by the continued warm weather. As a result orders from dealers are better and the general tone of the market has improved.

The lake trade is continuing active and the records compare very favorably with those of the corresponding period in 1910.

There is some congestion at the docks of the upper lake ports but not sufficient to seriously affect the trade in this State. Up to the present time the New Pittsburg Coal Company has about equaled its lake record of last year, when about 560,000 tons were shipped, and the Sunday Creek Company, is moving slightly more than last year. The Hocking Valley docks at Toledo have loaded 2,058,000 tons since the opening of navigation.

The steam business continues steady but there is nothing to indicate an improvement. Many factories are taking only a small amount of fuel and there is no disposition to stock up for the future. The demands for railroad fuel are not very great as the freight movement is comparatively light at this time.

Operations in the various Ohio fields have been fairly active during the past week, the production being about 80 per cent. of the average. In the strictly domestic fields, considerable activity prevails, and in the fields supplying lake coal there is a good production.

Retail trade is a little better with prices ranging from $3.25 to $3.50. The heavy rains of the past few days have made it difficult to make deliveries and there is a disposition on the part of the large users to wait until later to place their orders.

Chicago

Chicago coal dealers predict a severe cut in car service. The current report of the American Railway Association shows that the total car surplus amounts to 48,854 cars. This is the smallest surplus reported since November 23, 1910. During the two weeks ending Oct. 2 the total car surplus decreased 9528 cars.

The Illinois Central strike situation is still an important factor in the coal trade. Despite statements issued by the company to the effect that business is being handled in the usual way, coal dealers declare that they are not getting the same service that was furnished prior to the strike. It has been learned that some mines located on the lines of the Illinois Central have been unable to move any coal. Before the strike was called Springfield coal was quoted at $1.25 in Chicago and $1.40 in the country. The minimum now is $1.40 with a tendency to add 10c. a ton. As a result of the strike the market has been so strengthened that the country and city prices have reached a parity on the higher level.

Prices direct from the mines in net tons to retail dealers and steam users on spot shipments are as follows:

	Chicago	F.o.b. Mines
Clinton:		
Domestic lump....	$2.17@2.27	$1.40@1.50
Steam lump......	2.00@2.10	1.25@1.35
Mine-run.........	1.77@1.82	1.00@1.05
Screenings........	1.22@1.32	0.45@0.55
Pocahontas and New River:		
Mine-run	$3.00@3.05	$0.95@1.00
Lump and egg....	4.05@4.30	2.00@2.25
Springfield:		
Domestic lump....	$2.22	$1.40
Steam lump......	1.92@2.02	1.10@1.20
Mine-run.........	1.82@1.87	1.00@1.05
Screenings........	1.22@1.32	0.40@0.50
Sullivan County:		
Domestic lump....	$2.35@2.45	$1.50@1.60
Egg..............	2.25	1.40
Steam lump......	2.10	1.25
Screenings........	1.22@1.32	0.35@0.45
Coke:		
Connellsville......	$4.50@4.65	
Wise county......	4.50@4.65	
Byproduct, egg and stove..........	4.95	
Byproduct, nut....	4.55@4.65	
Gas house........	4.95	

Cincinnati, Ohio

The coal situation here is improving. The coal men are picking up orders in larger volume than heretofore, and the indications are that, while slow, there is a general bettering of conditions. The most backward are the fine coals for steam purposes, while the best is in domestic lump, which has revived considerably. This, despite the fact that there has not been the cold weather that is usual at this time of the year.

The only authoritative change in prices recently has been the circular drop in Pocahontas lump from $2 and $2.10 to $1.90 and $2. It is said by some who were opposed to this change in prices that it was unwarranted by existing conditons, excepting internal matters which have come to the surface in spots. In connection with this, it may be said that an official announcement concerning Pocahontas matters of wide importance, would not be surprising within a few days. About Nov. 1 is the date now set, although it may not become effective until the new year.

Charleston, W. Va.

There is some feeling of activity in the coal trade over that of last week, due to the increase in demand for winter shipments. This increase is general—the east and west sharing almost equally. Prices, too, it is claimed, have received a slight boost, but as usual it is almost impossible to ascertain just what the prices are, since there is little attempt at uniformity along that line.

Indianapolis, Ind.

The present condition of the coal-mining business of Indiana is best illustrated by the thousands of empty flat cars on side tracks in the mining districts. As a rule at this season of the year, there is always a fight for empties and charges of partiality and discrimination freely made. Every side track of the coal-carrying railroads has its capacity taxed by empty coal cars, while during previous years the miners have worked nearly steadily during this month.

Viewing the field over, there has been little in the way of diversity in Indiana to stimulate the coal trade during the past week. The operators, however, are optimisitic and maintain the prices at the mine in the face of a small demand. There is apparently no foundation for report that the operators are restricting the output for the purpose of controlling prices. Compared with prices at this period last year, it is claimed that present ones are a shade lower for all grades of coal. With sufficient cars the operators could overship the market, but they naturally have no wish to do so as they are confident there will be a revival of business generally after the first of the year.

St. Louis, Mo.

The higher-grade coals from the Standard field are bringing from $1.75 to $2.25, with the demand slightly increased over that of last week. The middle-grade coals from the standard field, such as Mt. Olive and Staunton, are bringing from $1.15 to $1.35 at the mines, for domestic lump and other sizes are bringing what the market will pay.

6-in. lump	$1.05@$1.15
3-in. lump	0.95@ 1.00
2-in. lump	0.90@ 0.95
Mine-run	0.75
Screenings	0.25@ 0.30

There is very little Springfield coal coming in, and some from Saline county.

The Carterville prices are as follows, f.o.b. the mines:

6-in. lump	$1.40@$1.50
3x6 egg	1.40@ 1.50
No. 1 nut	1.15@ 1.25
No. 2 nut	1.02@ 1.15
Mine-run	1.00@ 1.10
Screenings	0.35@ 0.45

Franklin county coal is selling at the following prices:

6-in. lump	$1.55@$1.65
3x6 egg	1.55@ 1.65
No. 1 nut	1.35@ 1.45
No. 2 nut	1.15@ 1.20
Mine-run	1.10
Screenings	0.50

Colorado

The lump and nut grades advanced 25c. per ton, Oct. 1. The increase has not tended to lessen the volume of trade, as it is evident current shipments are being sold from the cars and not placed in stock. The quantity of storage coal in the territory is comparatively light, and especially in the southern portion is this feature most pronounced. A high percentage of the orders for early delivery are traceable to this district.

The car situation shows no improvement. Available cars are barely adequate to fill orders placed by the mines working on the present basis. Some delay has been reported chargeable directly to car shortage, but of trivial consequence.

Steam orders show a slight gain over the previous week, due generally to the season's advance. However, renewed activity in railroad and industrial traffic is obvious. The sugar-beet plants are now operating and a good many alfalfa mills have al-

ready opened this year's campaign, which will provide a market for considerable steam coal.

No change is perceptible in the coke demand, which is considered normal at this time with prices firm.

Salt Lake City, Utah

There is no relief promised from any source except the weather man, and he has been doing very well for us the past few weeks. The mines are still operating on reduced time, due to a shortage of cars. On Oct. 18, but one mine in the State operated, and that only half a day. Cold weather in Idaho and Montana has increased the demand on Wyoming mines, and they are about 30 days behind orders. This means that Utah will get but little coal from that source.

Local retail trade is consistent with the weather. Stocks are diminishing gradually and a cold snap would be serious. Lump coal at the Utah mines is $2.40, nut $2.15 and slack $1.25. Wyoming lump costs $2.50, nut $2.25 and slack $1, f.o.b. mines. There are rumors of an advance both wholesale and retail, but nothing definite has developed.

New Mexico

The New Mexico mines show but little change in the volume of business over previous week. A slight depression in railroad orders is observed, which is counterbalanced by an increased requirement of commercial coal. Western New Mexico is operating full time with an occasional delay, due to short car supply. The prices in this district advanced 25c. per ton, Oct. 1, and remain firm with a constant demand.

Portland, Ore.

This week brought almost summer skies and summer sunshine; hence the consumers are not giving serious thought to the fuel problem as yet. Prices remain the same as last week and there is no indication of an immediate change. Only a severe and long cold spell will have the effect of driving values high this winter, for much fuel has been put in during the summer. No new cargoes have been reported as listed for this port at Australia, the number of vessels on the board reported as heading for this port being only three or four.

Following are the prices asked here, per ton, including cost of delivery to points within the city proper:

Japanese	$7.50	
Washington lignite	$7.00@ 7.50	
Australian	10.00@10.50	
Rock Springs, Wyo.	10.00@10.50	nut $9.50
Diamond, Wyo.	10.00	
Carbon Hill, Wash., lump	10.50	
Carbon Hill, steam	7.50	
Newcastle, Wash.	7.00	
Beaver Hill, Ore.	9.00@ 9.25	
Blacksmith coal	17.00	

San Francisco

The arrivals of coal for the past week by water are as follows:

British Columbia	1850 tons
Newport News (for U. S. Navy)	5768 tons
Total	7618 tons

Market conditions have not changed during the past week, and continued warm weather, the warmest of the year, has caused a decrease in domestic consumption. Retail dealers, taking advantage of the fair weather, are stocking up for their winter supply.

The effect of the railroad strike of shopmen is, as yet, scarcely felt in the coal market. Coal, being an imperishable article, would be one of the first commodities to be sidetracked in case of lack of motive power or other equipment, but up to time of writing it seems to be coming through on regular time.

Prices for the week remain unchanged, and are as follows, per short ton:

Wellington—clean	$8.00
Wellington—average	7.50
Australian—clean	8.00
Australian—average	7.50
Seattle—clean	6.50
Seattle—steam	5.00
Utah, Wyoming and New Mexico—clean (for domestic use only)	8.15
Pennsylvania anthracite	15.00
Welsh anthracite	13.50
Colorado and New Mexico anthracite	12.50
Cumberland—smithing	12.50

The inquiry for steam coals remained quiet, and with supplies of both large and small still in excess of requirements, prices tend to further easiness. A comparison of exports for 1910 and 1911 shows but little change. Quotations are approximately as follows:

Best Welsh steam coal	$4.02
Seconds	3.72
Thirds	3.66
Dry coals	4.08
Best Monmouthshire	3.72
Seconds	3.60
Best Cardiff small steam coal	2.10
Seconds	1.86

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage, and for cash in 30 days, less 2½ per cent.

For prompt loading admiralty steams fully maintain their position, while the cheaper classes of large, in view of a better inland demand, are now firmer. Smalls of all classes are, however, exceptionally weak.

For forward delivery business is difficult to arrange in view of the possibility of further labor troubles.

Total exports of coal from Great Britain for September with comparative statement with September of last year was as follows:

	September		First 9 Months	
	1910	1911	1910	1911
Total anthracite	215,595	217,319	1,812,352	1,762,204
Total steam	4,096,835	4,289,349	33,831,913	34,735,081
Total gas	1,012,224	918,305	7,711,341	7,743,871
Total household	157,690	124,479	1,118,538	1,098,581
Total other sorts	228,762	238,198	2,050,733	2,278,953
Totals	5,711,106	5,787,650	46,524,877	47,618,690
Total of coke exported	87,409	94,403	658,378	711,697
Total patent fuel exported	101,402	118,799	1,139,144	1,236,582
Total coal, coke and patent fuel	5,899,917	6,000,852	48,322,399	49,566,969
Coal, bunker, for foreign trade	1,789,126	1,681,507	14,528,745	14,346,947

British Coal Market

There are many causes which made the condition of the British coal industry rather a disturbed one. There is a shortage of railway equipment, an inadequate supply of shipping tonnage available, the labor outlook is uncertain and there is still a sudden and sharp demand for house coals. The last feature of the market is growing less as the public needs are supplied, but manufacturers and industrial concerns are still stocking against emergencies.

On the whole the markets are much firmer, the output big and future prices are considerably enhanced as compared with the prices ruling a year ago; there is an advance of about 48c. per ton all around. Patent fuel and coke trades are practically stationary, as they have been for some time past, while pitwood is very irregular.

German Coal Trade

Coal production of the German Empire for the eight months ended Aug. 31, is reported as follows, in metric tons:

	1910	1911	Changes
Coal	99,719,729	106,176,645	+6,456,916
Brown coal	43,948,178	46,897,544	+2,949,366
Total mining	143,667,907	153,074,189	+9,406,282
Coke trade	15,373,605	16,631,800	+1,258,195
Briquets trade	12,593,688	14,044,936	+1,451,248

Of the briquets reported this year 10,760,172 tons were made from brown coal or lignite.

The foreign coal trade of Germany for the eight months ended Aug. 31 is reported as below, in metric tons:

	Exports	Imports	Excess
Coal	17,340,092	6,981,230	Exp. 10,358,862
Brown coal	38,478	4,544,188	Imp. 4,505,710
Coke	2,965,933	402,626	Exp. 2,563,307
Total	21,942,389	12,068,744	Exp. 9,873,645

The exports this year included 8161 tons of coke to the United States.

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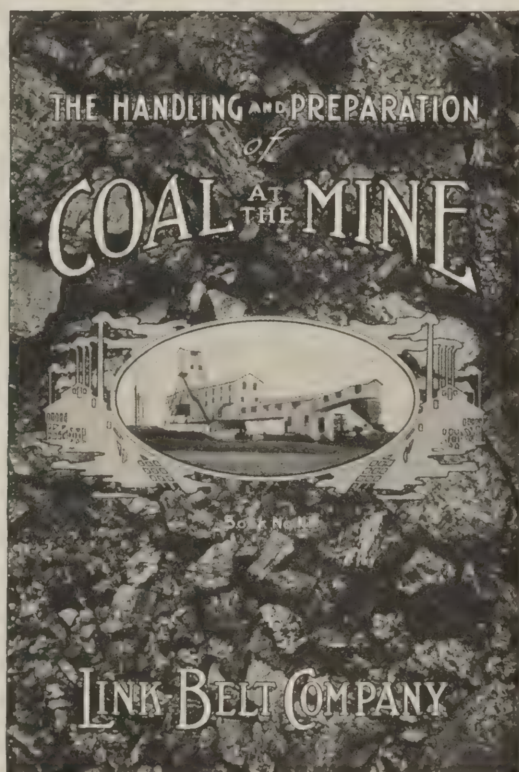

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Alphabetical Index to Advertisers

Classified Index to Articles Advertised

POSITIONS VACANT

Advertisements under this heading 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Wanted—Mining engineer for operating coal property in western Pennsylvania; must have had experience in Pittsburg coal district; state training and experience. Address Box 1, care COAL AGE.
Oct. 28.

Moments with the Advertising Editor

A Department for Subscribers Conducted
by the Service Department of Coal Age

"Anybody who can write, can write an advertisement. But the question is whether it will sell anything or not," was the statement of one of the biggest general-magazine advertisers of the country the other day.

Is this a fact?

Is a set of rhymed words that looks like a poem when printed on a page, but that never stirs anyone to an iota of feeling, a poem? Is a brain which never thinks, a brain? Is a salesman who never sells anything a salesman?

We don't think so; neither do we think a half-page or a page or a double page of words about something that is to sell, but which never induces anyone to buy it or investigate it, an advertisement.

An advertisement means at core a thing that makes somebody *turn to* something.

If the advertisement is worth its name, it will *turn* certain people who are interested in that class of goods to the particular representative of that class it refers to. It turns them because it makes them see in that product some certain characteristic that, they think, would constitute it their most profitable investment. And if the investigation verifies this impression, such "turnings-to" mean sales.

That is an advertisement.

And herewith another thing becomes apparent:

A real advertisement cannot be written about inferior goods.

When you see an advertisement, so called, that is all vacuous general statements, you can be sure of one of a brace of things:

Either the subject under discussion won't bear scrutiny.

Or the author of the copy didn't know how to write an advertisement.

You can't go to particulars about goods whose makers have spent most of their time in building up the glossed-over impression that their goods are as good or better than the next man's "because they are." It is the particulars behind the "because" that the latter-day buyer is wrapped up in.

Particulars sting down to those little differences, *and to the big differences which the little ones hide*, that appeal to the man who thinks before he acts, and who pays small attention to an advertisement that does not make him think. Such a man is quite apt to believe that "wide-as-the-sky" statements are the refuge of the lagger.

Of course they may not be.

Poor advertisements can be written about good products, and those same goods sell mightily, too. They may have no competition, or no competition at all in quality, or else the sales may be impelled by costlier ways of publicity for which, as we said last week, the buyer foots the bill in the end.

All this gets us to our point:—

COAL AGE advertisements not only tell the truth, *but most of them tell it so as to bring action.*

"Two and two make four" is true enough; but its repetition has no value—it *does* nothing.

"This machine is right for you because it is this and this, and this, and does this"—*that* can be both true and be written in such a way as to create instant desire to see, to investigate, to buy that machine.

We, the Service Department men who write COAL AGE advertisements, are trained to take advantage of this one big opportunity—that, in the case of a specialized paper like COAL AGE, every individual of our multiplied print-salesman goes *direct to a buyer or a person concerned or interested* in the buying of the thing advertised. We know every lost word may mean a lost sale

We write these advertisements fully as much to serve you as to serve the advertiser whose goods they describe. There is where the full idea of "service" comes in.

When we put together a convincing advertisement that turns you to investigate something in COAL AGE Selling Section and then, quite likely, to buy that thing, we perform a service for you by getting you to as efficient, or the most efficient machine, appliance, whatever it be, that the market can give you—without the "exploration-worry" on your own part after a thing that is at once reliable and suited for the immediate purpose.

COAL AGE advertisers hand over to us the writing of their advertisements because they feel we can do it most effectively; they give us their confidence.

And just as this confidence is thrown to the winds unless we write these advertisements effectively, convincingly, so this effectiveness goes to the winds unless the advertisements are *read.*

But when COAL AGE was projected to meet the need in the coal-mining field for a weekly paper for the ambitious miner, the progressive mining man, advertisers who bought space in COAL AGE knew their advertisements would be read as long as COAL AGE made good on its promises and so held the men it was built to appeal to and hold.

You are that progressive mining man, that ambitious miner. COAL AGE advertisements are for you, and when you read them and act on them, *you serve yourself.*

CA

Mine Safety Number

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 4.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, NOVEMBER 4, 1911

Ten Cents per copy.
U. S. and Mexico, $3 per year.
Canada, $4; other Countries, $5.

CA

COAL AGE

Vol. 1 NEW YORK, NOVEMBER 4, 1911 No. 4

THIS is no fable designed to convey a moral; nor is it fiction built from imagination; it is a brief recital of experience common to many coal men.

———o———

One evening, several years ago, I was sitting in my office poring over a map and figuring some way around a fault that had cut off our best coal. Of a sudden, the mine on the hill, 1000 ft. above, exploded. I jumped to the door; the mouth of the main entry was belching fire; the valley lighted up as though it was day, and the air filled with timbers, cars and coal.

Only the night shift was underground, but at such a time we don't figure whether half-a-dozen or half-a-thousand lives are at stake.

Soon the fan was running, a rescue party formed and messages despatched for help and material.

The mine was an open-light operation; in fact only a few safety lamps were available in the camp. Rescue apparatus had not been introduced in America, and the first-aid movement was only in its inception, so that no trained corps were available.

Men never worked harder than the fearless fellows on that rescue party. Each individual was striving in a common cause—the saving of human life. There was no thought of recompense, and less of personal danger. Even wives and children were momentarily forgotten.

For six hours the party worked with frantic haste, realizing each moment was precious. Ears were strained for the slightest sound of life on ahead. Brattice after brattice was built, and the air was pulling strong up to the point the rescuers had reached. When—

Without warning, there was a second explosion, and of all the volunteers who went underground that night only three live to tell.

Since then, I have been present at a number of mine disasters and have looked on the bodies of many victims, but the faces of the men who served on this, my first rescue party, are ever vivid in memory.

———o———

Regret is futile, and mistakes are but lessons in wisdom. The past cannot be changed; only the future is in our control. Still I often think how differently I would act now, and how unnecessary was the sacrifice of all those lives.

There would be no open lights in that party, no matter how strong the air-current, if the chance to serve came again tonight. Pell-mell haste would be forbidden, and I would fell or shoot the first man to disobey an order or venture ahead on his own responsibility—better one man die than a dozen.

It would be easy to fill a page telling what course I would now pursue; however, this is to be a reminder rather than a sermon.

You know that most of our misfortunes in the mines result from a disregard of common knowledge, a violation of elementary principles, or, last and greatest, a hasty and mistaken show of bravery.

We are fully aware of the dangers to be encountered, and many understand the technology of gas and dust explosions. What we lack most is courage—not courage to go underground and face the dangers, but a more heroic type that refuses exposure to needless danger.

Courage without wisdom is mere boldness, and this sort defeats itself. Be sure of the men you are with; your party as a whole is only as safe as the most ignorant and most careless member. *In many instances, more men have perished in the attempted rescue than were killed in the initial explosion.*

Work and Purposes of Mining Bureau

The Federal Bureau of Mines, with Joseph A. Holmes as its director, on July 1, rounded out the first fiscal year of its existence. It has been a year fraught with effective organization, and big accomplishments. It may seem hardly fair to say the latter, for it must be remembered that the Bureau of Mines is the successor to the Technologic branch of the United States Geological Survey, and that its work was but a continuation and enlargement of the problems outlined several years ago by Doctor Holmes as head of this branch. The real work of the Bureau of Mines has therefore been going on since 1907 which will be remembered as the darkest year in the history of American coal mining, the aggregate number of deaths in accidents reaching a higher total than ever before.

Loss of Life in the Coal Mines

The most important problem before the Bureau of Mines is an attempt to reduce the number of deaths in the mines and it is gratifying to note that in the last three years for which statistics are obtainable, there has been a decrease in the number of fatalities amounting to 25 per cent. In the year 1907, three thousand one hundred and twenty-five miners lost their lives, or 4.86 in every 1000 employed. In 1909, the last year for which there are official statistics, the number of deaths was 2412 or 3.62 men in every 1000 employed.

The record of the three years is as follows:

Year	Killed	Injured	Death Rate per 1,000 Employed
1907	3,127	5,316	4.86
1908	2,451	6,772	3.60
1909	2,412	7,979	3.62

As the year 1907 was the greatest in the history of American coal mining in the amount of tonnage and the number of men employed, it has been argued that the reduction in the number of deaths in the ensuing years may not be taken as an accurate criterion of improvement in conditions. However, the number of tons of coal mined for each life lost in the three years shows conclusively the betterment of conditions. The statistics are as follows:

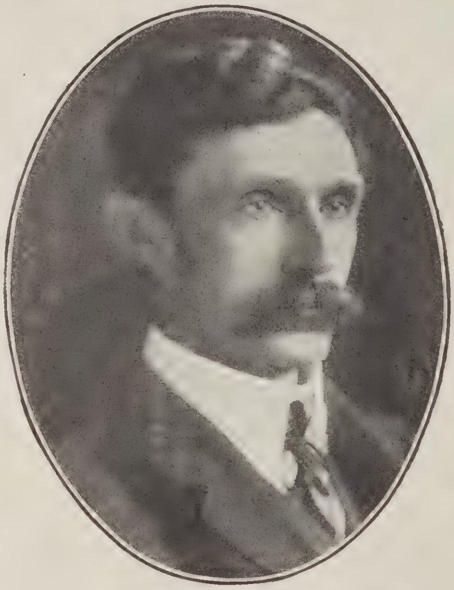
1907	145,471 tons
1908	167,545 tons
1909	186,567 tons

Still another way of showing the improvement is by the number of lives lost for each million tons of coal mined during 1907, 1908 and 1909:

The Bureau of Mines has made many important original investigations. Not less important has been its educative work, resulting in many economic and safety developments. It has been of much practical assistance in mine explosions.

1907	6.80
1908	5.96
1909	5.36

The Bureau of Mines does not pretend to take all the credit for this reduction in the number of deaths in the mines. The agitation which followed the four explosions in December, 1907, in which more than 700 men were killed, undoubtedly brought forth a new sense of responsibility upon the part of both the operator and the miner. This led to a more serious realization of the dangers that lurk underground and a desire to find the remedy.



J. A. Holmes, Director of Bureau of Mines

Explosibility of Coal Dust

The Bureau of Mines has performed no service better for the country than drawing attention to the fact, little credited at that time, that coal dust in a bituminous mine is more dangerous and more deadly to the miner than gas. Heretofore it had been believed that firedamp was the greatest menace of the mines and but little effort was made to prevent the accumulation of coal dust. Although many miners and mine operators believed the dust of bituminous coal would ignite from an explosion of firedamp, nearly all of them contended that the dust in a mine free from gas would not explode. Consequently in many mines where no firedamp would ordinarily be detected, miners paid little attention to coal dust, and in some of these mines terrible explosions have taken place.

The confirmatory demonstration to the American public by the Bureau of Mines that coal dust was the greatest menace to the mines called attention to another important phase of the problem, known indeed before, but none too generally. The most serious disasters had occurred more frequently in bituminous mines in the late fall and winter than during late spring and summer. The experts directed attention to the fact that the mines were drier in the winter than in the summer and therefore the coal dust was more liable to explode. They explained that cold air holds less moisture than warm air. The cold air, entering the mine to ventilate it, takes up the natural warmth of the mine, is raised in temperature to such a degree that it absorbs the moisture and passes out carrying the moisture with it. This process continues until the mine, including the coal dust, is perfectly dry. Such a condition makes a mine ripe for an explosion.

This information was important, because it told the operators and miners when it was necessary to take the greatest precautions.

Remedies for Coal Dust

The Bureau of Mines did not stop with the declaration that dust in bituminous mines was the greatest danger, but set about at once to find remedies. These were promptly given to mine operators and miners, with the result that in many mines, excellent precautions are being taken to prevent such explosions.

The first recommendation was the use of such explosives as the Bureau of Mines declared on examination to be reasonably safe in mines where either gas or dust is found. The use of black powder in dangerous mines was strongly opposed, as in every instance where black powder was used in the experiments, it exploded the gas or coal dust. Operators were requested to use only short flame explosives in dangerous mines.

The experts also urged that all dusty mines be kept wet, either by spraying water, or turning exhaust steam into the ventilating current, keeping the air

in the mine humid. In a bulletin published and sent to miners and operators, the experts stated: "There are two ways of keeping coal dust from being dangerous. One is to wet it; the other is to mix or cover it with rock or shale dust, clay or sand. If the coal dust is wet enough it will not ignite; if there is enough unburnable dust mixed with it, a flame will not spread."

Many mine owners adopted these precautions and State mine inspectors have insisted upon their use in mines they deemed dangerous. State Mine Inspector Laing, of West Virginia, in a recent statement declared that as a result of using the explosives recommended by the Bureau of Mines and the wetting of the mines in his State, there had not been a life lost from gas or coal-dust explosions in 17 months. This record has never before been equaled in the coal-mining history of his State.

Experimental Coal Mine

One of the real achievements of the Bureau of Mines has been the establishment of an experimental mine at Bruceton, Penn., 12 miles from Pittsburg, Penn. Other coal-mining countries have been talking of the necessity for such a mine for some years, but it remained for the United States to take this important step first.

The experimental mine was found to be an urgent necessity if the tests into the explosibility of coal dust and gas were to be carried to a successful conclusion. It was demonstrated in the experimental tube or gallery that coal dust would explode, but there were serious limitations placed upon the tests owing to the fear that the gallery would not stand the force of big explosions. Under the strain of certain tests at European stations, the galleries were destroyed.

Many who witnessed the coal-dust experiments at the Pittsburg station were anxious to have them made on a larger scale than is possible in experimental galleries and also to have the tests made under actual mining conditions. It is reasoned that when the exact conditions under which explosions take place are understood, tests of various preventative measures can be undertaken with some degree of precision. The experimental mine, which will soon be ready for tests, will be opened for a while in the same manner as many other mines, with all the bad practices that are found in mining—just to see what the results will be. The experts of the bureau have defined a number of these bad practices and they intend to prove in this mine that they are bad. All the remedies proposed by the engineers for removing the dangers of coal-dust explosions will be tried in the mine, in order that their efficiency may be demonstrated beyond all dispute.

A secondary purpose of the experimental mine will be a study of the explosives that have been placed on the permissible list for use in gaseous and dusty mines—testing them under actual working conditions in coal. Still another purpose will be the testing under mine conditions of gasolene motors to determine the safety of the apparatus in actual use. It is probable that many devices will be tested under actual service, and also tests made of the insulation of wiring. It is believed that the miners and operators will place more faith in the tests conducted in a mine under mining conditions than in the experimental gallery. Some have maintained that what happens in the experimental gallery does not happen in a mine.

Interior Mine-rescue Car

Raising Man from Electric Wire

The Testing of Explosives

It should be explained here that the Bureau of Mines has a completely equipped experiment station at Pittsburg, Penn., situated on the Arsenal grounds, Fortieth and Butler streets. Here the various explosives used in coal mining are tested to determine which are the safest to use in dangerous mines.

When the Government took up the investigation of explosives, it found such variation in the strength of the explosives and such reckless use of them in many of the mining fields that it might be said the miner took his life in his hands almost every time he touched off a fuse.

Not only were the explosives extremely dangerous in themselves through their variability, but they were oftentimes used in such large quantities as to preclude

the possibility of safety. The mortality statistics prove this contention. Fifty per cent. of all the fatal accidents and 39 per cent. of the non fatal accidents are the result of falls of roof and coal. In European countries the number of accidents from this cause is much less, which leads to the conclusion that in the United States the very great disturbing and jarring effect which the discharge of large amounts of explosives in a mine exerts is one of the most important factors which bring about the fall of roof and coal. It is believed that although the actual fall of rock or coal may not occur at the time of firing the charge, the heavy shot weakens the walls and roof, so that months after, without warning, it falls.

With such conditions to contend with, the Government proceeded to standardize explosives and to find out just what types were comparatively safe for use in mines that contained gas or coal dust. Manufacturers of explosives were invited to send in their explosives to be tested and they responded readily. The tests were conducted in the great steel cylinder, 100 ft. long and 6 ft. in diameter, the explosives being fired by electricity into gas or coal dust, or both gas and coal dust. Those explosives that did not ignite the gas or coal dust, after repeated trials, were passed upon as "Permissible Explosives" and recommended to the various State mining bureaus, coal-mine owners and miners, as being reasonably safe.

The tests brought out conclusively that it was exceedingly dangerous to use black powder in dangerous coal mines. In repeated tests the black powder never failed to ignite the gas or coal dust. This information was given to the operators and miners and there was the immediate abandonment of the use of black powder by many operators. It was shown to both miners and operators that with equal quantities of permissible explosives and black powder, the flame of the black powder is more than three times as long and has a duration of from 3000 to more than 4000 times that of one of the permissible explosives, and the rate of explosion is similarly slower. The length of flame is an important consideration in the relative safety of a powder, the longer flame and the flame of longer duration having just so much more opportunity to ignite the coal dust or gas.

As a result of the Government's efforts, the use of black powder in dangerous mines has been prohibited in certain States and in other States operators are using the permissible explosives voluntarily. In 1908, the coal mines used 2,000,000 lb. of short-flame explosives; in 1910 they used almost 12,000,000 lb. which is more than is now being used in Great Britain after many more years of experience. Perhaps nothing so much as these figures shows the splendid coöperation between the operators and this bureau. The continued use of the permissible explosives will have an increasingly good effect as time passes.

Mine-rescue Work

Since the bureau was organized, it has placed seven fully equipped rescue cars in the principal coalfields of the country. One car has headquarters at Wilkes-Barre, Penn., a second at Trinidad, Colo., the third at Evansville, Ind., the fourth at Rock Springs, Wyo., the fifth at Billings, Mont., the sixth at Huntington, W. Va., and the seventh at Pittsburg, Penn. In addition, the bureau maintains rescue stations at Pittsburg, Penn., Knoxville, Tenn.; Birmingham, Ala.; Urbana, Ill.; McAlester, Okla.; and Seattle, Washington.

Each rescue car is in the immediate charge of a mining engineer, who has with him a miner trained in rescue work and another trained in first-aid-to-the-injured methods. In time of disaster, the first miner, who is the foreman of the car, has charge of all rescue work. Each station is in charge of a foreman who is a practical miner, trained in rescue work. The stations and cars have complete outfits of oxygen helmets, which permit breathing for two hours in deadly atmospheres; oxygen reviving apparatus used in bringing asphyxiated miners back to consciousness; a collapsible steel cage to take the place of one shattered by an explosion; a portable telephone for use in the mine; safety lamps, etc.

Within the last twelve months 5000 miners throughout the country have been thoroughly trained in rescue work and many have been given certificates of efficiency. These men will volunteer their services whenever there is a disaster.

Each Bureau of Mines rescue car has a specified territory over which it travels, visiting the mining camps. At each stopping place, demonstrations in the use of the oxygen helmet are given, also lessons in first aid to the injured. In the evening, the mining engineer gives an illustrated lecture to the miners on greater safety in mining. Thousands of miners have attended these lectures in the last few months and have gone back to their hazardous work with a keener sense of its dangers, a desire to be more careful and to live up to the precepts of good mining. All of this must necessarily have a salutary effect.

Interior of Rescue Room at the Pittsburg Station

First Aid to the Injured

More than 5000 men are injured in the coal mines of the United States every twelve months. Some recover sufficiently to return to work, but several regiments of men are so maimed and crippled each year as to be useless to themselves and burdens to their families. Many of the injured men who are taken from the mine die later, perhaps within a few months. In quite a few instances, the death of these men or their crippling for life is due to the fact that they did not receive intelligent emergency treatment at the time of the accident.

It is to better this condition of affairs that the Bureau of Mines carries on each car, a practical miner trained in first-

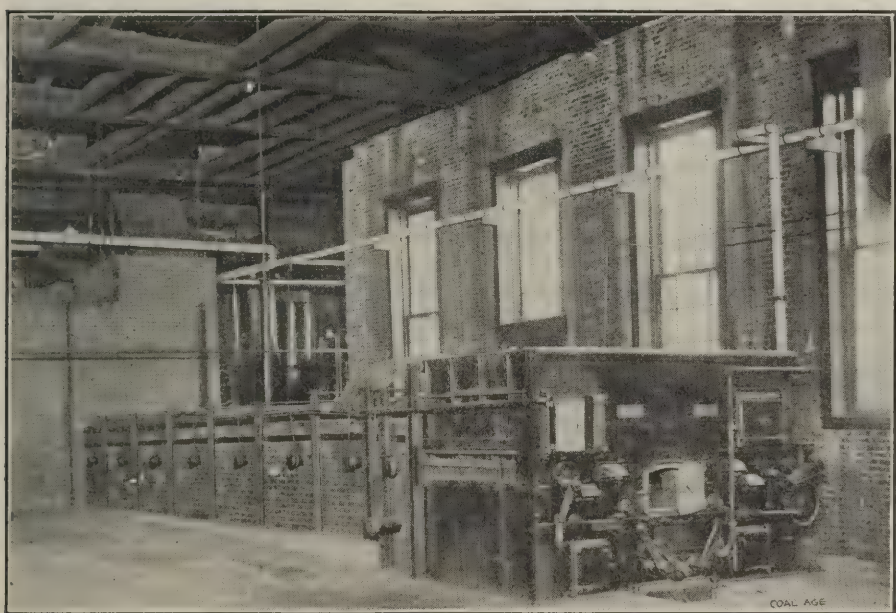
aid-to-the-injured work. This employee, while not engaged in actual rescue work, teaches the miners how to care for an injured comrade. Simple lessons in bandaging wounds and providing splints for broken legs are given at every mining camp visited. The miners are taking special interest in this feature of the work and it too promises to have an important bearing on the reduction of the death rate.

When the Government started to demonstrate the need for rescue work in the coalfields, rescue apparatus such as the oxygen helmet, which permits artificial breathing in poisonous atmospheres, and oxygen reviving apparatus to bring asphyxiated miners back to consciousness were practically unknown in the United States. Today, there are more than 300 oxygen helmets throughout the country, some belonging to the Bureau of Mines, others to State mining bureaus and still others to various coal companies. In the last two years, between 30 and 40 coal companies have purchased full rescue equipments and have crews thoroughly trained in rescue work. All of this is the result of the work of the Bureau of Mines. The Frick Coke Company, employing 30,000 men, has established a complete rescue station near Connellsville, Pennsylvania.

The Consolidation Coal Company, another big concern, has established a rescue station at Fairmont, West Virginia.

A third station has been erected at the Marianna mine in Pennsylvania by the Pittsburg-Buffalo Coal Company. Altogether it is believed 50 operators have established stations. In addition, the States of Illinois and Kentucky have established rescue stations and Illinois has mine rescue cars at its established centers. Ohio is about to equip a number of rescue stations. There are also a number of rescue cars owned and operated by the coal companies, one in the anthracite region, one in Colorado, the property of the Colorado Fuel and Iron Company, and one in Tennessee, the property of the Tennessee Coal and Iron Company.

The various rescue corps of the bureau have done valiant service at a number of disasters. Altogether it is estimated they have been instrumental in saving more than 25 lives during the year. This is the direct result. It is impossible to tell how many lives have been saved by the miners who have been trained in efficient rescue work by the Federal rescuers, and, after all, that is the real purpose of the Bureau of Mines rescue service. In many instances it is not to be expected that the rescue cars can arrive at the scene of a disaster in time to be of service, on account of the distance to be traveled, but the miners can be trained to conduct the rescue work themselves.



Murphy Smokeless Furnace Having Long Combustion Chamber

The Bureau of Mines and the Miner

In addition to carrying the educational work to the miners at the mines by means of the rescue cars and substations, the bureau has recently begun the publication of a series of circulars written in plain, nontechnical English for the benefit of the miners themselves. Two circulars have already been issued, one describing the permissible explosives and how they should be used, and another explaining the dangers of coal-dust explosions and how to avoid them. These circulars are now in the hands of several thousand mine superintendents, firebosses and miners and they are being sent out each day to those who apply for them. That these circulars are deeply appreciated by the miners is attested by the hundreds of grateful letters that have been received by the bureau within the last few months, mostly from the miners themselves, but many from operators and owners.

The bureau is also publishing bulletins, for the benefit of the operators, mining engineers and superintendents. These publications are of a more technical nature. They, too, are in great demand.

The increasing requests for all the publications of the Bureau of Mines are a true index of the interest that is being taken in the work and also a potent evidence that conditions are improving.

The Fuel Investigations

The investigation of the fuel resources of the United States is one of the serious and important problems of the Bureau of Mines. No nation can be great and prosperous without an abundant supply of fuel. Some countries have awakened to this fact too late, but the United States, with its usual foresight, has begun important investigations in plenty of time to conserve the supply. But the investigations into the waste in the mining of coal and the waste in the consumption of coal have not begun too soon. The fuel resources of this country are being used and wasted at a tremendous rate. The consumption of coal in the United States has doubled with every decade since mining began. Without a decided lessening of the present rate of coal consumption, either through more efficient use of this fuel or the extensive development of substitutes for it, the middle of the next century will find the nation's supply of easily workable coal so largely depleted as to bring serious hardships and a curtailment of manufacturing industries. The waste of the fuel resources is perhaps more serious than other resources, for the timber when gone can be replenished, the fertility of the soil can be restored, but when coal is gone, it is gone forever.

The total production of coal in 1909, the last year for which official figures are obtainable, was 460,000,000 short tons.

Investigations into the waste of coal in mining have shown the enormous extent of this waste, aggregating probably 200,000,000 tons yearly, of which at least one-half might be saved.

Waste of Coal in Power Stations

No accurate estimate can be made as to the total unnecessary losses in connection with the use of coal for different purposes, but lines of urgently needed investigation and inquiry are indicated by the facts that in the vast majority of the power plants of the country less than 10 per cent. of the heat units in the coal are converted into actual work.

From the 40,000,000 tons of coal which are converted into coke each year, by-products are wasted, which, if completely

saved, would have an aggregate annual value of more than the coke itself. This would include sulphate, 2,400,000 tons, sufficient to fertilize our farms, creosote for the preservation of our timber, and pitch enough for briquetting our slack coals, roofing our houses and repairing some of our roads.

It is of the utmost importance to the nation as a whole that our fuel supplies be used without unnecessary waste and with the highest obtainable efficiency, in order that it may decrease rather than increase the cost of power, heat and light to the American people, in spite of the necessary future increase in the cost of mining operations resulting from sinking deeper shafts and taking coal from thinner seams. These are the reasons for the fuel investigations of the Bureau of Mines.

The investigations which are now being conducted at the Pittsburg plant of the Bureau of Mines are being directed toward the decrease of the great waste, not only in the mining but chiefly in the utilization of the coal which the United States owns or purchases for its use. This is being accomplished by testing coals under various conditions, in various types of boiler furnaces, in pressure and suction gas producers supplying the gas for the operation of gas engines, and by making the coal into briquets and testing their efficiency in various methods of combustion. The results so far indicate that the U. S. Government, which purchases $10,000,000 worth of coal each year, and the public who buy nearly $2,000,000,000 worth, may ultimately save from 5 to 10 per cent. on their fuel bills as a result of these investigations. If the economy reached but 5 per cent this would mean a saving of $500,000 to the Government each year and $100,000,000 to the public.

Purchase of Coal on Specifications

As a result of the plan perfected several years ago by the Technologic Branch of the Geological Survey and being carried along by the Bureau of Mines, there has been a wide awakening upon the part of the large consumers of coal and the public generally as to the best method of purchasing coal.

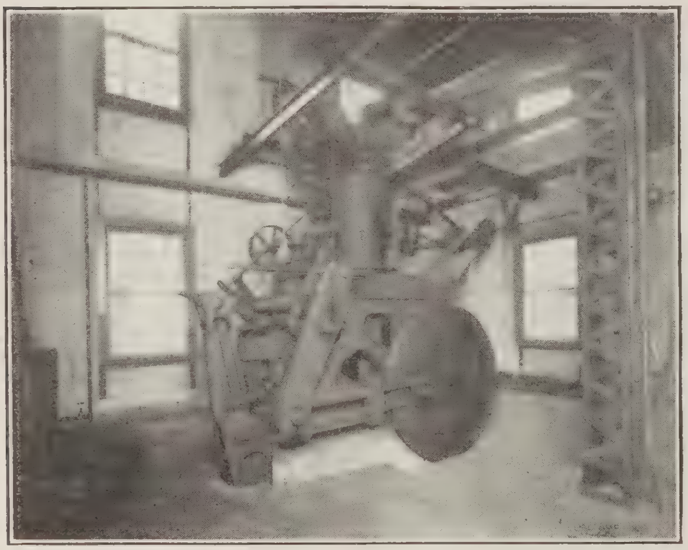
In the past everyone bought coal on the statement of the dealer or the reputation of the coal without asking anything in particular about the heating value or the amount of impurities in it. Now the Government and many of the large consumers are buying their fuel supplies on specifications which fix the amount of ash and moisture in the coal. Under these specifications, premiums are paid for coal better than the standard and penalties are demanded for coal below the standard. Under this system, the Government and big manufacturing establishments have been getting more nearly what they have been paying for and paying for what they get. The system is not only fair to the purchaser of coal but also to the seller, for if the latter has a high grade of coal he gets full value for it. The fuel bill of the Government now aggregates about $10,000,000 yearly, the saving on which, through securing coal containing less ash, alone amounts to nearly $200,000.

As a result of the example of the Bureau of Mines, many large corporations throughout the country are now buying their fuels on specifications. This plan has met with such high favor that fuel-engineering companies which test coals are found in practically all the large cities of the country.

The Gas Producer and Gas Engine

When the Technologic Branch of the Geological Survey began its investigations to increase the efficiency with which fuels are used, it had installed at its plant a gas producer and a gas engine of 250 h.p. The gas producer and engine were hardly known in this country at the time, but experiments in Europe had indicated the ability of the producer to turn coal into gas at little cost and to produce power through the gas engine economically.

The tests by the Technologic Branch and the Bureau of Mines have not only demonstrated that the gas producer and engine are cheap producers of power but have also shown that many fuels of such low grade as to be worthless for steam-power purposes may be economically converted into producer gas and may thus generate sufficient power to render them of high commercial value. Coals containing as much as 45 per cent. of ash, and lignites and peat high in moisture have been successfully converted into producer gas, which has been used in operating gas engines. The tremendous saving of the fuel resources of the country through the utilization of these low-grade fuels can be readily seen.



English Briquetting Machine

Gas Producer

Coal Doubles Its Service in a Producer

It has been estimated that in each test there was developed from the coal in the gas-producer plant an average of 2½ times the power which would have been developed if used in the ordinary steam-boiler plant, and that these relative efficiencies will probably hold good for the average plant of moderate power capacity, though this ratio may be greatly reduced for large steam plants of modern type.

It was found that the low-grade lignites of North Dakota developed as much power when converted into producer gas as did the best West Virginia bituminous coals when used under the steam boiler. In this way, lignite beds underlying from

20,000,000 to 30,000,000 acres of public lands, supposed to have little or no commercial value, are shown to have a large value for power development. This is of importance to the West and makes possible a great industrial development there. As a result of the investigations of the Technologic Branch of the Geological Survey and the Bureau of Mines, many large gas-producer plants have been installed throughout the United States.

The Briquetting of Coal

Another important feature of the work of the Bureau of Mines in conserving the coal supply, is the manufacture of briquets. These are composed of waste bituminous or anthracite coal mixed with 6 to 7 per cent. of gas pitch, the whole pressed into cakes or briquets by powerful machinery. Briquets have been used in foreign countries for many years with much success.

Briquets, in addition to affording a means of utilizing the waste coal, have a number of advantages over coal. They value and thus reduce the cost of transportation.

The Bureau of Mines has just completed a series of briquetting tests using lignite from California, Texas and North Dakota, that promise much to the people of the West. The lignite from these States, which is a form of coal, has been of little value because it cannot be transported far from the place where it is mined. The lignite, shortly after mining, slacks and crumbles into dust. It is also difficult to burn near the mines because of the great amount of moisture it contains, sometimes as much as 30 and 40 per cent. The Bureau of Mines has succeeded in briquetting this lignite without the use of a binding material and at a cost that makes it commercially possible. Some time ago, the bureau in a series of experiments at the Reclamation Service pumping plant at Williston, North Dakota, demonstrated that the raw lignite could be satisfactorily burned under boilers, by turning it into gas. The results of these experiments mean an adequate fuel supply for the people of has not only given its counsel as to the best methods of carrying on a campaign against this great nuisance, but has also demonstrated to those interested that coal can be burned without objectionable smoke. Its plant at Pittsburg is a model for the entire country in regard to the absence of smoke and its experts are always willing to explain how this is accomplished.

The investigations into smoke abatement have indicated clearly that each type of coal may be burned practically without smoke in some type of furnace or with some arrangement of mechanical stoker, draft, etc. The elimination of smoke means more perfect combustion of fuel, and consequently less waste and higher efficiency.

The Chemical Analysis of Coal

Chemistry is assisting the fuel experts to determine the characteristics and the comparative value of coals throughout the country. The primary purpose of the chemical analyses made is to give the Government, and the Navy in particular,

Gas and Dust Gallery No. 1, Bureau of Mines

hold together until almost completely consumed, which gives the air a chance to get between them, making the combustion more perfect and their burning under favorable conditions almost smokeless. It has been demonstrated that they produce a hotter fire than coal because of the added fuel value of the pitch.

The tests with reference to the combustion of briquetted coal have demonstrated conclusively that by this means many low-grade bituminous coals and lignites may have their commercial value increased by an amount sufficient to more than cover the increased cost of manufacture.

These tests have also shown that the highest-grade bituminous coals can be burned in locomotives with greatly increased efficiency and capacity, and with less smoke than the same coal unbriquetted. They have shown that the same locomotive may, with the same fuel consumption of briquets as with raw coal, very materially increase its hauling the Western States, where they had practically none before. The importance of these results is even further magnified when it is considered that the lignite fields are situated at great distances from the bituminous fields.

Steaming Tests of Coal

The tests of different coals under steam boilers have also shown the possibility of increasing the general efficiency of hand-fired steam boilers from 10 to 15 per cent. over ordinary results, and if this saving could be made in the great number of hand-fired boilers now being operated in all parts of the United States, it would result in a large saving in the fuel bill of the country and a resultant conservation of the fuel resources.

The Smoke Problem

The Bureau of Mines has wielded a large influence in the abatement of smoke in the large cities of the country. It exact information regarding the various coals purchased, no matter from what field in the United States. If a naval vessel coals at Boston, these tests will enable its engineer to select his fuel intelligently and to know what it is capable of doing. This information, it is conceded, would be of extreme value in time of war.

The analyses made are of great service not only to the men who do the Government's work, but to engineers throughout the country; and under the stimulus of work of this kind the question of fuel efficiency is receiving attention in many parts of the country. Many power plants in the United States are now buying fuel on definite specifications and have obtained increased efficiency as a result of the Government's investigations.

These chemical analyses of samples of coal from all the coalfields of the United States will aid manufacturers, wherever situated, to save money in the purchase of fuel, for they will enable them to

learn where they can buy the coal that is best suited to their purposes.

The results of the chemical analyses of coal will be published by the Bureau within the next few months. To the engineers of the country and the consumers of coal it promises to be one of the most valuable and most important bulletins ever published by the Government.

Some of the Results

The Bureau of Mines, through the influence of its fuel investigations and the publication of the results, has indirectly been responsible for economies involving millions of dollars and the consequent conservation of the fuel supply of the United States.

The bureau does not by any means claim sole credit for a number of the big improvements in the use of fuels, for many individuals were at work on some of these problems before the Government took up the work, but it does believe that its general campaign of educational work and the practical results accomplished have been responsible for a quick realization of many big economic projects that might otherwise still be in the future.

Two of the most notable of these projects may be briefly described here. At the St. Louis World's exposition, the United States Steel Corporation exhibited a 5000-h.p. steam engine as the marvel of the age. At the same exposition, the Government began its investigation of the possibilities of the gas engine operating on producer gas. Today, the Steel Corporation is operating gas engines with an aggregate capacity of a quarter of a million horsepower, using the waste gases from the blast furnaces as fuel. These gases formerly went into the air, polluting it and making life difficult in the vicinity of the great furnaces. The Government has not operated its gas engine on furnace gases, but it has shown the possibilities of the gas engine as a producer of power. The power equivalent of the gas engines of the United States Steel Corporation operating on waste gases, amounts to more than 1,000,000 tons of coal yearly.

The Technologic Branch of the Survey and the Bureau of Mines have preached the use of low-grade fuels and have practised what they preached by burning practically waste fuel in the furnaces at the testing station.

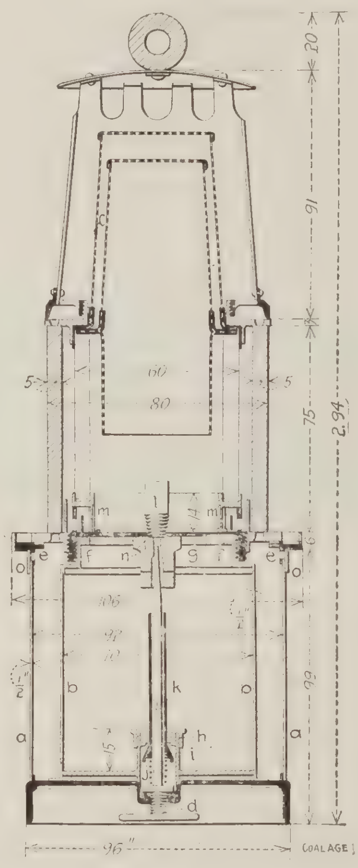
The Lehigh Coal and Navigation Company is considering the erection of a great central power plant at its mines in Carbon county, Penn. This plant, if constructed, will cost $3,000,000 and later extensions may be made involving a further expenditure of $7,000,000.

The fuel to operate this plant will come from a mountain of anthracite waste, (culm), the dump pile containing 10,000,000 tons of coal of such low grade that it cannot stand the cost of transportation. This great power plant will transform its power into electricity which will be transmitted for miles around, supplying factories, railways, shops and homes with light, heat and power.

Now that one company has started making use of the waste, or low-grade fuels, which has been urged by the Bureau of Mines, it will not be long before other plants of like nature are found at the bituminous mines of the middle West and at the lignite mines of the far West.

Acetylene Safety Lamp

At the conclusion of a paper in *Bulletin* de la Société Industrielle du Nord de la France, No. 165, in which a number of different types of safety lamps



Details of New Safety Lamp

designed for burning acetylene are described and illustrated, E. Didier dwells particularly on the construction of a lamp of this nature designed by A. Tombelaine.

The three essentials of the lamp are a cylindrical reservoir *a* for water; an interior receptacle *b*, for carbide; and the combustion chamber *c*. The water reservoir *a*, has several small holes *e*, at its upper edge, and a hole at the center of the bottom, threaded to receive the thumbscrew *d*. The carbide receptacle has a threaded ring around its top, by means of which it is tightly closed by the cover *g*, and at its bottom a valve chamber containing a felt washer *h*, a conical valve *i*, held in position by the spiral spring *j*. The pin *k*, which is a continuation of the thumb screw *d*, passes up through the valve rod, and serves to regulate the escape of acetylene through the burner *l*. The combustion chamber consists of a thick glass ring, two wire-gauze mantles, and a sheet-metal jacket, identical with the usual types of benzine safety lamps, except that the inner gauze extends downward below the outer. Air is allowed to enter through openings just underneath the glass cylinder, the orifices being so arranged with baffles and protected with gauze as to prevent a strong breeze from blowing against the flame. The lamp is locked by a fusible plug.

Method of Operation

In operation, carbide is placed in the inner receptacle, which is then screwed into place, and the bottom of the lamp immersed in water until it flows through the holes *e*, and fills the water reservoir. It then reaches the carbide chamber through the passage *n*, and the valve *i*. The amount of flow is regulated by turning the thumb-screw *d*. The object of the downward projecting gauze mantle is to prevent breakage of the glass if the flame should momentarily increase to unusual size.

In order to be able to use the lamp for detecting firedamp, the size of the flame can be much diminished by turning the thumb-screw *d*. This has the result, first, of cutting off the supply of water, and then of reducing the flow of gas through the needle valve *n*. Without the second provision, it would be necessary to wait several minutes for the generation of gas to cease after closing the water valve. Any surplus gas, after closing the needle valve, can return through the water reservoir and escape into the air. In ordinary use, the water and gas valves require but little adjustment.

The illuminating power of this lamp is about 6 c.-p., or five times that of an ordinary benzine lamp. Empty, it weighs 1.5 kg. The normal flame will last for 11 hours with a consumption of 100 g. of carbide and 150 g. of water.

The Cokedale, Colo., explosion illustrates the necessity of a mixed rescue corps, that is, a corps composed of men performing different duties in the mines. At Cokedale the rescue corps was composed entirely of shot firers and as the accident occurred at night while they were all on duty, the entire corps was either killed or severely injured, thus leaving no one trained in life saving to aid the miners and other employees trapped in the mine by the explosion.

American Mining Congress Meeting

Special Correspondence

The attention of the convention was largely directed to a solution of the present deplorable conditions surrounding the coal industry. It was the consensus of opinion among delegates that the Government should permit a better control of production and a fair regulation of coal prices.

The annual meeting of the American Mining Congress was held at the La Salle hotel in Chicago, Oct. 24 to 28, inclusive. The convention was well attended and the papers presented were of considerable interest, especially to coal men. President Taft addressed the Congress Saturday morning, Oct. 28, devoting considerable attention to the Alaskan coal-lands question. Secretary of the Interior Walter L. Fisher talked to the delegates Friday evening, Oct. 27, also occupying his time with a discussion of the coal-lands question in Alaska.

President Taft touched lightly upon the Ballinger incident by deprecating the unnecessary attribution of evil motives to those who directed the affairs in Alaska in the past, and said Secretary Fisher would earn his undying personal gratitude, as well as cause him to rejoice as an American citizen, if he put Alaska once more in untroubled waters, and in the way to a reasonable development.

The President also referred to the excellent work being accomplished by the Bureau of Mines, and paid a pretty compliment to the energy and effectiveness of Doctor Holmes, the present director.

Turning from the field of agriculture to the mining interests of the nation, Mr. Taft continued:

"So it is with respect to the mining industry; that, next to the agricultural industry, is perhaps the most important we have. It spreads over all space. It divides itself into so many different varieties and is so widespread that no one State can give to the research, investigations and general publication of results, the time, money and attention, and the number of people required, in order that we should make progress there. This is especially true with reference to the saving of the lives of miners engaged in this industry, and I am glad to note that Congress has passed a law creating a mining bureau."

President Taft then referred to the fact that in 1862 when the Homestead law was passed, the present Department of Agriculture was established. It was called a department, but the man at the head of it was not a cabinet minister, and he did not become so until many years later. The President's evident idea was to call attention to the parallelism between the establishment of the Department of Agriculture and the present Bureau of Mines, and to indicate that the growth of the agricultural bureau is likely to be repeated in the case of the mining bureau.

During the convention, interesting papers dealing with various phases of coal mining were presented by A. J. Moorshead, president of the Madison Coal Corporation, St. Louis, Mo.; Carl Scholz, president of the Consolidated Indiana Coal Company, Chicago, Ill.; D. W. Kuhn, president of the Pittsburg-Westmoreland Coal Company, Pittsburg, Penn.; G. W. Traer, Chicago, Ill., and Walter Williams, president of the Hart-Williams Coal Company. Practically all of these papers contained a plea that the Government should so modify the Sherman act that coal men might be permitted in some way, to regulate coal production and prices.

Various plans for controlling production and equalizing prices of coal were suggested: Carl Scholz called attention to the operations of the Westphalia Selling Syndicate in Germany, citing the history of this organization as one that might be profitably studied by the American people. Mr. Scholz said, "The same difficulties which now confront the coal operators of the United States were, in the early stages, experienced by mine owners in the Westphalia district in Germany. In fact, during 1870, a crisis was reached and disaster was only avoided when the German-France war brought a decided, but short-lived, relief.

A Lesson to American Operators

"The lesson to the coal operators of the United States is that Germany has faced and solved problems similar in character to those with which we are struggling." It was shown by Mr. Scholz that the sale of mining products can be handled more advantageously through an entirely separate organization managed by a firm of salesmen under the direction of the owners. This is the plan on which the Westphalia Coal Syndicate operates. The plan of the German company is buying and selling coal and coke, and acquiring mining fields and shares in mining companies. The capital is $600,000, divided into 8000 bonds of $75 each. This capitalization is based on 80,000,000 tons of production. Each member of the syndicate must acquire one bond for each 10,000 tons of annual output.

The management is intrusted to a board of two or more members elected from the directors, and twelve members, three of whom are changed each year. The managers are elected at the annual meeting of the bondholders. The tonnage allotted to each company is fixed by a commission of eight members. The syndicate buys and pays for all the coal covered by allotment. None of the product can be sold by any producer except through the syndicate. A mining company must furnish the quantities agreed to and the syndicate must market it. The mines owned by the German government have, since 1905, sold their product in competition with the syndicate. It is believed they will, later on, join the syndicate.

The chief advantage claimed for the Westphalia plan is the elimination of unnecessary and suicidal competition, and the result has been to place the coal industry in Germany on a basis which enables the operators to produce their tonnage at a reasonable profit; as a consequence, they are able to pay the miners a fair wage and furnish better protection against injury than was possible under conditions that previously existed.

An Increased Profit

The increased profit that has resulted to German coal operators since the organization of the Westphalia Selling Syndicate has warranted the better equipping of the mines with modern machinery and appliances. The advantage to the coal consumer has been the elimination of fluctuations in price by the depression of low figures in a time of surplus, and by rises to higher figures during a time of shortage. Under this plan, the consumers receive a more uniform price and the large consumer does not get a low price at the expense of the small buyer, who may be compelled to pay exorbitant figures.

The syndicate has, through the establishment of agencies, and arrangement for shipping facilities, made possible an efficiency in the marketing of coal, which cannot be reached by the individual producer.

Mr. Scholz concluded his remarks by saying: "Indicative and impressive is the inscription on the syndicate-building entrance, reading, 'Unity Makes Strength.' "

The remaining papers presented before the Mining Congress, and that are of interest to coal-mining people, will be published in the next issue of Coal Age.

National Mine Safety Demonstration

Special Field Correspondence

The Bureau of Mines, inadequately housed at the Pittsburg Arsenal, exhibits the plant where its many important investigations are in progress. Interesting and valuable demonstrations are conducted for the throng of visitors. The Bureau's present work is described and its future aims are outlined.

The national mine-safety demonstration has not failed to measure up fully to the expectations of the most sanguine of its promoters. Nothing is clearer than that there was nothing forced about the expression of interest of all concerned. It was not artificially augmented and fostered by any of the numerous agencies, which were the prime causes of the demonstration. The miners and the corporations are responding with ardor because "security first" is the most pronounced of all present-day mining sentiment.

The morning of Oct. 30 was spent in and around the buildings of the Bureau of Mines in the Arsenal grounds. These buildings were somewhat of a surprise to visitors who saw them for the first time, though it has generally been conceded by those who have viewed them before that they are inadequate for the purpose to which they are devoted. One felt a chill sensation as he piloted Joseph G. S. Hudson, chief of the new explosive section of the Dominion bureau of mines, Ottawa, Can., through the archway by the quaint and dingy quarters occupied by the Arsenal authorities.

These quarters, dating back to the early part of the last century, are built of old-fashioned hand-made brick. They inclose two little grassy squares. Back of the second square, set in a way economical of room, without any attempted grouping, and not facing in front or rear or sides on the lawns to which reference has been made, stand some long shed-like buildings for which the war department has no longer any use. No military force is kept at the Arsenal, the buildings facing on the two squares being used as a hospital and for the storage of quartermaster's supplies. In these inglorious buildings, at the rear, are summed up, structurally speaking, all that, after many years of agitation of congresses and institutes, the mining industry has secured from the Federal Government.

One of the buildings was once a paint shop. None ever rose to any dignity higher than a storehouse, until upon their dingy, somber fronts appeared the pretentious titles, "Bureau of Mines" and "Bureau of Standards." Concurrently, there were placed in two of them narrow passageways with cramped stalls on the right and on the left, in which the bulletins are being prepared which are being so freely quoted at home and abroad, either as the last word on uptodate mining or as lucid expositions of home and foreign researches.

Showing Ballistic Pendulum Immediately after a Powder Test

To revert to Mr. Hudson, one cannot but recall that he is about to erect a \$25,000 building on a lot already owned

by the government of Canada, that his bureau starts with an appropriation of $100,000, and that when that is expended the council of the Dominion expects to spend more.

When the present-day mining interests of Canada are considered and compared with those of the United States, one realizes how far less adequate is the provision of our Federal Government for safety and economic development than is the provision of the government of the Dominion. Nevertheless, Canada today has a population barely equal to the population of the State of Pennsylvania.

A new one-story red-brick shed has recently been erected to house some new experimental apparatus of the Bureau of Standards. It is to be hoped that no new buildings will rise of like kind in such a place, and that a new location, with a less restricted opportunity for development, will be found for one or both of these bureaus, and that when that happy time comes a building will be provided comparable to that erected to take care of the Bureau of Agriculture, or that part of the Bureau of Standards at Washington, D. C.

The Future Aims of the Bureau

The testing of explosives is so completely described under another caption in this same number that there is no need to elaborate on it here. The nature of the present work of the Bureau and the purposes of that work also are given in another place in this article. It is, therefore, opportune to call attention, not so much to present work and present purposes or past achievement, as to the future researches and future aims of the Bureau of Mines.

Research is not peculiar, for like all human activities, the preliminary planning rarely outlines the final resultant work. Questions in their solution involve others, so that ramifying problems spread out in several directions from what at first appears a simple inquiry.

It may be well to quote here the hithertofore unpublished statement of the chief engineer, W. H. Wilson, relative to the inquires the bureau purposes to try to solve. In an address before the Coal Mining Institute of America he declared the intention of the bureau to investigate misfires and their causes, the economic use of explosives in coal and metal mining, the nature of coal dust as exhibited in the several mines of the country, the problems resulting from quarrying practice, methods of tunnel driving in metal mines, the evidences of presence and the nature of mine gases, a comparison of the laws relating to mining in the various States, and throughout the world, problems of sanitation, and suppression of smelter fumes.

But we can readily see that the bureau will eventually enter the field of physics and chemistry, in a basal way, trying to discover what are the preliminary and concomitant actions of the gases in an explosion; what transpires before an explosive gas flames and explodes; what is the real, not the theoretic, reason for high specific heats; why safety lamps are reasonably safe, and other kindred subjects. These unpopular problems of great profoundity may give rise to certain simple, practical rules, which, if observed, may make it possible to avoid explosions.

In fact, no form of knowledge, however erudite and removed from practice, is unlikely to give practical results. The early work on coal-tar products was not

First-aid Miners' Team Bandaging for Face and Neck Wounds

Two-man Event, Showing Judges Observing Speed and Efficiency of Team

A Number of Bituminous First-aid Teams during Rest Interval

Bandaging and Splinting of Man with Broken Arms and Legs

conducted to discover a sweetening substance, to prepare a coloring for dress goods or wine, to provoke a steady action of the organic functions or to relieve headache, but inadvertently it has laid bare all of these. And the public would do well to prevent pressure from being brought to bear on the bureau to be too severely practical, that is, to seek results before causes, or to hunt the place before the road thither.

Many Problems

The action of air currents on lamps of various designs the nature and methods of resistance of immunizers to explosion, the best forms of immunizers, the value of various sprinkling devices and humidifiers, the possible action of electricity and electric arcs on air, the absorption of oxygen by coal, and the slow oxidation of the latter, the peculiar nature of coking coal, causes of fluxing and caking of coals in the furnace, the effect of waste gases from oil and gas engines on the purity of the air currents, the structure of the roof, its action under stress, with all that this includes, the loads on mine timbering and steel work, the corrosion and pollution by mine waters, the best methods of complete extraction of minerals, the more favorable method of using waste gas and byproducts from ovens, the manner in which timbers may be creosoted, the destruction of various types of timber fungi, the best forms of concreting and dampproofing for mines, the prevention of overwinds and falling cages, the determining factors in the direction of an explosion, the distance an explosion will travel over dustless, wet, damp or immunized zones, or in the same direction as an air current, the speeds and pressures during an explosion, the strength of stoppings needed to resist its extension, the temperatures resulting and the means of tracing back an explosion to its primary focus and initiating cause, the possible relations of compression to forceful explosions, the possibility of explosions being caused sometimes by mine concussion, are a few of the subjects which the industry is requiring the bureau to settle, and to which it is likely that the industry will receive no answer for many years.

Unnecessary Duplication of Inquiry

It must be remembered that the Bureau of Mines is almost the only body in the United States which is doing any amount of mining-research work. In England, the work is being divided freely among the colleges and universities, and interesting results are being obtained. But here, apart from the experiments on the strength of packwalling at Lehigh University, and on the causes of spontaneous ignition, still undetermined, at the University of Illinois, almost nothing has been done toward mining-research work, except by this bureau, though not a little was accomplished at one time in ascertaining the causes of heat waste and imperfect combustion in boilers, a field which the Bureau of Mines, in its desire to conserve fuel, regards as a part of its domain.

A Bad Practice—Opening Powder Keg with a Pick

An Illegal Act—Filling a Cartridge without Removing Lamp

It is to be hoped that some effectual means may before long be taken to prevent duplication of experiments in America and abroad. Although some experiments need duplication, if only for a confirmation to our own people that the results are really what they are asserted to be.

In the matter of coal dust, there are possibly more theorists in the coal field than one could believe possible. They say that they cannot see how coal dust can explode without the presence of gas. A lot of needless experimentation has been conducted in America and in England to show that it can and that it does. It is remarkable that shrewd, practical men who in all their experiences apply the pragmatic test: "Does the action happen, or does it not?" in the matter of coal dust and its ignition apply only their powers of reasoning despite the lack of evidence on which that reasoning is based, and say that what repeatedly happens in America, in England, in Belgium, in France and in Austro-Hungary, can never happen, because it contradicts the laws of nature.

In such cases, duplication is necessary, but there is work which there is no need to repeat, and which will appeal just as forcibly if it is quoted in the bulletins of the bureau as it would if it formed a part of the actual operations of that organization. All institutions desiring to make investigations should make such intention known, that they may be allowed a clear field and leave a clear field to others. Mining investigation should be conducted as is astronomical research, across international lines, with frequent *pourparlers* between the scientists of all nations. It is reported that as a result of recent visits to the foreign stations, such an understanding has been effected.

The Inspection of the Bureau

The visitors first entered the long building on the opposite side of Butler street from the Arsenal. Here was inspected the physical laboratory, where high temperatures are measured, and physical apparatus and instruments calibrated. Experiments are proceeding on thermal conductivity at high temperatures and on the explosibility of mine gases. In another room was exhibited the bomb calorimeter, in which solid and liquid fuels are burned and their heating values (B.t.u.) determined. In the boiler room, hand-fired return-tubular boilers were shown arranged for smoke prevention, and here also were several types of domestic heating boilers, where waste, small in each unit but large in aggregate, is being studied.

A visit to the small but useful library of about 3000 volumes, conveniently situated about two blocks away from the point where they need to be used, followed and the visitors examined three rooms in which mining-engineering investigations are being made. The fuel

laboratory was then exhibited, where proximate and ultimate analyses are made of coal, lignite, peat and coke, and analyses of mine and boiler water, ash and slag. The petroleum laboratory, the next point of call, was devoted to the inspection and analysis of petroleum. Here some interesting experiments are being made on petroleum and its products.

In two other rooms the chemical constitution of coal is under examination. The chemists are endeavoring to find the actual compounds which enter into its composition. This work is done, not by distillation and burning of coal to get the percentage of volatile matter and of ash, nor by direct chemical action on the various parts, but by the use of solvents of different kinds, which dissolve the many compounds out of the coal probably without chemical change. Thus liberated from their environment, they can be concentrated from the solvents, seen, weighed, analyzed and their individual characteristics determined. Here also Doctors Frazier and Schnelling are making some valuable researches into the nature of explosions.

In the gas laboratory, investigations are being conducted into mine air and natural gas, the possibility of converting the latter into gasolene, and the effects of noxious mine gases on the well being of men and animals. In yet three other rooms are conducted investigations into the destructive distillation of coal, its weathering and spontaneous combustion, and the power of coal to store up various gases, alien and self created, within its pores. Another room visited was the photographic laboratory.

In the last three rooms were located the chemists whose work it is to analyze black powders, dynamite and permissible explosives, to determine the stability or effective life of stored explosives and the amount of the exudation of nitroglycerin from its absorbents on storage.

Address of Welcome

Somewhat belated, occurred the address of welcome of the director, Joseph A. Holmes, which was delivered at the rear of the Arsenal in between the motley congeries of buildings with which the reader has already been made familiar.

The guests of the bureau then viewed the testing of various incandescent lamps in an explosive mixture of gas and air. Some on being broken caused an explosion, and some did not, their relative safety being determined largely by the size of the filament, the temperatures to which that filament was heated and the speed with which the filament was burned away.

In another building, from a foundry cupola, gas samples were being taken and temperatures being observed of various horizontal zones of a coke bed. The expectation is that with a knowledge of the chemical action and intensity of heat at various levels, some information may be gained, which will make possible valuable changes in coking methods. A gas producer was also being studied, the fuel being burned at high temperature and capacity and the slag in a liquid condition, being removed by tapping.

The bureau has been experimenting on the use of limestone in this connection, to facilitate the fluxing of the slags which otherwise would clog the taphole. The smokeless combustion of low-grade fuel, high in volatile components, in a furnace fired by mechanical stokers was being exhibited in another building. If the soft-

Testing for Gas

coal man relishes but little the work for power economy, done by the bureau, the work for smokeless combustion interests him much, for by it he is enabled to draw on territory regarded as exclusively the domain of the anthracite operator and his sales agent. But above all, he looks to the bureau to encourage the sale of slack coal by these demonstrations of its efficiency and smokelessness when fed by mechanical devices.

The value of an exterior combustion chamber was then demonstrated, and the Murphy system exhibited. It is expected that the best method of making steam in a boiler will be found to be that of using an external combustion chamber; one where the progress of combustion is unchecked by the presence of large bodies of iron backed by water at relatively low temperatures. The heat in such an arrangement, being extracted in its entirety from the fuel, will be conveyed by the heated gas to the boiler. As it now is, in the ordinary boiler, the heat of partial combustion is utilized to heat water when it is more needed to complete the burning of the fuel, and thus obtain the heat units from the evolved gas and comminuted carbon.

In building No. 17, which lies at an angle to the rest, as if trying and failing to get a view of the Arsenal lawn beyond, single- and double-gauze safety lamps were tested in a current of air of known velocity containing 8 per cent. of natural gas. In another room, men wearing various types of breathing apparatus were training, in noxious gases, to perform the work of mine recovery.

The apparatus for the physical testing of explosives was then exhibited, including the large as well as the small impact machines, and the cone and pendulum friction device. In another building, a machine was running converting California lignite into merchantable briquets.

The spectacular events of the morning followed. A permissible explosive, having a strength equal to that of ½ lb. of 40 per cent. dynamite, tamped with 1 lb. of dry fireclay, was fired in the cannon of the dust and gas gallery No. 1, which was filled for the occasion with 7 per cent. of natural gas. No explosion followed, but when an exactly equivalent experiment was tried with black blasting powder FFF, the result was a violent explosion with a flame, which emerged from the end of the tube, opening every port hole in the gallery and enveloping the yard with smoke. A coal-dust explosion in miniature was exhibited in a laboratory apparatus designed for that purpose. As a final *tour de force,* in gallery No. 2, an electric mine locomotive with explosion-proof protective devices removed, on being operated in an explosive mixture of gas and air, caused a violent explosion.

The Mine Hospital

The ideal mine hospital should, if possible, be cut into the rock, and where this is not practical, concrete should be used for the walls. Such hospitals should be equipped with steam heat, hot and cold water and a sterilizing plant. Iron-doored, damp-proof closets for bandages, gauze, splints, etc., should be set in the walls. A dressing chair, dressing couch, stretcher and a first-aid kit will complete the equipment. The kit is for use at the working face, in case of serious accidents, where the patient must receive some attention before being transported to the hospital.

Methods of Testing Explosives

Special Correspondence

The tests of the explosives section, Bureau of Mines, are both chemical and physical. This article details the methods by which permissible powders are proved for the recommendation of the department to the mining industry.

The section of the Bureau of Mines devoted to the study and selection of explosives for use in the mines is a leading part of the Mine Accidents Division and though not more interesting than other sections is one of paramount importance in the safeguarding of the mines from disaster.

Principal among the apparatus for determining the action and acceptability of explosives is the gas and dust gallery No. 1, a cylindrical gallery 100 ft. long with a minimum internal diameter of 6 ft. 4 in. It consists of 15 similar sections each 6 ft. 8 in. long, connected by lap-riveted joints. The first three sections, those nearest the concrete head, and therefore receiving the main brunt of the explosion, are made of ½-inch boiler-plate steel; the remaining twelve sections are of ⅜-in. steel of like character, capable of resisting a tensile stress of at least 55,000 lb. per square inch.

Fig. 1 exhibits clearly the form of the chamber. To the right can just be seen the concrete head within which the charge is ignited. Along the top are visible the rows of release pressure doors, one in the center of each section, each provided with a rubber bumper to prevent destruction of the door when opened violently by the force of an explosion. These doors in use can be closed and fastened by the studbolts provided for that purpose, or they can be closed and left unfastened or left open during the explosion, as may be desired.

At each of the lap joints connecting the sections and on the interior of the cylinder there is a 2½-in. angle iron making a full circuit of the internal perimeter and upon the face of this angle iron, a paper diaphragm may be placed and held in position by semicircular washers, studs and wedges. These paper diaphragms are used only to confine the gas and air mixture before the explosion.

Along the lower part of each section at its center are placed windows measuring 6x6 in., made of ¾-in. plate glass.

The natural gas used is from the distributing mains of the city of Pittsburg, a typical analysis of which is as follows:

Carbon dioxide	0.0 per cent.
Oxygen	0.2 per cent.
Heavy hydrocarbons	0.0 per cent.
Carbon monoxide	0.0 per cent.
Methane	85.3 per cent.
Ethane	11.8 per cent.
Nitrogen	2.7 per cent.
	100.0 per cent.

It has been found that the gas in the mains is of uniform percentage and furnishes therefore a reliable basis on which to compare different explosives.

The volume of gas entering the gallery is accurately measured by a meter reading to 1/20 of a cubic foot. The gas enters the required division (consisting of three sections) or divisions of the gallery near the bottom of the cylinder from a 2-in. perforated gas pipe 14 ft. long. The perforations are so arranged that an equal flow of gas is maintained from each unit length of this pipe.

Each division is further equipped with an exterior circulating system, providing an efficient method of mixing the gas with the air. For the first division this circulating system is stationary, a portion of the piping being equipped with heating coils for maintaining a constant temperature of the mixture. All other divisions have a common circulating system mounted on a truck which may be used on any one of these divisions. Valves are provided for isolating the fan, so that a possible explosion will not injure it.

Gas and Dust Gallery No. 1, Fifteen Seconds after Explosion

The center section of each division is provided with an indicator cock, which is used for two purposes: 1. For indicators to record pressures above and below atmosphere. 2. For providing an opening where samples of the mixture may be procured. All divisions of the gallery are equipped with shelves laterally arranged for coal dust.

The cannon in which the explosive is fired is embedded in a concrete head, the axial line of the bore hole being coincident with the axial line of the gallery. The cannon consists of two parts, a jacket and a liner. The jacket is 36 in. long, 24 in. external diameter and 9½ and 7½ in. internal diameter, and is made of best cast steel, cast iron or vanadium steel. The liner is 36½ in. long, with a 1-in. shoulder 7¾ in. from the back, changing the diameter 9½ in. to 7½ in., having a smooth

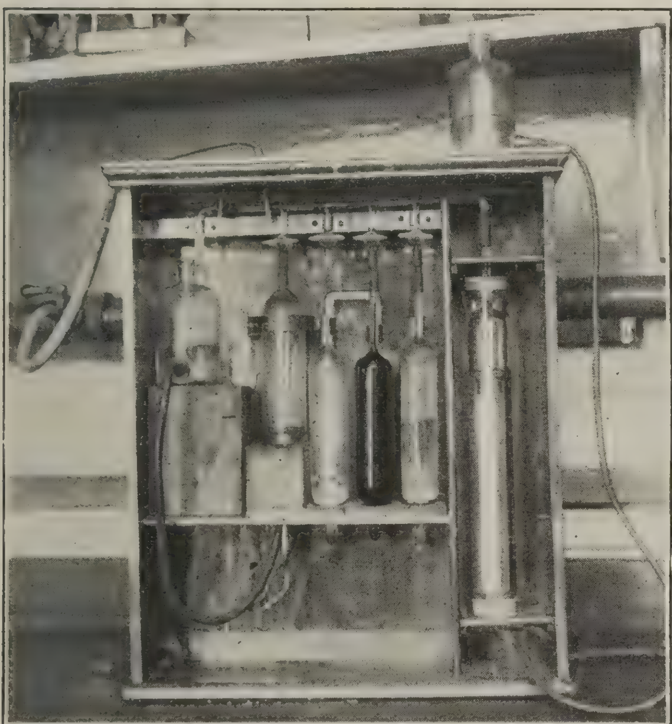
bore 2¼ in. diameter and 2½ in. deep. The face of the cannon is even with the face of the concrete head.

It might be well to add that the strain on the cannon used by the bureau is considerable, for the powder used is of more strength than that used for artillery purposes. Moreover, powders for military and naval uses are made in compressed hexagons of large size so that they act slowly and continue to explode till the shot has left the cannon. If it were not for this provision none of the larger-bore guns used in military practise could withstand the strains to which they would be subjected. As it is, their life is short. Looking at these shorter cannon they seem needlessly heavy until the this, of course, to assist in maintaining a constant temperature.

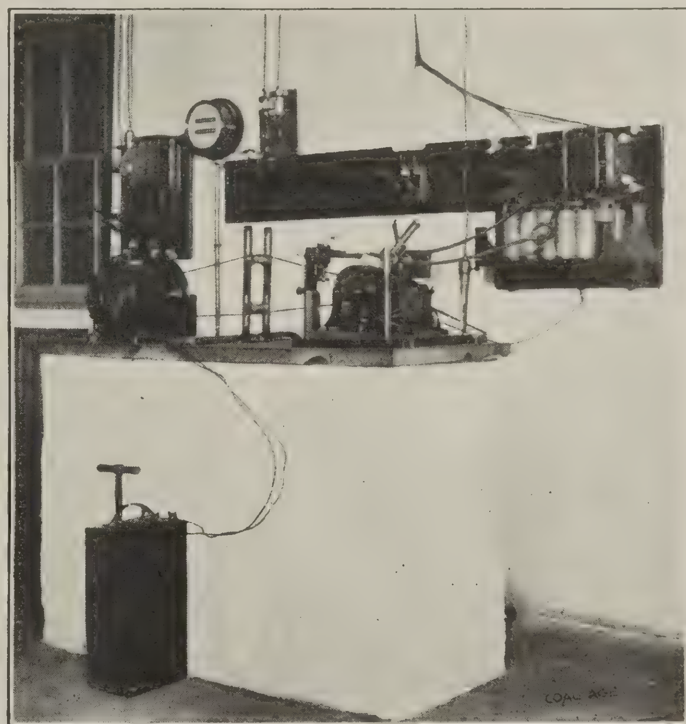
The entire gallery rests on a concrete foundation 10 ft. wide, having a maximum front hight of 4 ft. 6 in. and a minimum hight of 2 feet.

The concrete head in which the cannon is placed completely closes that end of the gallery. A narrow drain, extending under the tube its entire length, with a tapped hole at the bottom of each section, provides an efficient method for drainage.

The buildings near the gallery are protected by two barricades near its open end, each 10 ft. high and 30 ft. long. A back stop 6 ft. high and 9 ft. long, 50 ft. from the end of the gallery, prevents to control the quantity of steam flowing through them and are inclosed in a tight wooden box, approximately 2 ft. 10½ in. by 3 ft. 7 in. by 5 ft. 5 in. The air enters this box through a rectangular hole 10x12 in. in the end of box, also through 25 round holes 2 in. in diameter. A baffle board 12x19½ in. is set inside the box opposite the large opening to distribute more evenly the current of air over the surface of the radiators. The air leaves this warming box through an 11¾x30-in. opening and is carried upward by suitable boxing to a compartment 3 ft. 8¼ in. by 12 in. by 14 ft. 2½ in., which contains the humidifier heads. From there it goes through No. 15 doorway in the top of gallery, the end of the gallery



A Modified Form of the Orsat Apparatus



Apparatus Measuring Rate of Detonation

reason for their immense strength is made obvious by due consideration, the arguments being amply fortified by the experience of the bureau. Replacements of cannon furnish an important item of expense in the disbursements of the bureau.

The charge is fired electrically from the observation room and, that the risk of charging the cannon may be minimized, the charger carries in his pocket the plug of a stage switch (this being the only one of its kind on the grounds), so that it is impossible to complete the circuit until he has left the gallery.

That portion of the first division of the gallery which is not in concrete has a 3-in. covering, consisting of blocks of magnesium, asbestos fiber, asbestos cement, a layer of 8-oz. duck, and then a dryproof roofing and the whole covered with a thick coat of graphite paint; all any of the stemming from doing damage.

The tests are witnessed from the observation room, a protected position about 60 ft. from the gallery. The walls of the room are 18 in. thick and the line of vision passes through a ½-in. plate glass 6 in. wide and 37 ft. long, and is further confined by two external guards, each 37 ft. long and 3 ft. wide.

When humidity tests are run on gas and dust gallery No. 1, the apparatus is further equipped as follows: To the 14-in. doorway of section No. 1 is connected by suitable boxing a Koerting exhauster of 240,000 cu.ft. of free air per hour capacity. No. 15 doorway is used as the air inlet and to it are connected by suitable wooden boxes a compartment that contains steam radiators and the humidifiers. Three 38-in. triple-column radiators, averaging 310 sq.ft. of heating surface, are arranged with valves being efficiently closed by brattice cloth and a paper diaphragm.

The Ballistic Pendulum

The ballistic pendulum is used for the purpose of measuring the disruptive force of a unit charge of any explosive. The unit disruptive force is defined as being that force which is required to swing the pendulum through an arc equal to that through which it is swung by a charge of one-half pound of 40 per cent. nitroglycerin mixed with the standard absorbents required by the bureau.

The apparatus consists essentially of a cylindrical weight in the form of a mortar, weighing 31,600 lb., suspended on knife edges, and a steel cannon mounted on a truck which runs on a short track. The truck is parallel with the direction of the swing of the mortar, and the cannon at the time of firing may be placed 1/16

of an inch from the muzzle of the mortar. The mortar is suspended from a beam supported by concrete walls 139 in. high, 51x120 in. at the base. On top of each wall is a base plate anchored to the wall. The knife edges rest on bearing plates placed on top of these base plates. Each bearing plate is provided with a small groove for the purpose of holding oil to lubricate the knife edges and to protect them from the weather. Each knife edge is 6 in. long and the bearing surface is rounded to conform to a radius of 1/4 of an inch. The mortar rests on two U-shaped saddles which pass through heavy steel castings bolted to the beam. The vertical distance from the point of the knife edges to the center of the trunnions of the mortar is 89 3/4 inches.

The cannon used on the truck are similar in size and material to those used in gas and dust gallery No. 1. The truck consists of four wheels set to a 30-in. gage and the track extends about 9 ft. from muzzle of mortar to bumper.

The shot is fired from the first floor of building No. 17, about 10 yd. from the pendulum, by means of an electric firing battery. The man who charges the cannon carries a safety plug from a stage switch when working and is thus protected in the same manner as the charger at gas and dust gallery No. 1.

A recording device is placed at the back of the mortar, and is connected to it by means of a horizontal rod at the end of which is a circular face. A lug inserted in the bottom of the mortar directly below its center of gravity pushes this rod, thus transmitting the length of the swing to a scale at the other end of the rod. By means of a vernier the length of swing is recorded to the 1/200th part of an inch.

Trauzl Lead Blocks

The Trauzl lead-block test is the method adopted by the Fifth International Congress of Applied Chemistry as standard for measuring the unit disruptive force of explosives. The unit disruptive force of explosives thus tested is defined as the force required to enlarge the bore hole in the block an amount equivalent to that produced by 10 grams of standard 40 per cent. nitroglycerin dynamite stemmed with 50 grams of dry sand, under standard conditions as produced with a tamping device. The result of these tests when compared with those of the Bichel gage indicates that for explosives of high detonation the lead block is quite accurate, but for slow explosives the expansion of the gas is not fast enough to make comparative results of value, the gases escaping from the bore hole in the block rather than taking effect in causing its expansion.

The lead blocks are cylindrical in shape, 200 mm. (7.88 in.) in diameter and 200 mm. high. Each has a central cavity, cylindrical in shape, 25 mm. (0.988 -in.) in diameter and 125 mm. (4.925 in.) deep, in which the charge is placed. The blocks are made of desilverized lead of the best quality and as nearly as possible under identical conditions. The charge is placed in the cavity and prepared for detonation with electric exploder and stemming. No yoke is used and no additional attempt is made to further confine the charge. The bore hole after the explosion is pear shaped, the size of the cavity depending not only upon the disruptive power of the explosive, but also upon its rate of detonation as described above. The size of the bore hole is measured by running in water from a burette until the cavity is just full. The difference between the original size of the cavity and its size after detonation is of course the enlargement produced by the explosion.

Ballistic Pendulum for Determining Disruptive Force of Powder

The Explosion Calorimeter

The explosion calorimeter is designed to measure the quantity of heat given off by detonation of explosive charges of 100 grams. The apparatus consists of a calorimeter bomb, the inner receiver or immersion vessel and wooden tub, a registering thermometer and a hooking frame.

The bomb is bottle-shaped, of 1/2-in. wrought steel, and has a capacity of 30 liters (31.7 quarts). On opposite sides near the top are bored apertures, one for the exhaust valve, for obtaining a partial vacuum, measured by about 10 mm. (0.39 in.) of mercury column, after the bomb has been charged; the other for inserting the insulated plug through which passes the fuse wire for igniting the charge. The bomb is closed with a cap, by means of which the chamber may be made absolutely air tight. The bomb weighs 158 lb., is 30 in. high with the cap on, and is handled to and from the immersion vessel by means of a small crane.

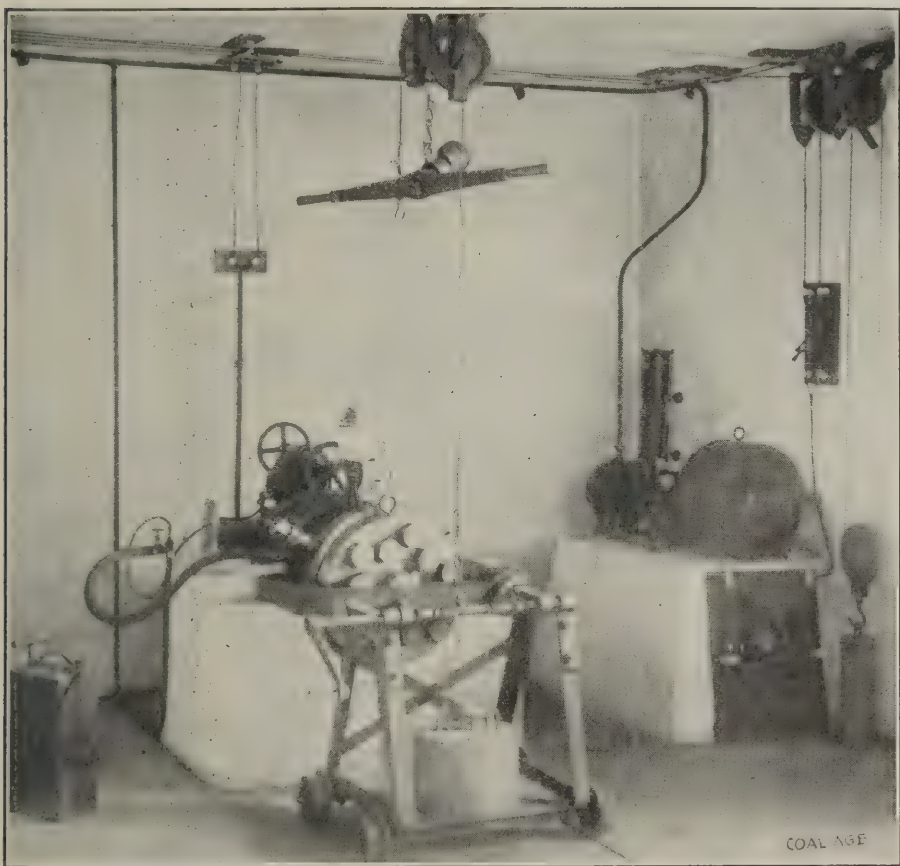
The inner receiver is 30 7/8 in. deep, 17 7/8 in. inner diameter, and is made of 1/16-in. sheet copper, nickel plated, and strengthened on the outside with bands of copper wire. The outer tub is 30 in. deep, 21 in. inner diameter, is made of 1-in. lumber, and is strengthened with four brass hoops on the outside.

The stirring device consists of a small wooden beam connected to a system of three rings, having a horizontal bearing surface, and is operated vertically by means of a worm gear run by an electric motor. When the apparatus is put together the inner receiver rests on a small standard on top of the base of the outer tank. The rings of the stirring device run between the bomb and the inner receiver. The bomb itself rests on a small standard placed on the bottom of the inner cylinder. The apparatus is provided with a snugly fitted board cover.

The rise in temperature of the water is read from a Centigrade thermometer measuring to the one-hundredth part of a degree. The hight of the mercury column is read by means of a magnifying glass.

The bomb is charged from the top, the explosive being suspended in the center. The caps are then screwed on, the apparatus set together as above described, first, however, exhausting the air to the desired degree of rarefication.

The apparatus is assembled on scales before the water is poured in and the weight taken, and then it is weighed after the receiver is filled with water. By obtaining the weight of the water in this way and knowing the temperature, the calorific value may be computed. The capacity of the inner receiver is about 70 liters (74 quarts). The charge is exploded by electricity while the water is being stirred. By combining the quantity of heat of the explosive in calories with the specific heats of the products of combustion at the proper temperatures the maximum temperature of explosion may be arrived at.



BICHEL PRESSURE GAGE, MEASURING PRESSURES FROM COMBUSTION OF EXPLOSIVES

Rate of Detonation Apparatus

This apparatus for measuring the rate of detonation is used to determine the velocity with which detonation travels through a given length of an explosive. For this purpose the explosive is placed in a long galvanized iron tube 38 mm. (1.496 in.) in diameter and 1.22 meters (4 ft.) in length and suspended in a pit. This pit is 11 ft. deep, 16 ft. in diameter, and is provided with a steel-plate casing backed by a cushion of sawdust and with a heavy cover consisting of large timbers, covered by reinforced concrete, and anchored to the ground with eight deadmen. By means of electrical connections at each end of the tube connected to the recording device known as Mettergang's recorder, placed in an adjacent building, the interval of time elapsing between detonation at the two ends of the tube is accurately measured on a smoked drum revolving with a known peripheral speed. In using such small lengths of explosive as one meter it is obviously essential that very minute differences in time be recorded. The recording device is conveniently equipped in such a way that one one-hundredth part of a millimeter may be measured. The drum is 500 mm. in circumference and its normal speed is 86 revolutions per second. The smallest time interval that can be measured, therefore, is 1/4,300,000 sec. The usual length of explosive used is one meter and the sticks of explosive are, after cutting off their ends, placed end to end.

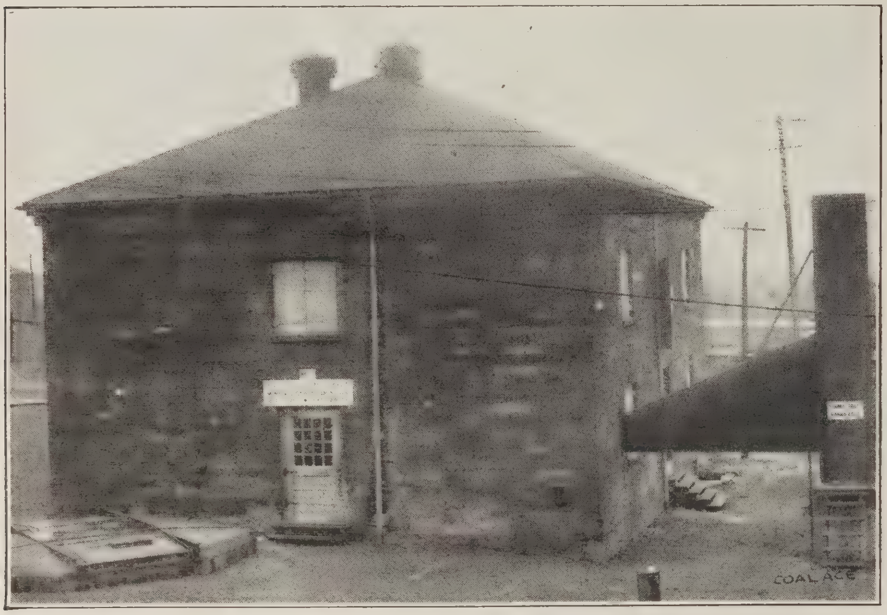
Flame-test Apparatus

The flame-test apparatus was designed for measuring the length and duration of flame given off by explosives. It consists essentially of a cannon, a photographic instrument and a drum geared for high speed, to which a sensitized film may be fastened. About 13 ft. from the outside wall of the building in which the test is observed is set the foundation for the cannon and incasing cylinder or shell. Set on top of this is a cannon identical with the one used for the gas and dust gallery No. 1, the details of which are included in the description for that apparatus. The shell or cylinder is set on top of the concrete and is concentric with the cannon, and is 43 in. internal diameter, 20 ft. high, constructed of ¼-in. boiler plate in 24 sections and made absolutely impenetrable to light on the sides and base. Riveted to the shell and connecting it with a dark room in an adjacent building is a light-excluding conduit of rectangular cross-section, 12 in. wide on the inside, horizontal on the bottom, sloping on the top from a hight at the cylinder of 8 ft. 3 in. to 21 in. at the inside of the wall of the building. It is carefully insulated from light by means of oakum packing at the joints in the building, and when not in use two small steel doors isolate the dark room from the light leaking from the top of the shell. A vertical slit is cut in the shell 2 in. wide and 8 ft. long coincident with the center line of the conduit. A vertical plane drawn through the center line of the bore hole of the cannon and of this slit, intersects the center line of the quartz lens, the center of the stenopaic slit immediately in front of the film and the axis of the drum on which the film revolves. The photographic apparatus consists of a shutter; a quartz lens placed in such a position as to focus the rays of light, including the ultra-violet rays, which are those attending extreme heat; a stenopaic slit between the lens and the rotary drum, 76 mm. (3 in.) long and 1.7 mm. (0.067 in.) wide; a rotary drum 50 cm. (19.68 in.) in circumference and 10 cm. (3.9 in.) deep, geared to and driven by a 220-volt motor, which is connected to a tachometer reading in both meters per second and revolutions per minute. A maximum peripheral speed of the drum of 20 meters (65.62 ft.) per second may be obtained. The speed is regulated by a rheostat. The drum, gears, shutter, lens, stenopaic slit and connecting apparatus are inclosed in a box which excludes all light, for convenience in order that the film may be left on the drum in position should the operator desire to leave the dark room. One hundred grams (0.22 lb.) of the explosive are used in the cannon and the firing line extends from the cannon to the dark room, from which place the shot is fired. The firing line is equipped with a stage switch as a precaution.

With the drum at rest the flame is shown on the film as a vertical line of a width equal to the stenopaic slit and by simple proportion the exact hight of the flame may be determined. When the drum is in rapid motion of known velocity not only the hight of flame but the duration may be computed by measuring the lateral displacement on the film and applying it to the known peripheral speed.

The Impact Machine

The impact machine is designed to determine the sensitiveness of an explosive to shock. For this purpose a drop hammer is used, constructed in such a way as to meet the following requirements: 1. The necessity for having a substantial unyielding foundation, of constant temperature. 2. Minimum friction in the guide grooves so as to approximate the conditions of a freely falling body. 3. Prevention of escape or scattering of the explosive when struck by the falling weight.



Flame-test Apparatus Measuring Duration and Hight of Flame

The apparatus consists essentially of the following parts: an endless chain working in a vertical path operated by electricity and provided with two lugs equally spaced; a steel anvil upon which the charge of explosive is placed; a steel stamp pressing on top of the charge and holding it in position; a magnetizing collar operating freely in vertical guides and provided with small jaws in the rear so placed that the lugs of the chain engage them; a steel weight which operates loosely in vertical guides and is drawn by the magnetizing collar to determinable hights when the machine is in operation; a demagnetizing collar which may be set at known hights and which is provided with a release for the jaws of the first collar, and a recording device geared to a vertically driven threaded rod which sets the demagnetizing device and thus determines the hight of fall of the weights.

The apparatus is supported by a concrete pedestal which is set at a convenient hight for the operator. The heavy oval-shaped steel base of the machine itself is anchor-bolted to this pedestal and into the base is screwed the anvil on which the charge of explosive is placed. The main standard of the apparatus is about 65 in. high and $2\frac{1}{4}$ in. diameter, shrunk into a flanged collar which is screwed into the base plate at the rear. The collar guides are $\frac{5}{8}$-in. rods and extend from a plate securely fastened to the top of the flanged collar at the base of the main standard to the plate of the apparatus. The steel stamp which transmits the blow of the fallen weight is $7\frac{1}{2}$ in. high, $1\frac{1}{8}$ in. in diameter, tapered at the base to a small cylinder $\frac{3}{8}$ in. high and $\frac{3}{8}$ in. in diameter, which operates at the center of the anvil. The drop hammer weighs 2000 grams (4.41 lb.) and moves in loose-fitting guides which produce a minimum of friction. The hammer is dropped from varying hights until detonation takes place. A maximum safety hight is determined when five attempts to explode a charge fail at that hight, and if five or less than five attempts at that hight plus one centimeter, (0.39 in.) give at least one explosion.

Care is taken that the anvil and stamp are well cleaned after each test. The whole apparatus when not in use is covered with oil and provided with a hood.

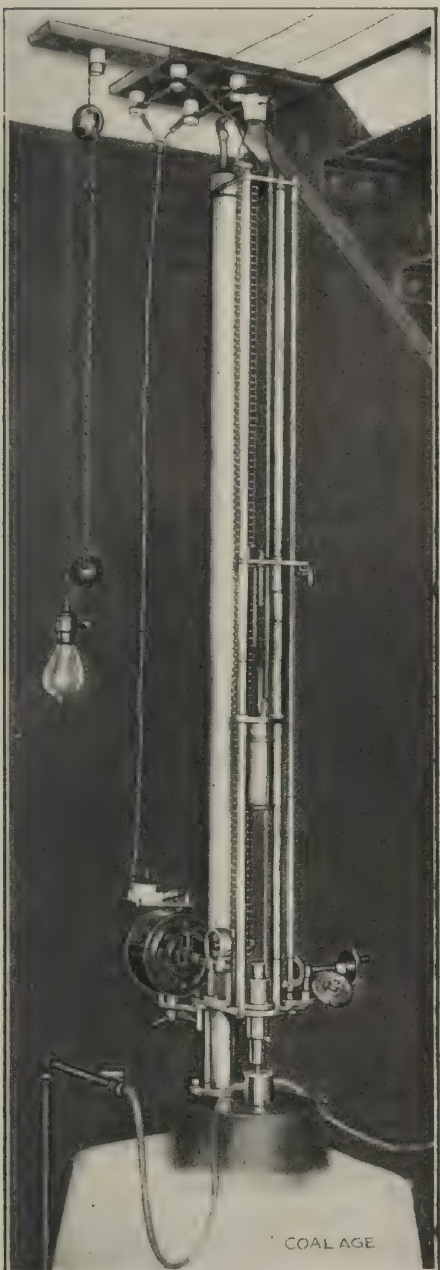
In order to maintain a uniform temperature while experimenting, water at a temperature of 25 deg. C. (77 deg. F.) flows through the anvil.

The Explosion by Influence Tests

For explosion by influence the pit described when detailing the apparatus for testing the rate of detonation is used, and two sticks of each explosive are required. The sticks are placed end to end, separated by a certain distance, always a multiple of one inch, and the pair suspended in a vertical position. The lower stick

Calorimeter Used to Determine Heat of Combustion of Explosives

is detonated. This detonates or fails to detonate the other, the action or failure to act depending upon the distance between the sticks and the sensitiveness of the explosive to detonation in this manner. The maximum distance of explosion by influence is established if the second stick explodes at that distance and fails to explode three times at that distance plus one inch.



Impact Machine

Rate of Burning of Slow Explosives

The test of the rate of burning of slow explosives is performed in the same pit and the explosive is placed in a water pipe having an inside diameter of $1\frac{1}{4}$ in. One end of this pipe is closed with a plug, the other end being free. The fuse is placed in the free end and the explosive burns toward the plug. Insulated annunciator wires are placed through the explosive one meter apart and the time of burning is indicated by sparks on the Mattergang's recorder, but the time interval between the sparks is taken by means of a stop watch.

Care is taken that the density of the explosive is normal.

Bichel Pressure Gages

The Bichel pressure gages are used for determining the strength of explosives by measuring pressures developed in an inclosed space in which an escape of generated gases is rendered impossible. The apparatus consists of a stout steel cylinder which may be made absolutely air tight, an air pump and proper connections for exhausting the air in the cylinder to a pressure of 10 mm. of mercury, an insulated plug for providing the means to ignite the charge, a valve by means of which the gaseous products of combustion may be removed for subsequent analysis, an indicator and drum, with proper connections, for driving it at a known speed.

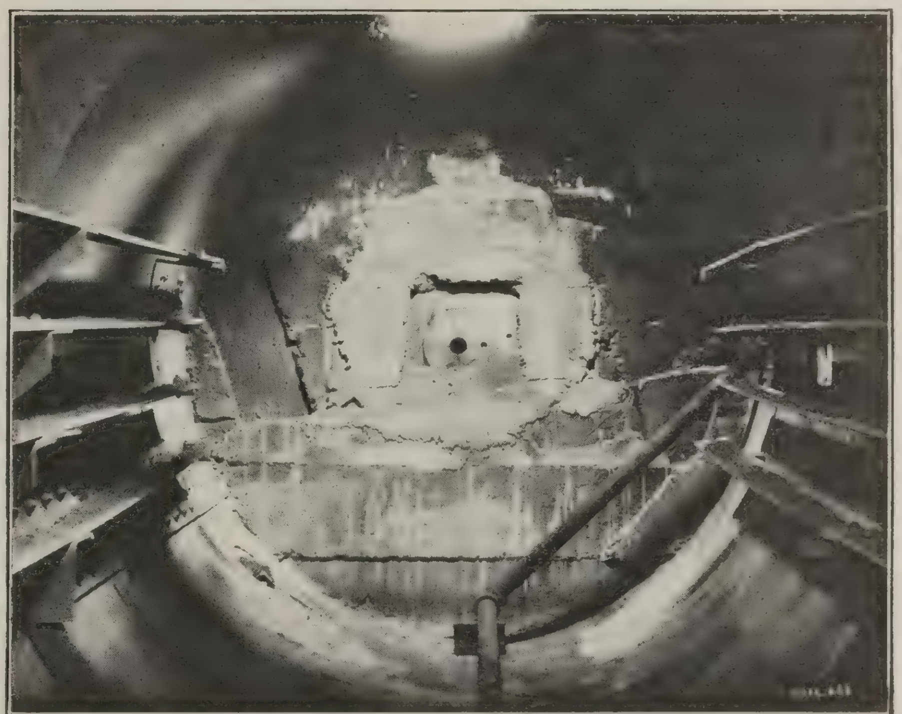
The cylinder rests on a solid concrete footing at a convenient hight for handling. It is $31\frac{1}{4}$ in. long, $19\frac{3}{4}$ in. diameter, and anchored to the footing. The explosion chamber is 19 in. long and $17\frac{7}{8}$ in. diam., having a capacity of exactly 15 liters (1585 quarts). The cover of the cylinder is a heavy piece of steel held in place by heavy steel studs and nuts and a yoke.

The charge is placed on a small wire tripod, and connections are made with a fuse to an electric firing battery for igniting the charge. A near-vacuum is produced by means of an air pump in order to more closely approach the conditions of a tamped charge exploding in a bore hole inaccessible to air. When the charge is exploded a record is made on the indicator card. This shows a rapidly ascending curve for quick explosives, grading into a shallower curve slowly rising for explosives of slow detonation. When the gases cool, the curve merges into a straight line, which indicates the pressures of the cooled gases on the sides of the chamber.

Finding Pressure of Charge

Since the volume of the chamber is nearly 75 times that of the volume of the charge, the pressure of the charge confined in its own volume may also be found. The cooling influence of the inner surface upon the gaseous products of combustion is a vital point in computing the pressure developed by an explosive. Its effect is eliminated by comparing the pressures obtained in the original cylinder with those of a second cylinder of a larger capacity into which has been inserted one or more steel cylinders, thus increasing the superficial area while keeping the volume constant. By comparing the effect of the increased cooling surface with the original a curve may be plotted which will determine the actual pressures developed after the elimination of the surface influence.

The black-powder separator is made similar to the separators used in powder mills, but of reduced size.



Concrete Head, Cannon, Dust Shelves and Distributing Gas Pipe in Gallery No. 1

Illustrations of First Aid Work

By M. J. Shields*

Describing in detail the most approved methods of treating injured miners. The illustrations present actual work performed in the Government mine at Bruceton, Pennsylvania.

*First Lieutenant, M. R. C., U. S. A., American Red Cross Society.

The illustrations with which this article is accompanied are representations of actual work performed in the Bruceton mine, of the U. S. Bureau of Mines. The patient in Fig. 1, is supposed to have a compound or open fracture of the arm, with bleeding. The first thing to do is to raise the forearm so that the elbow is bent. Elevating the arm tends to stop the bleeding, by decreasing the pressure in the veins, and this in itself eases the pain.

The Red Cross tourniquet is being applied. This is a simple affair; nothing more than a straight and strong piece of webbing, which is passed around the arm, and which is secured by a clasp, having small teeth. When the clasp closes on the webbing, a strong spring holds it firmly in place. The pressure on the blood vessel is attained, as will be seen, by placing a small block over the artery to be compressed; the artery in this case of which the circulation is to be stopped is the "brachial" or main artery of the arm, which runs in a course corresponding to the inside seam of the shirt of the patient when in place.

The hemorrhage is now stopped, and it is necessary to attend to the fracture. But first observe how carefully the attendant on the left is supporting the arm of his patient (Fig. 2) with a deft placement of his own forearm, so that the fracture is not aggravated. At the same time, he places his left thumb on the bandage to hold it in place while his companion applies the pressure.

The wound is first covered with aseptic gauze, to keep infection away, then the arm is bandaged to keep the gauze in place. This bandage is light, and care must be taken not to have it unnecessarily thick where the splints will later come. The splints, which consist of boards ⅜ of an inch thick and about 3 in. wide, are applied to both sides of the arm, these boards or splints being padded with cotton.

Splints Are Made of Yucca Wood

It might here be said that the splints preferably used are made of Yucca wood, which is brought from California. The wood is soft and easily bent to fit the arm, especially when it has not been kept in too dry a place. The inside splint extends nearly to the ends of the fingers, so that the last joints can be passed down over the end of the splint, if the patient so desires. The splints should always be long enough so that they will extend well beyond each side of the fracture, but, of course, it will often happen that the first-aid man will find himself unable to find splints of the kind here described, in which case he will avail himself of any stiff piece of wood, whether it fits the arm or not, but he will bear in mind that the primary consideration is that the splint shall effectually span the fracture. After this, either triangles or bandages are applied to hold the splints in place. The pain of a fracture is usually relieved by a well applied splint.

The arm is then placed in a flexed position, with the thumb pointing toward the nose of the patient, as shown in Fig. 3. One point of the triangle is thrown over the left shoulder, and the body of the bandage is permitted to fall over the front of the patient between his stomach and his arm. The point which is now lowest is folded back over the outside of his arm and passed over his right shoulder, and tied to the other point at the back of his neck. The third point now projects untidily from the end of the elbow, and should be folded over and pinned so as to secure the elbow in place as indicated in Fig. 4.

Fracture of the Rib

The patient in Fig. 5 has fractured his rib. The man on the right is aiding the patient to hold up his arms. The patient is told to expire or throw out his breath, so that his chest will be reduced in girth. By this means, the bandage when applied will be tight. A wide, or 6-in., bandage is used, and the pressure on his side keeps his broken bone or bones in place. When a man has a fractured rib, he instinctively holds his hand over the fracture to prevent the motion which results from the inspiration and expiration of his breath.

Treatment of Facial Burns

The patient in Fig. 6 is supposed to be the victim of severe facial burns. His shirt is opened in front by the attendant and tucked into a roll all around his neck, so that the bandaging may be made to cover every burned part. Very little is done to clean the head of the patient. If any particles of dirt are seen, they can be removed if it can be done without

Fig. 1. Showing Patient with Compound Fracture of Arm

Fig. 2. Attendant Supporting Fractured Arm of Patient

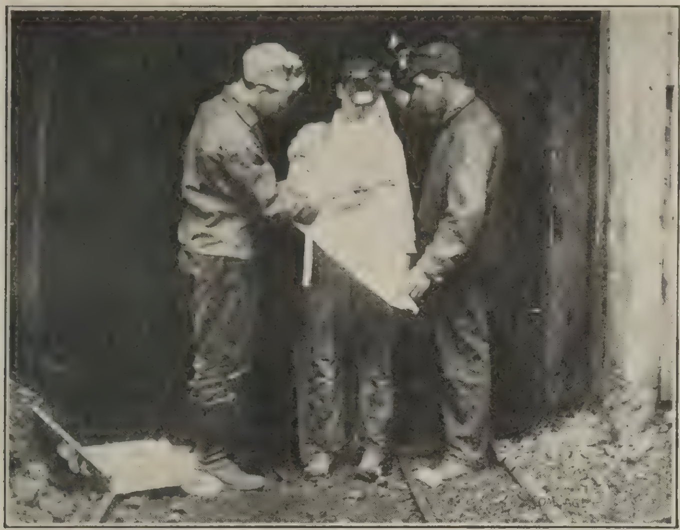


Fig. 3. The Arm Is Placed in a Flexed Position

Fig. 4. Method of Securing the Elbow in Place

Fig. 5. Attending a Fractured Rib

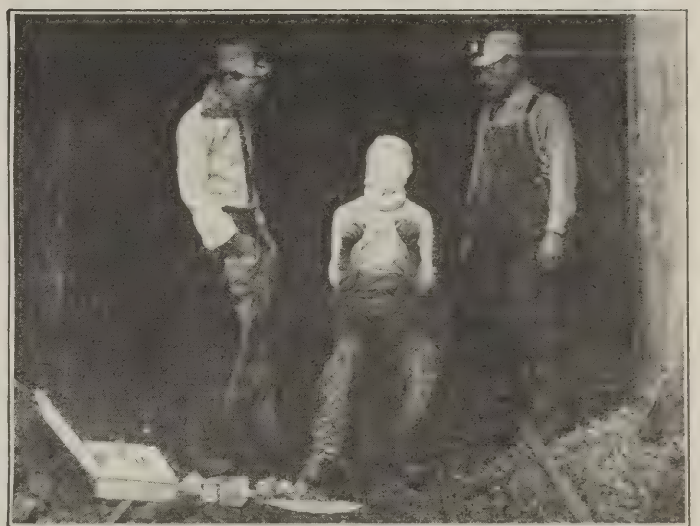


Fig. 6. Patient with Severe Facial Burns

Fig. 7. Dressing a Scalp Wound, Using Only Emergency Kit

Fig. 8. Showing the Use of Pulmotor on an Asphyxiated Man

dragging or fingering of the wound. If the skin is burned to the clothing, it is not dragged off, but cut away with shears. Nothing is allowed to come in contact with the burn until the gauze is put on, and this is done soon, for delay means infection and shock. The patient is told to close his eyes, if infection has not already caused him to close them.

A large piece of picric-acid gauze is moistened either with steam, if that is obtainable, or with clean water. This should cover the burn completely. As the eyes and nose are burned, no holes should be left for them to project through the dressing. The patient can breath through the bandage and picric-acid gauze without difficulty, and it is essential, not only for his comfort, but also for the rapidity of his recovery, and for the avoidance of blood poisoning, that no portion of the burned cuticle shall be subjected to the germs with which the atmosphere is everywhere loaded. The acid warms the wounds and makes them more comfortable.

Holding a burn before the fire causes it to cease its smarting. In a like manner, picric-acid gauze comforts the wearer who is suffering with burns. Moreover, picric acid is aseptic and prevents infection. Care must be taken, however, that the picric acid does not come in contact with the uncovered eyeball; otherwise it will occasion some distress to the patient.

By throwing one point of triangular bandage over the head, the other two points can be passed around the neck in opposite directions to meet at the back and cross so as to keep the first point in place. They can then be made to reencircle the neck, and can be tied in front. This completely protects the wearer if the burns do not extend any distance toward his breast.

Dressing a Scalp Wound

Fig. 7 illustrates the use of the Red Cross first-aid compress-bandage dressing on a scalp wound on the right side of the head (temple). The compress dressing is a 4-in. bandage, with a gauze pad of 10 thicknesses sewn in the middle, which, when first taken from the first-aid packet, is folded in accordion pleats, so that when the attendant grasps it at either end and pulls, the compress remains in the center. Notwithstanding that his hands may be dirty and unclean, they can do the patient no harm, because it is not necessary for his hands to touch the wound or the compress itself. The bandage is passed twice around the head vertically, then crossed and passed around the scalp horizontally, over the temples. The attendant is shown making the final tie.

Finally the triangular bandage is placed over the head, but the method by which this is accomplished is not shown in the illustration. Two ends of the triangle are carried around the head and tied in front. If there is any bleeding, you can arrange the knot so that it is right over the source of the blood, which is oozing from the injured part, and, by drawing it tight, you can destroy the circulation and prevent further bleeding.

The Use of the Pulmotor

Fig. 8 shows an attendant using a pulmotor on an asphyxiated man. He has set him down sitting with his legs straight out before him. A rolled coat is laid on the ground a little below where his shoulders would come when he is laid out at full length. The erect portion of his body is then laid back so that his head rests on the ground, and his back is curved over the coat. In this manner, by bending his body, his throat is made perfectly straight and in the best of shape for breathing, real or artificial.

The tongue is drawn out by a retractor, which is a pair of light nippers which can be set in place so that no extra pressure has to be placed on them except at the time of application. The retractor is passed into a gas-tight bag, which forms part of the pulmotor, and the tongue is held up by holding the retractor through the walls of the bag. The pulmotor, which, of course, is already being held over the face of the patient, is now pressed forcibly over the nose and mouth, and the valve of the pulmotor is opened. The apparatus then automatically drives oxygen into the lungs of the subject. As soon as his lungs are full, the pressure reverses the valves in the pulmotor, and then it exhausts the waste gases, or the unused oxygen, from the lungs of the subject.

National First Aid Meet

By R. Dawson Hall

On Tuesday, Oct. 31, the National Mine Safety and First-Aid meet was held in the Forbes field, Pittsburg. The demonstration was attended by some 20,000 people, including President Taft, Secretary Fisher, Miss Mabel Boardman, Governor John K. Tener and Major Lynch. The first part of the program was the work of the Red Cross teams, 40 in all competing. The uniform of the men and their general deportment elicited much praise. Seeing that these men have been drilled in disconnected centers and that the Red Cross Society has not been able to provide all the assistance which it would have preferred to bestow, the work has been phenomenal.

There is no question but what the time was ripe for the work when Doctor Shields first took hold of it, and when the efficient organization of the Red Cross took it up. The 10 events were well performed. The enthusiasm of those who took part was unquestioned.

It is permissible, however, to criticize some few things, one especially which the teams have been urged continually to avoid. Respiration should never be restored by the Sylvester method when a man has badly burned or fractured arms. It is pathetic to watch some of the teams working badly wounded arms up and down in this sort of calisthenic exercise. Nor should the subject be allowed to put his mouth down on the ground when other forms of respiration are used. Just think what such a treatment might mean to a subject who really had such wounds, or had ceased to respire.

It is wrong to excuse a team by saying it is rattled. The men should never get confused, for a mine disaster develops the disease and only cool men should be chosen for first-aid work. The appearance of the men would be greatly improved if all, instead of about 90 per cent., were taught to deport themselves like soldiers, when not attending subjects. I would also suggest that all patients be placed in similar positions on the mats.

It seems, however, an ill acknowledgment of such excellent work to criticize what few things were wrongly performed. Still more unenviable would it be to pick out among so many excellent teams, one of superlative merit; the work was not to put the burden of choice on anyone else.

An account of the Bureau of Mines demonstration, which followed, must be omitted and left for another issue.

Explosions in Great Britain

The following is a list of the colliery explosions in Great Britain, with the date of occurrence and the number killed, that have occurred since 1851, involving the loss of 100 lives and over:

RECORD OF ENGLISH EXPLOSIONS

Mine and Situation	Date of Explosion	No. Killed
Cymmer, Glam	July 15, 1856	114
Lund Hill, Yorks	Feb. 19, 1857	189
Risca, Monmouth	Dec. 1, 1860	142
Oaks, Yorks	Dec. 12, 1866	361
Ferndale, Glam	Nov. 8, 1867	178
Swaithe Main, Yorks	Dec. 6, 1875	143
Blantyre, Lanarks	Oct. 22, 1877	207
Haywood Wood, Lanarks	June 7, 1878	189
Risca, Monmouth	July 15, 1880	268
Abercarne, Monmouth	Sept. 11, 1878	120
Seaham, Durham	Sept. 8, 1880	164
Naval Steam, Glam	Dec. 10, 1880	101
Clifton Hall, Lancs	June 18, 1885	178
Llanerch, Monmouth	Feb. 6, 1890	176
Park Slip, Glam	Aug. 26, 1892	112
Combs Pit, Yorks	July 4, 1893	139
Alboin, Glam	June 23, 1894	290
National, Glam	July 11, 1905	119
West Stanley, Durham	Feb. 17, 1909	167
Whitehaven, Cumberland	May 11, 1910	136
Pretoria, Lancs	Dec. 21, 1910	344

Thus, of 21 explosions in which 100 or more were killed, three occurred in February with 532 deaths; one in May with 136 deaths, three in June with 657 deaths; four in July with 492 deaths; one in August with 112 deaths; two in September with 432 deaths; one in October with 207 deaths; one in November with 178 deaths; five in December with 1091 deaths.

Explosion in Illinois Mine

By Floyd W. Parsons

It appears that the explosion in O'Gara mine No. 9 at Harrisburg, Ill., was caused by the ignition of a keg of blasting powder. A fortunate circumstance prevented a much higher death roll.

The most serious mine accident that ever occurred in Saline county, Illinois, took place Monday morning, Oct. 23, in O'Gara mine No. 9, at Harrisburg. Eight American miners were killed.

Immediately after the explosion, rescue parties were formed and made their way into the mine in an effort to save the men who were entombed. The rescuers were directed by Superintendent Morris, of the O'Gara Coal Company. Assisting Mr. Morris were William Johnson, general superintendent, and George Morris, assistant superintendent, of the Saline County Coal Company. After encountering serious difficulties incidental to the noxious fumes that followed the explosion, the rescuers succeeded in reaching the scene of the disaster and, by effective working, brought out a dozen men who were overcome by the gases.

After getting the affected miners to the surface, where they were placed under the care of doctors, the rescue party returned to the workings and continued their efforts until they reached the North entry where they found the bodies of 8 men who had succumbed to the effects of the gases following the explosion.

The dead were all found in rooms 14, 15 and 16, in the main North entry. None of the victims were disfigured, or seriously burned, but all were found with their faces covered—some with their hands and others having parts of their clothing drawn over their faces in a vain effort to keep out the poisonous gases. Several members of the rescue party were temporarily overcome by the gases, but were revived later.

About an Hour Elapsed

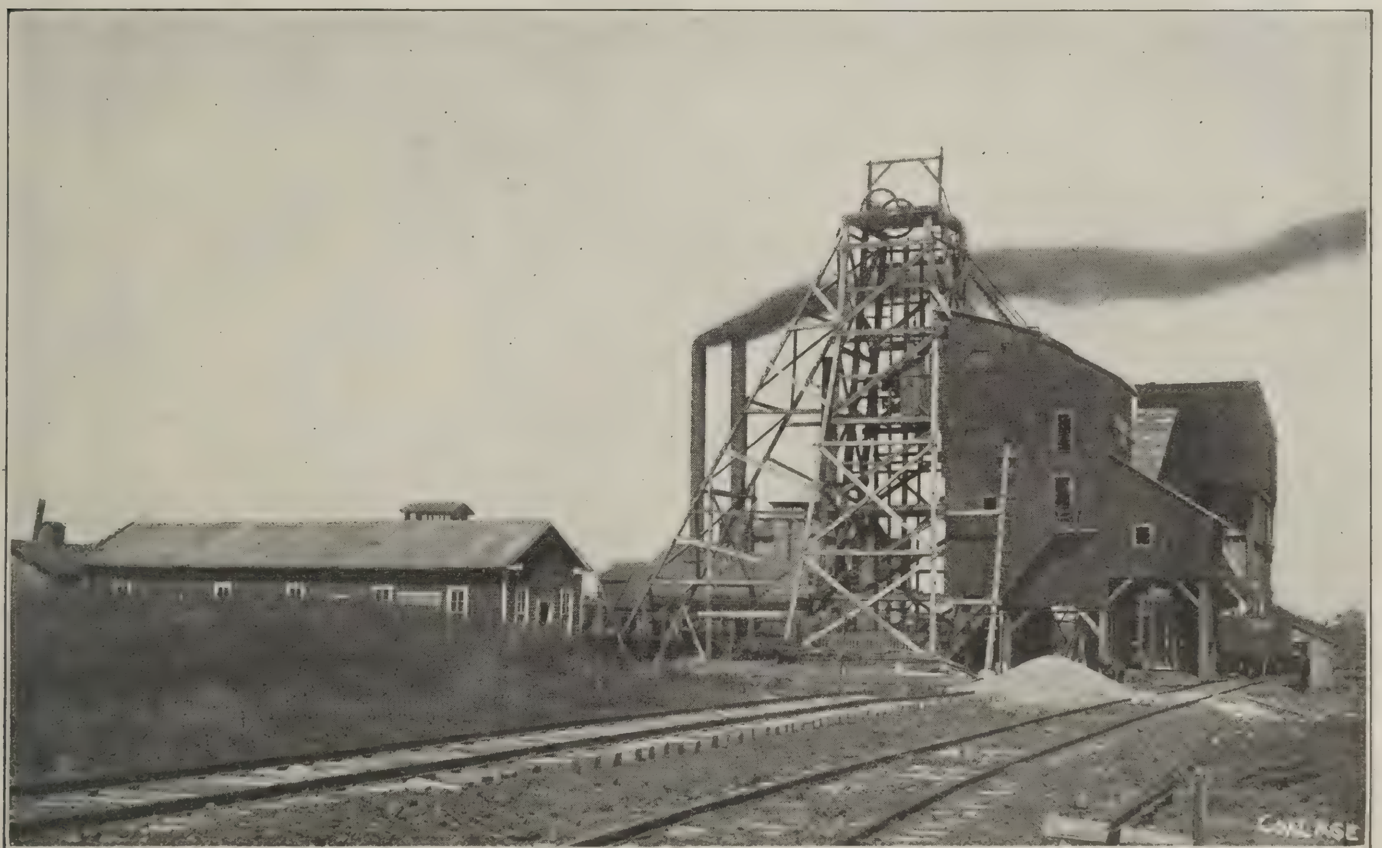
It was fully an hour after the explosion occurred before the rescuers got into the rooms where the bodies were found. The victims were immediately carried to the shaft bottom, and a little later taken to the surface where a temporary morgue was made available.

It is fortunate that only about 25 men were in that part of the mine where the accident occurred, and, aside from the 8 miners who lost their lives, the others either made their way out or were carried to the surface by the rescuers. It is reported that about 400 men were at work in other parts of the mine and were not affected by the explosion or the gases that followed.

Probable Cause

As is usual after a serious accident of this kind, a number of theories were advanced as to the cause of the explosion. The firebosses who examined the mine on the morning of the accident reported the workings free from gas. The company officials claim that the mine is not gaseous and has never been reported as dangerous. The workings are naturally damp so that no great attention was paid to moistening the dust. The seam that is worked averages over 6 ft. in thickness and lies 168 ft. from the surface.

The investigations seem to indicate that the explosion was caused by a keg of blasting powder which was accidentally set off. This theory is borne out by the statements of the rescuers who claim that when they entered the mine and ap-



O'Gara Coal Company's No. 9 Mine Where Eight Men Were Killed

proached the affected district, the powder fumes were so heavy that they had great difficulty in penetrating to the point of origin. If the explosion had been gas or dust this condition would hardly have been present.

A Fortunate Circumstance

In connection with this accident, it seems to me that fatalities would have been considerably heavier if the fumes of the powder that exploded had not been drawn into the adjacent mine, O'Gara No. 4, which was temporarily idle. The circumstances were as follows: The main North entry, just off which the explosion is thought to have occurred (in room 15), has an underground connection with mine No. 4. This latter mine was being ventilated by an exhaust fan although no men were at work underground. The force of the explosion blew out the stopping that connected the North main in mine No. 9 with the workings of No. 4, short-circuiting the air and causing the fumes and gases to be drawn out through No. 4 mine. The ventilator at No. 9 mine was working as a blower while No. 4 fan, as before stated, was exhausting.

It is quite probable, if the door connecting the two mines had not been blown down, the gases of the explosion would have been forced back through No. 9 mine, suffocating more men.

State Mine Inspector Rosbottom brought out the twisted and misshapen powder keg that is alleged to have been the cause of the disaster. This keg will be presented as evidence at the coroner's inquest. A few investigators have advanced the belief that the explosion was due to gas from mine No. 4 entering mine No. 9; however, there appear to be no facts to support this belief. The contention of the O'Gara people is that a lighted lamp was left near the keg of powder and in some manner fire from the lamp reached the powder, causing it to explode.

Considerable secrecy has been maintained by the O'Gara company in connection with this accident. No first-hand analysis of the explosion is possible, therefore, at the present time. Coal Age will publish the final verdict when the facts are made public.

Explosion Test at Bruceton Mine

By J. T. Beard

After some delay the mine was fired by an explosion of coal dust resulting from blownout shots.

The National Mine Safety Demonstration inaugurated and carried to a successful culmination under the auspices of the United States Bureau of Mines, American National Red Cross and the Pittsburg Coal Operators' Association, this week at Pittsburg, reflects great credit on the promulgators of the movement. The results proved that the effort was appreciated by the great body of mining interests in this country. No larger or more representative gathering of mining men has ever been called together than that which assembled at Pittsburg, Monday and Tuesday, Oct. 30 and 31, to witness and take part in this first great national demonstration.

The readers of Coal Age are already familiar with the large amount of preliminary work that was required and has been so wisely executed during the past two years following the terrible mine disasters of 1906 in France, Japan and especially in West Virginia. There was need of wise enactment of law that could only be accomplished by the united efforts and action of the various mining interests represented in the large engineering and mining societies, institutes and congresses of the country. Suffice it to say this preliminary work has been done wisely and today the Federal Bureau of Mines is the child of these coöperative interests, born in the hour of necessity and now rapidly attaining its majority and proving its worth by its wisdom and activity. In spite of some little adverse criticism coming naturally as the result of the division of work that must always follow the inauguration of any new department or bureau in either national or State governments, the Bureau of Mines has quietly performed its work and is rapidly gaining the confidence and coöperation of all classes of mining men and mining interests from the engineer and operator to the miner. Coal Age does not hesitate to earnestly commend the work of the bureau to its many readers and asks of them the most hearty coöperation and support, which we feel is already being cordially given.

One of the main features of the present demonstration was a dust explosion in the experimental mine now leased by the Federal Bureau of Mines from the Pittsburg Coal Company for the purpose of making its investigations of mine conditions more real, and for keeping in touch with actual practice. This mine is located at Bruceton, about 13 miles from Pittsburg. Before the Government could enter into or become a party to this contract or lease, it was necessary for Congress to pass an enactment with the approval of the Secretary of the Interior, which was done shortly after the creation of the Federal Bureau of Mines. The act of Congress, we understand, carried an appropriation of $450,000, which was thus placed at the command of the newly created bureau, for its allotment to the various branches of the work now in its charge. Through this allotment by the Bureau of Mines, we believe a fund of $65,000 became available for the equipment and work of the experimental mine at Bruceton.

Availing itself of the generous offer and the hearty coöperation of the Pittsburg Coal Company, the Mining Bureau was not slow to contract for the lease for one year of the tract of coal at Bruceton where the present experimental mine was opened about August, or September, 1910. The Government cannot enter a contract for a period of time greater than one year; but the Bureau of Mines, we understand, has been assured verbally of the willingness of the Pittsburg Coal Company to extend its lease of the mine at the expiration of the time named, should an extension be desired by the bureau.

By the terms of the agreement, the mine was opened according to plans approved by the Pittsburg Coal Company. This was necessary in order that the coal company might operate the mine for its own purposes at any later time when the bureau might wish to abandon its investigations along this line. During the period of practically twelve months in which the bureau has been pushing its work of investigation at Bruceton, the mine has been opened, the necessary surface buildings erected, much concrete masonry put in at the drift mouth and in portions of the mine entries where it was necessary to establish recording stations for holding the various instruments used to indictate the pressures, velocities, temperatures, etc., resulting from a mine explosion. In this period of twelve months the main entry and air course have been driven practically 750 ft. into the hill.

Ventilation of the Mine

Ventilation was at first secured by the erection of a small Sirocco fan, 36 in. in diameter and 20 in. wide, at a point near the mouth of the drift air-course. This fan furnished an air-current of about 4000 cu.ft. per minute; its position, however, was later changed to better suit the purpose of the tests, to its present position in the mouth of the steel tubes or second opening. In this latter position, the fan is run as a blower. The air-current is taken in through the steel tubes

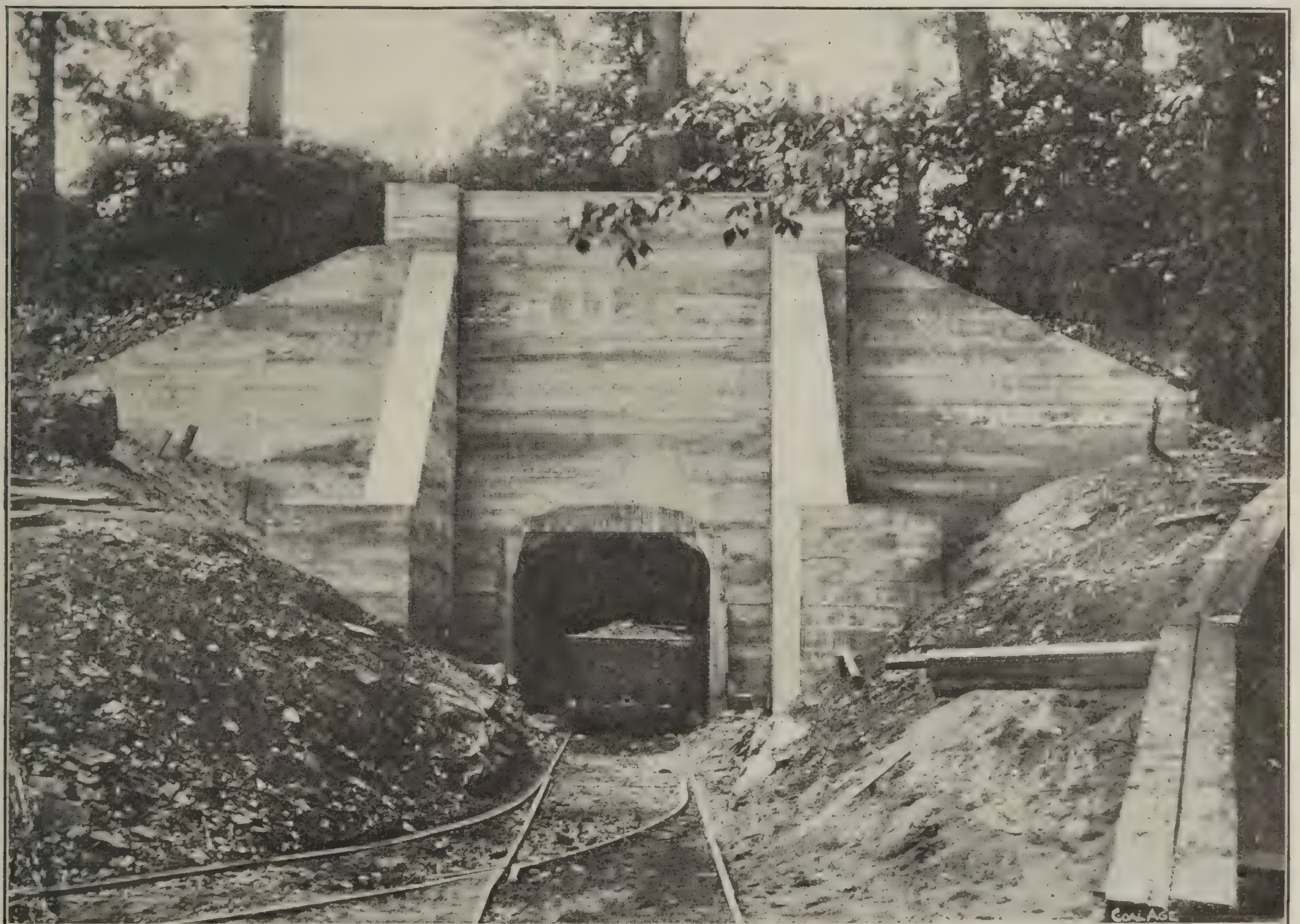
and conducted to the last crosscut between the drift entry and air course, about 60 ft. from the face of these entries.

Location of Shots to Explode Mine

It was in the face of this drift heading that the shots were located, which were, by their explosion, to fire the dust that was scattered on shelves arranged along the ribs the entire length of the entry or drift. These holes were bored straight into the face of the solid coal, from 3 to 4 ft. in depth. Each hole had a diameter sufficient to contain a piece of 1½-in. iron pipe, which was closed at one end with a wooden plug and filled with about 2 lb. of black blasting powder and inserted into the hole bored in the coal after which the hole was tamped with 6 in. of clay. An electric fuse was used to fire the charge.

The Purpose of the Experiment

The purpose of this experiment was to prove or disprove the theory that simple coal dust in a finely divided state would explode under certain favorable conditions without any gas being present. The mine at Bruceton was entirely free from gas, none having been found in the frequent careful tests that were made to discover gas. The mine was therefore well adapted for the purpose in view. In order to insure the success of the demonstration that took place Oct. 30, a trial explosion was arranged for Tuesday, Oct. 24. The results of this trial exceeded all the expectations of those in charge and served as a guide for future experiments. The roar of the explosion and the accompanying blast of flame issuing from the mine openings was described by those who witnessed the experiment as terrific. After this trial the mine was again put in order and prepared for the later demonstration.



The Main or Right Portal of Government Experimental Mine, Bruceton, Penn.

A Dust Explosion Demonstrated

Little, if any, change was made in the amount of dust used and the charge of powder required to produce its explosion; these amounts had been well calculated in the first trial experiment. About ½ ton of dust was used in the entire length of entries, or an average of 1 lb. of dust per lineal foot of entry in the main drift, and ½ lb. per lineal foot in a portion of the intake airway. This dust is to be prepared at the mine by crushing and grinding the coal and passing the same through a 100-mesh screen. The result is a fine impalpable powder that is readily blown from the shelves on which it is placed, by the force of the blast.

Inspection of the Mine

Previous to the explosion the visitors were allowed to pass through the mine, entering at the drift mouth and passing in through the main heading, which was the return airway, to the face and then out along the intake airway and through the steel tube to the surface. It is estimated that 1231 persons entered and inspected the interior of the mine.

It had been expected that only those directly interested in and acquainted with mines would go underground, but in compliance with the popular desire to see all there was to be seen, no one was denied entrance. This inspection of the workings exhausted much valuable time and it was long after the time set for the explosion when the first attempt was made to fire the mine.

Preparing for the Blast

After everyone had returned to the surface and before the blast could be fired, it was necessary to remove the line of incandescent lamps that were used to light the entries, and to make the electric connections at the face of the heading. When this was done, the first attempt was made to explode the mine, shortly before 5 o'clock. Three pistol shots were fired, announcing that all was

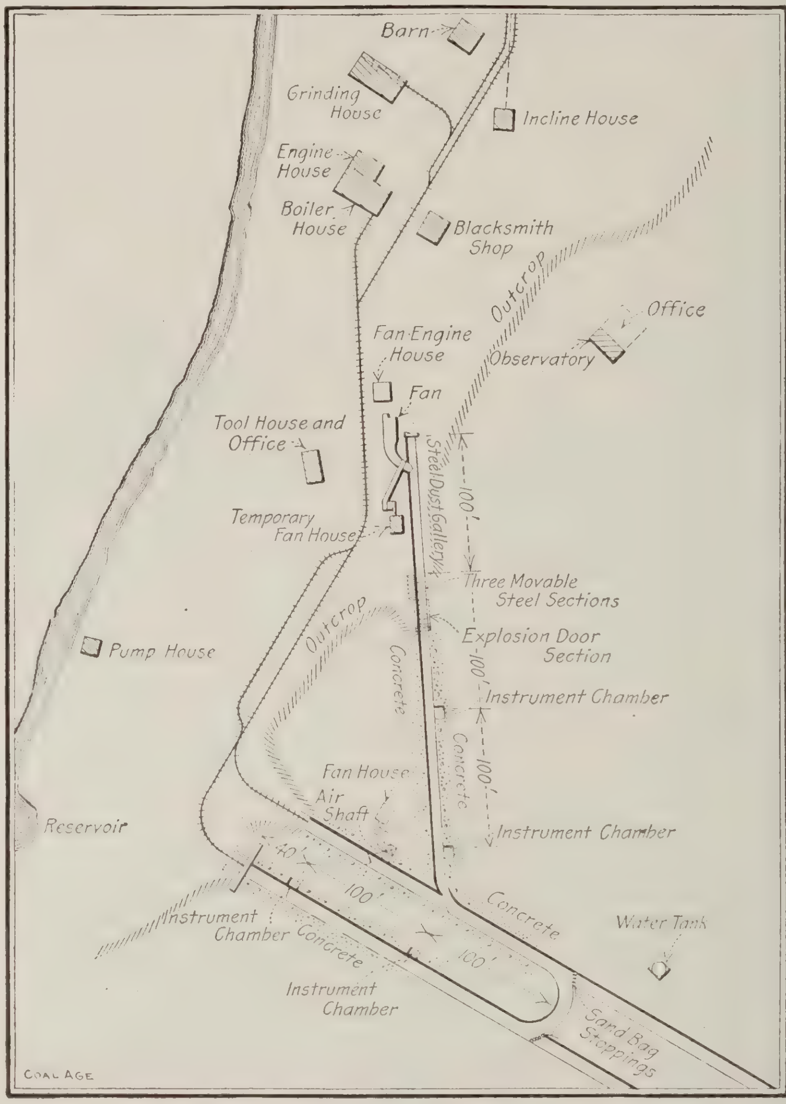
in readiness and that the explosion would soon take place. A small six- or eight-volt blasting battery was used, but the blast failed to explode. The officials in charge were wholly at a loss to understand the reason for the failure. No time was to be lost, however, and after a hurried consultation, the wires were disconnected and men sent into the mine to ascertain the cause, and, if possible, remedy the trouble.

The Second Attempt Failed

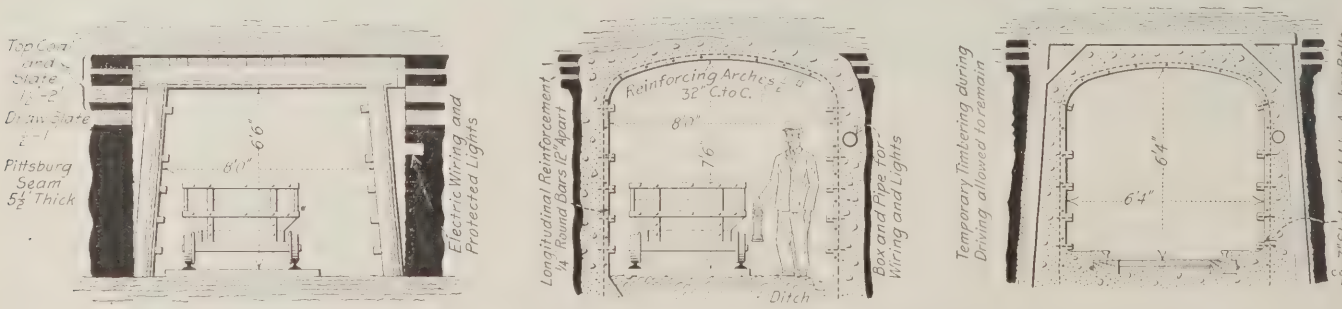
A half-hour later, three pistol shots told the waiting throng that all was ready for a second trial. The expectancy of the next few moments can better be imagined than described. The gathering darkness and the drizzling rain, which had been falling during the afternoon, added much to the unpleasantness and the vexation caused when this second attempt to explode the mine failed.

It was now 5:30 p.m.; the squad of rescue men who had been anxiously waiting for over two hours to take their part in the demonstration and enter the mine immediately after the explosion, were now sent back to their car. Many others gave up in despair and returned to the station, believing there would be no further attempt made by the officials to carry out the program. A large number of the waiting throng, however, still remained, possessed with what seemed to be a forlorn hope that they would yet experience the reward of their patience and witness the longed-for explosion at the mine. In the meantime, the determination of the officials grew with the fast-coming darkness. A new line of wire was run into the mine and connection made with the lead wires of the fuse at the head of the entries. When this was done the full voltage of the electric-light circuit (110 volts) was turned on.

flame, first from the main-drift mouth and a second later from the steel tube at the second opening. This was accompanied with the sharp rattle of the manhole doors of the steel tube as they were



Official Map of Bruceton Mine. (A More Recent Map is to Follow)



Cross-sections at the Government Mine, Bruceton, Penn.

Timbered Mine Entry — Concrete Mine Gallery — Timbered Entry Concreted

wise about 50 ft. on each side of the opening and reached an estimated hight of 100 ft. in the air, rolling backward from the tunnels in such volume and fury as to thoroughly alarm the crowd of spectators on the hillside above. These observers fled precipitately in all directions.

The Explosion

The effect was magical. The air was suddenly rent with a thunderous roar and the heavens illuminated with a fiery glare that for a few moments sent terror to the hearts of those still waiting on the hillside. Practically simultaneously with the roar underground there was a burst of

successively blown open by the force of the blast, the sound much resembling the roll of a drum.

The scene, with its surroundings of tall forest trees, the deep ravine and the hillside, was spectacular in the extreme. The flame bursting from the mouth of the two openings of the mine spread side-

spectators on the hillside above. These observers fled precipitately in all directions. The explosion lasted but a few seconds, however, and all was again wrapped in darkness now blacker than before, owing to the dense volumes of smoke that poured from the mine openings. The flame in many places had

ignited dead leaves of the tall trees, which, but for their wet condition, might have caused a more serious conflagration. The air for a brief period of time was filled with falling débris, soot and burning leaves. A mine car containing some 500 lb. of gravel, standing about 40 ft. in front of and in line with the mine drift, was blown nearly 200 ft. across the ravine, while another car loaded with rock was moved some 20 ft. and turned partly around. The event was certainly an important object lesson that cannot but prove of lasting benefit to all who were privileged to witness the scene. The Bureau of Mines is to be congratulated on the result of this part of the first national safety exhibit.

Motors Shielded Against Gas

Legal rules in some countries require that electric motors installed in gaseous mines shall be constructed or mounted so that the sparks which they may produce will not cause explosion.

A requirement that the construction of the motor shall afford protection against gas does not mean that it shall prevent

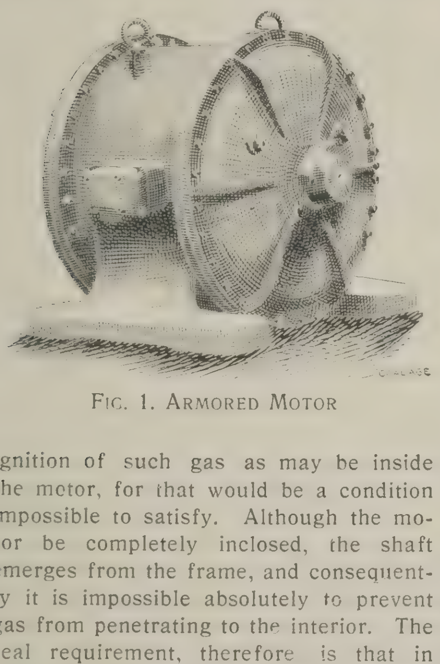


FIG. 1. ARMORED MOTOR

ignition of such gas as may be inside the motor, for that would be a condition impossible to satisfy. Although the motor be completely inclosed, the shaft emerges from the frame, and consequently it is impossible absolutely to prevent gas from penetrating to the interior. The real requirement, therefore is that in case an explosion occurs inside, it shall not be propagated to the outside.

As regards the protection of motors against gas, great importance may be attached to the experiments which took place from 1903 to 1905 in the mines of Gelsenkirchen under the auspices of the Association of Mining Interests of the district of Dortmund, Germany, at the expense of the mining fund of Westphalia in coöperation with various manufacturing companies, and under the direction of the assessor of mines, Mr. Beyling. These experiments showed that there existed two methods of constructing motors guarded against gas. These two methods have been employed with success.

The Two Methods

The first method consists in completely armoring the motor and constructing it so solidly that it will resist the pressure in case an explosion occurs inside of it. Fig. 1 represents a motor of this sort completely armored.

The second method is to let the gases of the explosion issue, but so to cool them that they cannot carry the fire to the surrounding atmosphere. For this purpose is provided a casing for the motor with protecting rings composed of numerous annular pieces of sheet metal placed about half a millimeter apart. The explosion gases pass radially through the rings and are so cooled by the surfaces of the plates, that it is impossible for them to communicate the fire to the surrounding atmosphere. The effect is analogous to that of the wire gauze in the Davy safety lamp.

The frame with its rings and sheet-metal sheathing entirely surrounds either the whole motor, Fig. 2, or only those parts where sparks may be produced during service. In the latter case, where half armored or open motors are used, the

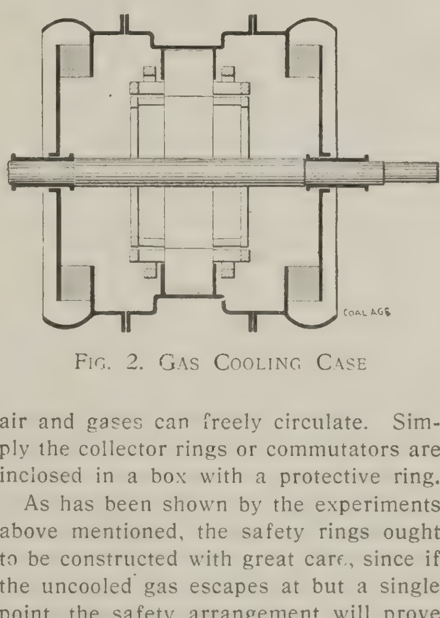


FIG. 2. GAS COOLING CASE

air and gases can freely circulate. Simply the collector rings or commutators are inclosed in a box with a protective ring.

As has been shown by the experiments above mentioned, the safety rings ought to be constructed with great care, since if the uncooled gas escapes at but a single point, the safety arrangement will prove unavailing. The same danger would exist where there was some grounding in the frame of the motor.

It is highly important that motors intended for gassy mines shall, before delivery, be tested most carefully under all the conditions to which they will be subjected after installation.

NOTE—From *L'Echo des Mines et de la Metallurgie*, Paris.

Be careful not to oppose respiration on the part of an asphyxiated person about to recover under treatment. Do not compress his lungs when he desires to inflate them. If the respirations are long apart, carefully continue the bellows-blowing action between natural respirations.

First Aid in Accidents

The following is a timely excerpt from the circular No. 110, on, "First Aid to the Injured," issued by Johnson & Johnson:

The greatest danger to wounds from accidents is due to contamination with foreign substances, not always visible, but far reaching in effect. Certain invisible irritating matter (germs) quickly find lodgment in any wound by transference from the air, the clothing, the skin; in fact, from anything that may come in contact with it. In consequence of such contamination, blood poisoning, gangrene, inflammation, fever, erysipelas and a train of complications are liable to follow any wound.

Small scratches and pricks, when not properly cared for, may result in inflammation and the formation of gatherings or abscesses, which will disable a person for a considerable time or cause the loss of a limb or even endanger life itself.

The necessity and value of prompt and efficient first aid in injuries needs no comment. During the war with Spain, in the Philippine campaigns and in the Russian-Japanese war it has been established that, by the prompt application of first-aid dressings, the loss of life and limb has been reduced to the lowest ratio in the whole history of warfare.

The modern practice of surgery requires that the dressings applied to a wound shall not only look clean, but shall be surgically clean (that is, aseptic), free from surgical dirt.

The application of the principles involved, has saved many an idle day, soothed untold suffering and even saved millions of lives. From the surgeon's standpoint, a piece of spotless linen may be a filthy rag; he does not judge from the looks but by his knowledge of the effects.

Watering Dusty Entries

A recent English invention for watering dusty roads in coal mines is described as follows: A tub or tank is mounted on an ordinary mine-car frame in such a way as to leave, below the tank and above the frame, an open space, in which revolves an iron saucer-shaped disk with four vanes across its face. This disk or turbine rotates rapidly in a horizontal plane through the action of an endless chain driven by the wheels of the mine car. Water flows through a valve in the bottom of the tank, onto the turbine wheel below, and by its rotation is spread outward and upward, the flow being regulated by the valve. This latter may be of either the lever or screw type, the former permitting more rapid adjustment. The turbine wheel may be thrown out of gear at will by a lever which is controlled by the man in charge.

COLLIERY NOTES and COMMENTS

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

A miner recently lost his life from suffocation by natural gases. He went past a fence and past a danger sign into a drift, which he knew contained inflammable gas, in order to obtain a shovel which had been left in the drift several days before. The lesson is clear.

Remember that a little dirt adhering to electric mine machinery, a loose terminal wire, a poorly covered joint or careless cable insulation has often caused, and may at any moment cause, death. Careful investigations have shown that most mine accidents, due to electricity, are the result of want of care.

When the different coal-mining States demand an oral and written examination of all mine foremen, and issue certificates to the same before they are allowed to hold positions, and when the State delegates certain police powers to men who successfully pass such examinations, then and not until then will the mine laws be enforced, the death rate materially reduced and property conserved.

According to official reports more than half of the deaths due to the underground accidents in the Nottingham section of England are caused by falling roof; and this after every effort has been made to secure systematic timbering. The various causes of fatalities in coal mines are stated to be in about the following percentages: Falls of roof, 57.8; haulage, 22.6; shafts, 8.8; other causes, 10.8.

When about to institute first-aid instruction work in a colliery, let the first class consist of the bosses, superintendents and the heads of departments; then form classes among the miners. In this way all classes of employees will come in touch with the work, and in case of serious accident there will be a better understanding and more cordial coöperation among such men as may happen to be in the mine at the time the accident occurs.

A competent impartial State Mining Board, free from politics and composed of the most competent of specialists, would do much to prevent accidents, save life and conserve natural resources. To such a board the law should compel all companies to submit their plans as to surface buildings, underground workings, methods of mining and plan of ventilation before mining operations could begin. Such a board should be invested with the power to reject or approve plans submitted to them; thus only such plans as meet the approval of the highest mining authorities of the State could be adopted.

One English writer, in explaining what action should be taken after an explosion occurs, advised among other things that the manager place a notice board in a conspicuous position near the top of the shaft with the following cautions: "Real courage does not consist of being careless of danger, but of being quick to face and disarm it." "Courage without caution is dangerous; caution without courage is contemptible." Would it not be worth while to place such a cautionary signboard in some prominent position near the shaft at once without waiting for an accident to occur. Hundreds of miners have been killed through exercising courage without caution.

It has been demonstrated that sparks will pass between carbon dust, immersed in oil, under pressure of 50 volts, proving that in electrical pressure between metal terminals, the carbon dust which collects forms chains, so that the electricity passes easily from the one to the other. Where metal terminals are exposed, dust held in suspension is gradually deposited, and will be sufficient to establish a short circuit. Assuming a short circuit caused by coal dust at the terminals, and a cloud of dust caused by a traveling trip of cars, Professor Thornton, an electrical expert, concludes it will probably be sufficient to start firing along the roof and perhaps cause an explosion.

The inquiry into the disaster at the Maypole colliery in Lancashire, England, disclosed an apparent lack of any definite line of action to be followed by the firemen and shot lighters when they found parts of the mine dangerously affected by emissions of firedamp, a condition that must arise from time to time in gassy mines, however skilfully the ventilation may be applied. For this reason the commissioners concluded: "An important lesson to be learned from the disaster seems to us to be that an endeavor should be made in mines which make firedamp freely, to fix, if practicable, some standard of ventilation, with the object of lessening both the responsibility and discretion of the under officials."

Mine accidents usually occur at the working faces, which are generally remote from the mine hospital. In such cases, to save time, it has been suggested that a stretcher be made at the face with materials usually found there, such as coats, overcoats or a pair of grain bags, which are commonly used by miners to carry explosives into the mine, and a pair of rails, drills or pipes about 6 ft. long. In case the coats are available, they should be buttoned then turned inside out. Insert the rails or drills lengthwise into the sleeves, thus forming a comfortable stretcher. In case grain bags are used, both corners of the bottom should be cut off so as to permit the improvised handles to pass through. The bags placed lengthwise will make a good stretcher.

In organizing the rescue station at the Kleophas mine, in Upper Silesia, the management has arranged that, both night and day, six fully qualified men are always at the surface, and ready for immediate action. Of the three parties of six men each, the first is employed on the day shift on the surface, the second on the day shift in the mine, and the third on the night shift on the surface. The parties regularly change shifts and work both on the surface and underground. In this way they do not lose their knowledge of underground work. For rescue work to be most effective, there should always be a corps "ready at call" on the surface. This arrangement of shifts should be observed by all. If all the men were below they would be helpless in case of disaster.

At the conclusion of the inquiry into the Whitehaven explosion (Cumberland, Eng.), the jury recommended: "That the finding of gas in working places should be more generally noted and reported in writing; that the ventilation be more adequate; that a system of watering the main roads by means of a spray be brought into operation; that a special rule be made providing that no lighted lamp should be placed on the ground of the working place while the mining of coal is being proceeded with; that workmen on being given their working lamps should be supplied with a tally having numbers corresponding with those of the lamps; that the doors of the return airways should have special keys provided for the opening of the doors on the return side of the airway; that special attention should be given to training in ambulance work and necessary appliances; that strict observance of the special rules should be enforced on all workmen and officials."

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This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

The Pittsburg Arsenal

It appears a fitting time, now that so many mining men are gathered at the National Mine Safety Demonstration, to call attention to the undesirable quarters in which the Bureau of Mines performs its valuable work, and to express the fear that the significance of the bureau may be lost sight of by ourselves and our foreign visitors when we and they view the bare and meager buildings with which the operations of the bureau are surrounded.

Compared with our university and college buildings, with the offices of our larger corporations, with, one might add, the high-school buildings of our larger towns, the arsenal at Pittsburg, the home of our Bureau of Mines, looks squalid and commonplace.

There are questioners who wonder whether our universities and colleges, which teach the civil, mining and mechanical arts, do well to surround themselves with so much grandeur, training the young man to associate his profession with a luxury, with which in practice he must almost invariably dispense. This contrast results in his disillusionment and renders him, in a degree, at least, unfit for the vicissitudes of life he must later experience. But while this argument has a certain degree of truth for the raw product passing the collegiate mill, it cannot have for the finished product, mellowed by practical training and experienced hardship, such as finds home for research in the Bureau of Mines.

Uninviting indeed are the gloomy buildings offered as laboratories and offices to these engineers whose salaries are not so large as will compensate them for the inconveniences they must endure. Will an uninviting home for the bureau on an inferior street in an unfrequented part of the city, away from library and technical school, do the work that would be done, and enlist the men who would be enlisted if the investigations were carried on amid pleasanter surroundings?

It is true the lines of endeavor of the earnest men of the bureau are laid toward the accomplishment of more and more research in return for the penurious gifts of a nation, which is but tardily responsive to the needs of the work and the excellence of the results already obtained. Other bureaus, which have deserved no more from the public, have had magnificently appointed headquarters constructed for them. The nation should do no less for the Bureau of Mines, constructing a wing or central building for immediate needs only, and paying attention to the architectural possibilities of future additions. The plant should be located where it will be an adornment to Pittsburg, and a complement to its present dedications to knowledge, visible to the general public and ready of access to the valuable technical library stored within the walls of the Carnegie Institute.

The Laws of Safety

The codes of mining laws are the monuments of our care for life. Some are defective; some are reasonably well alined with our present knowledge; what they are, what they are not, is due to the operator and the miner in all States where mining is an important industry. True it is that both parties attack certain provisions as too onerous to one class or another, but if the proposed enactment is well grounded, the sentiment of the unprotesting carries the provision through. Although the general sentiment of the operators and miners is for safety, we sometimes feel abashed at the narrow arguments for laxity urged by the few. The impulse is well nigh universal that safety must ever hold first place.

This feeling was abundantly evidenced in the recent meet at Pittsburg. Operators and squads of men came from all over the United States to study safety and to exemplify it, willing to travel further to obtain such knowledge than they have so far shown themselves willing to travel for a broadening of their economic training. We cannot but feel proud that the knowledge which means money is less appreciated than the knowledge which means life.

The laws of each State are the laws framed by the mining industry. It made them, passed them and, as a whole, approves them, while they in turn approve the industry. These same laws have been created in accordance with the spirit of the age. The mining fraternity does not regard them as mere enactments, bristling with penalties, nor as disagreeable restraints, but rather as the outcome of the industry's better self. It is to be hoped ever that the law will be fulfilled, not in "the letter that killeth, but in the spirit that giveth life."

The Scranton Mine Cave Commission

There is a natural regret that the Scranton mine-cave commission and the engineers it engaged came to no startlingly new conclusions and gave no mollifying assurances to the public that security and absolute roof support could be obtained at small cost.

But it is no small misfortune when a city of 130,000 inhabitants, with buildings of great artistic merit (for indeed Scranton has some which for pure beauty are seldom excelled) rests upon a tottering series of crumbing walls, aggregating over 65 ft. in hight, and so arranged that the full strength of these is not obtained; walls that are yet to be removed wherever possible and for which no provision for replacement has been hitherto considered.

So sore an ill can be assuaged by no inexpensive cure-all. The city owes the commission a debt for bluntly acknowledging the magnitude of the peril and for urging on the citizens and operating companies that they provide adequate means, at the needful expense, for the prolongation of the life of the city they live in. It would have been criminal for the engineers hoping to mollify the public and the coal companies to have made an evasive or inadequate recommendation and a report filled with weakling deceits.

The hope of a gratifying report might have been held out, had the structure been in the form of a dome or an arch. Then the load could have been carried to certain limited areas, and fracture might have been prevented by provisions against excessive settlement at the inclosing walls or wall-like piers on which the dome or arch, respectively, rested. Or again, had the measures been, as they are in the case considered, relatively flat, and had, as is not the case, but one bed of coal been worked, then any attempt of the structure to fail as a beam, would have been prevented by the thrusts or horizontal pressures set up by the binding of the strata overlying the coal as they endeavored to crowd into the space between the supports. These thrusts, combined with downward loading, would create surfaces of pressure whereby the flat roof would be transformed into dynamic semblance to an arch or dome and the internal strains with resultant internal falls would probably create a real culvert or cupola with filled spandrels.

Such a roof might settle in one large area, as a vast unit, making the bulk of the city safe, even had the very supports of the arch been cautiously removed, providing care had been taken to secure the arch in position against side pressure, for though the thrusts in an arch, when it is high, are not considerable or large compared with the vertical loading, yet it is important that they be taken care of, for a structure of that kind, when it spreads at the supports is considerably weakened.

But with several beds worked and with intervals between the beds thin, the result can only be a series of superposed arches too shallow for self-sustenance, and for which there is no cure but filling, complete or incomplete. The method, proposed by the commission, is to provide a series of flushed foundations at the corners of city blocks, which will provide for the support of whole congeries of buildings, which, when shrinkage comes, will involve them altogether and let them down without mutual strain.

These blocks of buildings will have foundations spaced like those of the Eiffel tower and in a dynamic sense, will rest as if on a series of arches parabolically curved in three dimensions, as in that unique structure, yet with all the curves concave as viewed from below. The arches will be not the less truly entitled to that name, because they may happen not to be so shaped. They may continue to stand up like flat arches, such as are commonly used to span house openings, or they may break up and reshape themselves into the forms of quasi-Roman, or of quasi-ellipsoidal spans.

That it is better to support the street corners than the blocks themselves (unless indeed the filling is almost continuous) is seen when one reflects that one flushed pillar may shrink more than another and the strains resulting from the shrinkage would be likely to rend an overlying building, wall from wall.

The suggestion of filling the Dunmore beds is not unreasonable. It must be remembered that they are thin, none, over any large area, exceeding 4 ft., and a great deal of rock will need shooting in any event for gangways and chamberways, and where the roof is weak, there may be more roof fall than there is room adequate for stowage. The rock in the anthracite region is peculiar in that it stands air well and when piled in chocks, its first set under the final load is its last. There is no further settling as a result of its disintegration, or of the deterioration of the surfaces on which it rests.

The Value of Scrap

Many mine managers have the price of a coveted and necessary piece of equipment lying around their property in the form of scrap. The wornout car wheels and axles, gears, chain links and sprockets, old rails, old pipe, old rope and all the sundry discarded irons and castings which so generously bestrew the ground around some collieries, often represent a tidy sum of money.

Such accumulations of useless and discarded material are, moreover, apt to impart an appearance of disorder and an impression of waste quite out of proportion to the expense involved in systematically disposing of them. The stranger, be he merely an inquisitive visitor or the company's largest stockholder, judges, to a great extent, by externals. It is always well to avoid the appearance of evil. Scrap, left at random about a plant, has a decidedly negative value; it is worth a good deal to be rid of it.

It may be that the things which go to make up the colliery junk heap are looked upon by a wary and acquisitive foreman as possible saviors in some time of need, but any such expected value is seldom realized. When the emergency arises, it usually develops that nothing in all the varied assortment will quite fill the bill. Repair parts are one thing and scrap decidedly another. The former should be sound and serviceable, carefully stored and cared for. The latter is worth, perhaps, half a cent per pound.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Interesting Questions

To Prevent Accident, Loading Coal

Ques.—A large percentage of mine accidents is caused by miners persisting in loading coal where the roof is unsafe. What rule would you adopt to prevent this condition and reduce the number of accidents therefrom?

Ans.—An invariable rule should be adopted that no coal shall be loaded at the face until after the miner has carefully examined the roof and coal face, in his place, and either taken down or timbered securely all loose coal, slate or rock. This rule can generally be enforced by the penalty of a lost turn if the rule is violated. Every miner should be held responsible for the timbering of his own place; and the mine foreman and his assistants should see that such timbering is properly and promptly done.

Safety in Blasting in Mines

Ques.—Describe briefly the comparative merits of firing shots in mines by means of fuel, squibs and electricity, in respect to safety.

Ans.—When shots are fired by the common single-tape or double-tape fuse the length of the fuse can be regulated so as to give the person who fires the shot plenty of time to retire to a place of safety. This cannot be done in the use of squibs.

Indeed when squibs are used, the miner is often tempted to break off or shorten the end of the match of the squib, or untwist the end so as to hasten the explosion and at the same time to avoid the danger of misfire by the match going out after it has once been lighted. At times, the miner dips the match of the squib in coal oil for the same purpose. All of these practices are extremely dangerous, often causing the shot to explode before the miner has reached a place of safety. It frequently happens that, in the use of fuse for blasting, an unscrupulous miner, when he has overcharged a hole and is somewhat doubtful in regard to the safety of the shot, will cut a long length of fuse to enable himself to get well out of harm's way before the shot explodes. He does this, at times, with an entire disregard of the safety of his fellow workers. In the use of fuse a good quality of double-tape fuse should be employed. Single-tape fuse should never be used in mining, owing to the danger of the fuse being injured in the rough work attending the tamping of the hole, and in the rough handling which is general in mining work.

In the use of electricity for blasting there is always less danger of misfires, and the danger from hangfires is extremely slight, although both of these occur at times. There is, also, in the use of electricity, less danger of a premature blast, resulting in the miner being caught before he has reached a place of safety. In electrical firing, the battery should always be kept under lock and key and be in the charge of one competent person who is to fire the shot. The lead wires used to conduct the electric current into the chamber or room are never connected to the battery until all connections have been made at the working face where the shot is located. After the workmen have retired from the place the shotfirer brings out his battery and connects it with the lead wires; he then applies the handle and operates the battery. Should the shot fail to explode in this method of firing, after two or more trials, the shotfirer removes the handle from the battery, disconnects the wires and proceeds, after the space of a few minutes, to investigate the cause. In electric firing it is never safe to approach a shot that has missed fire before the elapse of from five to ten minutes, at least; and more than this time should be allowed if all possible danger from accident is to be avoided.

Hangfires in Blasting with Fuse

Ques.—Explain what conditions may cause a shot to hangfire where a fuse is used for blasting in mines.

Ans.—In firing blasts with fuse a shot may hang fire for an indefinite period, lasting from a few minutes to several hours, according to the kind and condition of the fuse in the hole. Perhaps the most common cause of a shot's hanging fire is due to a small piece of coal or rock being jammed into or against the fuse in tamping, whereby the train of powder is broken. The outer covering of the fuse then smolders till it at length reaches and ignites the powder beyond the break. Or the fuse may be damaged before it is placed in the hole, and give the same results as described above. Sometimes the powder of the fuse becomes damp and burns slowly and intermittently, or the fuse may be drawn out of the charge and only ignite the paper wad that some miners use over the powder; the paper smolders for a time and finally ignites the charge. In blasting with fuse, it is never safe to return to the face when a shot has failed to explode. The miner should go home and leave the investigation of the trouble for the next day. It is the only safe rule.

Safety Arrangements, Mule Haulage

Ques.—What arrangements should be made, in mule haulage, to insure the safety of drivers and all persons employed in the mine?

Ans.—Strict regulations should be enforced relating to the movement of cars, and especially providing for the meeting places of drivers on single-track roads. No cars must be left on haulage roads, or extending from the mouths of rooms where they would interfere with haulage on the main track, or in a position where they might become loose and run down grade. No car must be taken down a grade where sprags are required without the driver first seeing that such sprags are properly adjusted. A door must not be located at the foot of a sharp grade. Refuge holes must be provided at all doors for the protection of trappers, where trappers are employed; and at proper intervals on all haulage roads used as travelingways, except where such roads are wide enough to allow safe passage for men on the side of the track.

Safety Arrangements, Shafts and Slopes

Ques.—Mention briefly the various arrangements and appliances for safety, employed at shafts and slopes.

Ans.—The top of all shafts and steep slopes, as well as all landings, should be protected by suitable gates to prevent persons falling into the shaft or down the slope. Safety blocks should be placed on all tracks leading to the shaft or slope, on every landing, to prevent mine cars running or being pushed into the shaft or slope. All cages should be provided with sufficient hoods, safety catches and bridal chains; and where men are to be hoisted suitable guards should be used on each end of the cage. The last car of a trip being hauled up a slope of moderate inclination, should always be provided with a good drag-bar or "dog" to prevent any or all the cars running back down the slope, in case the rope or a coupling should break.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

Leasing System for the Alaskan Coal Lands

Secretary Fisher, of the Department of the Interior, has declared himself positively with reference to the policy he intends to recommend to Congress this winter in connection with coal mining in Alaska. Mr. Fisher's statement has been received with unusual interest in this city because of the influential character of his recommendations, particularly in view of his recent visit to Alaska. As already forecast, Mr. Fisher takes the view that the value of the Alaska coal has been greatly exaggerated. There are, he says, great quantities of lignite and low-grade bituminous coal in several parts of the Territory, but there are only two known fields of high-grade coal in Alaska, the Bering River field and the Matanuska field, both of which contain anthracite and high-grade bituminous coal.

"My own judgment," says Secretary Fisher, "is that the present market for Alaskan coal is limited and uncertain, but that the demand will rapidly increase as the country is developed." Whatever may be the value or extent of the demand, Mr. Fisher thinks that the time has past when public mineral lands should be allowed to go into private ownership in fee simple. He, therefore, urges the leasing system, saying, "Taking all our principal coal-mining States, the census figures for 1909 show that out of a total of 6,900,000 acres of coal lands under operation more than 2,000,000 acres, or 30 per cent. of the whole, were in 1909 operated under a system of private leases. It is, therefore, substantially correct to say that, whether we like it or not, the choice is not as to whether we shall mine our coal on the leasehold system, but whether we shall mine it under leases from private owners or from the Government direct."

Conditions and Terms of Leases

"That the customer has everything to gain under the Government leasehold must be apparent because the Government can make its royalties as little as it chooses and it has no invested capital and no unearned increment on which to pay returns. Opposition is to be expected only from those who wish to secure our coal lands for stock-jobbing or speculative purposes or so that they may make a greater profit than is essential to secure immediate development. Indeed, immediate development can be assured only under the leasehold system. Without it there is no reason why private individuals should not secure the property and hold it out of development until they can take advantage of the increasing demands of the future."

"Expedients could be adopted in the effort to enforce development by requiring the purchaser to mine a certain amount of coal or to expend a certain amount of money in developing the land under pain of forfeiting his title to the Government, but this, after all, is only a crude and awkward device for securing what can be far more effectually secured by means of a lease. Regulation of this sort would be a new departure in either State or Federal administration. It would raise fundamental questions of public policy about which differences of opinion exist, which are as yet uncompromising. It would doubtless prevent any early action by Congress."

"Under these conditions it would seem a sufficient undertaking to inaugurate a new system of tenure, without imposing upon Alaska the additional difficulties of the administration of a hitherto untried attempt to settle by public regulation what would constitute a reasonable profit for the miner, the wholesaler and the retailer of coal."

Rates on Coke to Chicago

An application has been filed with the Commerce Court by the Anaconda Copper Mining Company and the Boston & Montana Consolidated Copper and Silver Mining Company to review the decision of the Interstate Commerce Commission in the case involving the rates on coke from West Virginia and Pennsylvania to Chicago and Chicago junctions.

Previous to the present year the railroads had in effect a rate on coke of \$2.65 for smelting and \$2.35 for iron furnaces. The copper companies desired to collect reparation on shipments made under the \$2.65 rate during five years, which, it is said, would have amounted to \$18,286. The commission decided that the railroads should have but one rate on coke between these points, but refused to take any action relating to reparation. The single rate was to go into effect Dec. 31, 1910.

William A. Glasgow, Jr., representing the copper people, recently filed the petition with the court to review the decision of the commission and to award the complainants the reparation demanded.

Alabama

Birmingham—The Mulga mine, which is the property of the Birmingham Coal and Iron Company, is now one of the best equipped mines in the State. The daily output is averaging 1100 tons and the 400 men employed there are working full time.

In a report issued Oct. 28, the Alabama State mine inspector states that there are now 242 coal mines in the Birmingham district, of which number, 21 are idle at present. There are over 20,000 miners at work in this field and 6000 more could be employed under existing conditions, according to the report.

The Coosa Valley company has been organized at Atlanta, Ga., with a capital of \$2,000,000, to develop coal and mineral lands in northern Alabama.

Colorado

Oak Creek—The Routt County bank of Oak Creek and the various business houses on a recent pay day cashed checks totaling \$75,000. This is the largest amount paid out in any one month in the history of the Routt county coalfields, but it is said that each succeeding month will show still further increase.

Cañon City—The 150 miners of the Bear Gulch mine of the Colorado Fuel and Iron Company, went on strike recently, as a result of the inauguration of the basket scale in paying for the coal.

Pueblo—This city is very much incensed over a recent increase of 25c. per ton in the retail price of coal and the project of a municipally operated coal mine is being discussed.

Illinois

Duquoin—Despite the discouraging conditions which exist in the southern Illinois coalfields as a result of the railroad strike, unusual activity is being manifested by the coal interests in sinking new mines.

Several new shafts are now being sunk in Williamson and Perry counties. A company of Tamoroa business men has secured the Kimsey farm of several thousand acres, northeast of this city, and the work of sinking a large mine is under way.

The Zeigler District Coal Company of Chicago, which owns a large mine at Christopher, has purchased several thousand acres of untouched coal land near Mulkeytown, east of this city, and will sink a shaft.

Indiana

Indianapolis—President White, of the International Mine Workers' Union, has sustained the officials of the local unions in calling a special session of the organization to pass upon the weekly payday proposition. President White held that there was no evidence that the local officers acted hastily in calling the convention, and that the proceedings throughout were fair and legal. This means that the semi-monthly payday will stand until the present contract between the miners and operators expires next April.

Iowa

Newton—A 3-ft. vein of coal was discovered recently several miles south of here. It lies at a depth of 34 ft., under 17 ft. of rock.

Des Moines—Amended articles for the Lucas Coal and Supply Company, of Lucas, capital stock, $250,000, have been filed.

Kentucky

Middlesboro—The Interstate Coal Company has purchased 800 acres of coal land in Knox county for $50,000, and will develop mines.

Louisville—The Kentucky and Indiana Terminal railway has awarded a contract to the Roberts & Schaefer Company, Chicago, for a 500 tons capacity coaling station to be built at Louisville.

Montana

Havre—The Havre Electric Light Company is opening up a coal mine 3 miles north of town. The vein is 3 to 4 ft. thick, at a depth of 150 ft. and the coal is reported to be of excellent quality.

Ohio

Columbus—For some time past a syndicate which has acquired large areas of land in Richland and Jackson townships, Vinton county, has been exploring for coal and it is said that large areas have been found, among them a 53-in. vein. Practically every acre of land in the two townships is under either option or lease. The Columbus & Southern railway, it is said, has passed into the control of the same interests, and will be extended to give an outlet for the coal.

The consolidation of the big coal interests of eastern Ohio, which was reported some time ago as under way, has been practically completed, according to recent information. The combination will include the five largest operating companies in Jefferson, Belmont and Harrison counties, and will have a property valuation estimated at $20,000,000.

The new apparatus purchased by the State, recently was the means of saving from death eight men overcome by gas in the Black Top mine of the Morris Coal Company at Lore City, Guernsey county, according to report made to the State mine inspectors' office.

Pennsylvania

Bituminous

Pittsburg—It is reported that a coal deal between local capitalists and a New York syndicate involving $1,000,000, has been closed. Several thousand acres of coal lands in Forward township, near Elizabeth, in the McKeesport district, are said to have been sold. According to the report, building of tipples and docks will be commenced at once.

The experimental mine of the U. S. Bureau of Mines, at Bruceton, Penn., was the scene of a coal-dust explosion Oct. 24. About 200 lb. of coal dust were purposely ignited by the engineers in charge and from all reports the results exceeded their expectations, considerable damage having been done.

Ohiopyle—It is stated that several mines will be opened up in this vicinity along the extension of the Western Maryland railroad. Recent investigations by this company are reported to have resulted in disclosing something like 10,000 acres of high-grade coal land.

Indiana—With five openings in active use and four more ready for work within a few weeks, the Penn Mary Coal Company, of Heilwood, expects to close the year with its finest record since the opening of the mines.

Anthracite

Scranton—Reorganization and financing of the Peoples Coal Company by its new owners embody plans of exceptional interest to stockholders and investors. A total bond issue of $400,000 is authorized, but only $350,000 is being put out. The capital stock of the company will remain at $100,000.

A recent decision handed down by Judge Garman, of Luzerne county, practically awards to the borough of Forty Fort a tract of coal land valued at $100,000, which is being mined now by the Lehigh Valley Coal Company. The original deed dates back to 1768.

Pottsville—The Kaska William colliery, under the management of the Alliance Coal Company, will be extensively improved and developed. A contract has been awarded to a local firm covering several hundred yards of rock tunnel and this work will be started at once.

Washington

Ellensburg—Orders have been issued by the Northwestern Improvement Company that No. 6 mine, located in Roslyn, is to shut down on Nov. 1 for the winter. This is the largest mine at Roslyn. The order is the result of the company having sufficient coal on hand.

Seattle—A 5-ft. seam of coal was uncovered recently in Thompson Valley, B. C., south of Kamloops, by the grading crew of the Canadian Northern railway. The coal is said to be of commercial quality, and it is expected that the find will result in the immediate opening up of a new field.

West Virginia

Wheeling—W. G. Simpson, receiver for the Gorrell Coal Company, at Pipe Creek, has sold to J. W. Gorrell, the mine and equipment for $131,000. The mine, which contains 1000 acres of No. 8 Pittsburg coal, was appraised at $133,000. It is said Mr. Gorrell will organize a company and operate the mine.

The Consolidation Coal Company has secured the contract for 40,000 tons of steam coal for the Egyptian State Railways. This is the first time the latter company has asked for tenders for American coal.

Canada

Vancouver Island—The Western Fuel Company is opening two new mines. The Canadian Collieries, Ltd., has decided upon development and additions to plant, etc., involving an outlay of about $750,000. One important change will be the development of hydroelectric power as a substitute for the existing power plants at the several mines at Cumberland.

Alberta—Good progress is being made at the Chinook Coal Company's plant. The tipple is complete. The boiler house is under roof and machinery is being installed. Underground development also is being pushed rapidly forward.

Personals

Samuel Stanley has resigned as sales manager of the Jackson-Superior Coal Company, Columbus, Ohio, and is succeeded by E. F. Aylward, of Cleveland.

E. N. Zern, mine superintendent with the H. C. Frick Coke Company and Jamison Coal and Coke Company since 1908, has been appointed assistant professor of coal mining in the University of Pittsburg.

C. B. Wadsworth, chief engineer for W. J. Rainey in the Connellsville coke region for the last 23 years, has resigned his position taking effect Nov. 1, after which he will take a rest at his home in Ravenna, Ohio.

Harry E. Zaring, formerly assistant secretary of the Crucible Steel Company of America, has been elected secretary of the Crucible Coal Company and will assist J. W. Neff, general manager, in the development of the company and its operations.

Harry S. Brady, who for the past two years has been general manager in Ohio for the Pittsburgh Plate Glass Company's coal interests, has left the latter company to become associated with the Cleveland office of the Moreland Coke Company, of Pittsburg.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The coal market, broadly speaking, still continues to show a little improvement as the season advances. While some sections report trade slow and prices sagging, in other districts the demand is urgent with offers of substantial premiums for spot deliveries.

In the extreme East, a genuine shortage of anthracite seems imminent, while bituminous is improving, although still weak in spots. The lake shipments continue unusually heavy, and demand is satisfactory.

Pittsburg reports mines still working 70 to 75 per cent. capacity with the market dull and heavy; however, the recent blowing-in of several furnaces may help the coke industry. The Ohio trade continues good with prices firm. A car shortage is developing on the Chesapeake & Ohio railroad, although it has not reached serious proportions. It is expected the Lakes will remain open till Dec. 1, and with the congestion relieved at the upper end, the shipments are now heavy.

The Middle West market continues dull. The effects of the Illinois Central strike are becoming apparent and it is thought if this trouble is not settled within the next two weeks, the situation will become serious.

Labor troubles and heavy snowfall, with a decided drop in temperature, are making demands in the West urgent. On the Pacific coast the market is normal and supplies adequate.

Boston, Mass.

Anthracite and advancing freights are the features here this week. Rates on hatch loads of bituminous in Reading barges are 75c. from Philadelphia to Boston, instead of 65c., and the supply of barges is so short for anthracite generally that soon we shall be facing a genuine scarcity in all sizes. It is said that during the week ending Oct. 21, not a single Reading tow arrived in Philadelphia, and with the brisk demand now, and the complications almost in sight, there is little prospect of the companies catching up on deliveries. Then, too, a number of buyers in the East are suddenly waking up to the nearness of winter and are crowding their usual sources of supply for immediate shipments. The eastern storage depots for some of the anthracite-producing companies are said to be practically bare of stock and anything like early replenishment is not yet in view. Anthracite within the week has taken a serious turn, serious for those caught with light supplies.

This week, the first of clear weather for some time, was one of heavy water arrivals, both in anthracite and bituminous, but the shortage in tonnage is now so marked, and the season is so far on, that there is likely to be no recession in rates, at least for the rest of 1911. Freights east from New York to the shoaler points about the Penobscot are now firm at $1, where a fortnight ago they were 65 to 75c.

All-rail in bituminous there is no apparent change. Sales agents and operators alike have had so discouraging a year that they are rather diffident over the immediate future. The Southern coals will have to move up considerably before there will be much extra tonnage for Pennsylvania.

Pocahontas and New River prices at Mystic wharf are up, although a rumored sale at $3.75 on the cars is rather discredited; $3.53, however, seems a firm figure, but it should be said that what coal is at the railroad piers is almost exclusively on contract. There is little free coal and there is not likely to be until transportation begins to move again with something like regularity. On an 85c. freight, $3.53 would still be a low price, netting but $2.45 f.o.b., Hampton Roads, or $1.05 at the mines, less commission, although, of course, such sales now are on bottoms chartered some weeks ago.

New York

A very satisfactory demand on contract for the higher-grade steam coals continues to be the feature of the coal business in the New York market. The supply of these grades at the New York piers is more than adequate to the demand, but with the contract movement so good, prices for standard grades while not strong, show no tendency to decline. Inferior steam coals are in oversupply in this market and as there has been considerable of it on demurrage, prices have been made in a number of instances, regardless of the cost of production, to escape further penalties.

The car supply at the mines furnishing this market continues to be satisfactory, but at some of those mines shipping to the West, a scarcity of equipment is beginning to be noticed.

Railroad movement to New York tidewater has been exceptionally good this fall, and that is one reason for the large standing tonnage now at the New York piers.

Prices for steam coals have not changed any this week, and with the exception of the demurrage coal, range about as follows: $2.35 f.o.b. for West Virginia steam coals; $2.55 for ordinary Pennsylvanias; $2.65, fair-grade Pennsylvanias; and $2.75@2.85 for the better grades.

The supply of slack coal seems to have been somewhat reduced, and there is a little more demand for this grade.

Pittsburg

Bituminous—While the lake movement is nearly over, a considerable tonnage will be moved in November. Mine operations have shown no material change thus far, and are between 70 and 75 per cent. of capacity. Prices are unchanged, the ones here quoted being under the nominal market, but subject to occasional further shading: Nut, $1@1.05; mine-run, $1.05@1.10; ¾-in., $1.15@1.20; 1¼-in., $1.25@1.30; slack, 40@50c. per ton at mine, Pittsburg district.

Connellsville Coke—The market continues in its rut. There is no interest in contracts for next year, and the small sales of prompt coke being made are at unchanged prices. Several lots of prompt furnace coke, aggregating perhaps 50 cars, have changed hands in the past week at $1.50, which has been the quotable market for several weeks. One sale for forward delivery is reported within the past week, a lot of 6000 or 7000 tons for November and December delivery, at $1.55, ovens, a fair price at this time of year when prompt coke is $1.50. The movement in foundry coke is light. We quote per net ton, f.o.b. ovens: Prompt furnace, $1.50; contracts over first half (nominal), $1.65@1.75; prompt foundry, $1.80@1.90; contract foundry, $2@2.25.

A second Wickwire furnace at Buffalo went into blast last week and Clinton, in Pittsburg, goes in blast this week, both stacks using tributary Connellsville coke.

The *Courier* reports production in the Connellsville and Lower Connellsville region in the week ending Oct. 21 at 310,-766 tons, an increase of 500 tons, and shipments at 3791 cars to Pittsburg, 4933 cars to points west and 1039 cars to points east, a total of 9763 cars, an increase of 300 cars.

One of the two Zug Island blast furnaces of the Detroit Iron and Steel Com-

pany, at Detroit, Mich., has been regularly in blast, using Connellsville coke. The other stack, which regularly uses byproduct coke, has been out for several months, during which time it has been converted to a "thin-wall" furnace, the lining being made one brick thick and the steel shell being equipped with a water-cooling arrangement.

Philadelphia

There is not the feverish activity in the retail trade that was manifested earlier in the month, and the trade has now settled down to a good strong current of business. There is some difficulty in having orders promptly filled for some of the sizes, but, as a rule, the delays are not serious. Compared with last year, dealers report that their tonnage is considerably ahead, and it looks as though the prediction of a hard winter is beginning to bear fruit in the minds of the prudent householders.

The wholesale trade still continues active as earlier in the month. Careful inquiry shows that none of the sizes are lagging, many of the companies are behind on deliveries, and it has even come to picking up coal from stock, which is rather unusual at this season of the year. The tonnage is reported as showing a very comfortable increase over the preceding year, with no apparent signs of a falling off. The stormy weather prevailing along the coast during the last week has interfered materially with the movement of water coal, and as a consequence there is a large number of cars on hand at tidewater. This condition will, no doubt, change soon, as open weather has been predicted, which will enable vessels to land.

The improvement in the bituminous trade has been very marked during the past week, but the inclement weather has interfered with movement, and while the coal has been sold and is waiting shipment, it is causing the operators considerable anxiety and annoyance, with fear of large demurrage bills. But the fact remains that there is a general improved tone to this branch of the trade, and it looks to be permanent.

Buffalo, N. Y.

There is a steady, though slow, improvement in the soft-coal trade. Dealers and operators express doubt and dissatisfaction with conditions as they see no material change for the better and so are inclined to believe that the increased demand is a mere reflex of the time of the year, and they do not expect any advance in prices until the rush comes after the first of the year, when consumers become afraid that the supply will stop in April on account of labor disputes.

The volume of trade is as large as it was a year ago, so the complaint is all on account of low prices. It takes a very large tonnage to insure a fair profit, so the small jobber is accomplishing very little and as a rule the operators are complaining that they are only paying expenses.

Soft coal is unchanged in price, Pittsburg three-quarter is quoted at $2.50, mine-run at $2.40 and slack at $2, with Allegheny Valley prices from 20 to 30c. lower. There is no stir in coke at $4.25 for best Connellsville foundry, and $3.50 for stock coke. There is a good demand for smithing coal at $4 from Georges Creek, Cumberland. The supply of cannel coal is increasing, but there is demand enough to meet it, at $4.25. Retailers are making a price of $7 for cannel, which they usually sell in small quantities.

The hard-coal movement is large, even for the time of the year, especially by lake. Early in the season it was thought that the record-breaking movement would give way long before this, as the upper lake docks would be full to capacity, but it is now reported that the glut of soft coal is much greater than the hard. Lake shipments of anthracite from this port continue at about 100,000 tons a week.

Cleveland, Ohio

The Lake coal business for this season is practically closed. A large tonnage on cars still remains on track, both at Cleveland and along the Lake Erie points, awaiting boats for loading. This is to be held over at this end and the upper Lake points during the winter.

It is understood that all contracts have been canceled for any further shipments north this season, and the consequence is that the shippers are paying car service on the coal that is now on track, if not reconsigned prior to Dec. 1, which is the time limit given by the railroads. The result is that shippers are using every effort in procuring boats and loading same as fast as the machines can unload the cars.

The domestic trade has taken another spurt in the past week, here as well as in rural districts in Ohio. The approaching cold weather and the expected scarcity of cars, is the natural consequence in this case. It is also noticeable that the steam trade has somewhat improved. Prices, however, in both the domestic and steam trade, have not shown any appreciable advance up to the present time. Dealers are looking forward in the near future for the better prices, which naturally follow when demand increases.

Columbus, Ohio

More favorable weather, in the form of a slight cold snap, caused an increased demand for domestic grades and as a result the entire trade showed a better feeling. Orders for immediate shipment for domestic uses came in fast and the tonnage moved during the past week was much larger than the week previous. Prices are being well maintained at the quotations in the circular of Sept. 1, although there are some complaints of price cutting.

Steam business is running along unchanged. There is a feeling of uncertainty in the manufacturing establishments and they are not taking supplies for the future. The policy followed is to buy only what is needed for immediate wants. Railroads are also using a minimum as the freight movement is still small.

One of the best features of the market is the lake trade, which has regained its activity, and the tonnage is increasing from all Ohio fields that participate in the lake traffic.

The congestion of the docks of the upper lake ports is passing away and the movement to the interior is better. There is nothing at the present time to interfere with an active lake trade right up to the close of navigation, which is expected to be about Dec. 1.

The following are the prevailing prices, per ton in the Ohio field:

Fancy domestic	$1.75@$2.25
Domestic lump	1.50@ 1.65
¾-in.	1.35
Nut	1.15
Mine-run	0.95@ 1.15
Pea and slack	0.40@ 0.50
Coarse slack	0.35@ 0.40

Cincinnati, Ohio

The tone of the local market is optimistic. Steam business is holding its own—if not slightly improved—and domestic trade is considerably better. Probably hundreds of furnaces in homes and steam plants in large buildings were equipped for gas consumption during the past summer and the retailers have begun to receive notice of it when they make inquiries as to why the usual order for the winter's supply of coal had not been received. The wholesalers feel it, indirectly, of course, but they are not so vitally affected because coal that cannot be sold in this immediate market is offered in some other market, while the retailer's market is very restricted.

Steam prices are unchanged, as also are the domestic. The car shortage on the Chesapeake & Ohio railroad continues and several operations report that they have had to shut down one or more days the past week in consequence. Cars are constantly being released from the lake trade, but the effect of that is of doubtful value as they are then used for long-distance hauls and are more difficult to keep track of than in the short haul to and from the lakes. Should bad weather add to the situation it is more than likely that the car shortage would assume a serious aspect.

The retail prices for fuel delivered are unchanged and continue as follows: Smokeless lump, $4@4.25; smokeless mine-run, $2.60@2.75; bituminous lump, $3@3.25; bituminous nut and slack, $1.90@2; anthracite, $7.25, since Sept. 1, when the price was advanced 25 cents.

Charleston, W. Va.

While there is an appearance of greater firmness and possibly a little more activity, there is no enthusiasm over conditions in the coal trade, especially as applied to the Kanawha and New River territories. It is opinion of some of the best judges of conditions and of the future that coal-trade conditions will not be very good until after 1912 has gone into history.

There are, however, a number of instances where mines are doing a big business and are running up to capacity, and what is more encouraging, are making preparations for greater outputs to meet the demands for their particular coal.

Indianapolis, Ind.

The brightest spot in the Indiana market appears to be in the Vigo field in the vicinity of West Terre Haute. John Nathway, sales agent for the Hall Zimmerman Mining Company, says that conditions are not nearly so bad as painted. "The summer has been unusually good with us and our mines have lost hardly a day throughout the season," said he.

On the other hand, operators in other fields say that during the past history of the coal-mining business in Indiana, October and November have been the biggest coal-selling months. Previous to this, during these months dealers have bought coal at the mines to fill their current demands against the winter needs. The operators say the dealers are taking less precaution to supply themselves this year in advance of cold weather. It is apparent, the operators say, that both retailers and consumers have decided to depend largely upon the open market.

Coal prices are demoralizing. With short demand for steam coal, operators have been trying to push domestic coal on the market and this has depressed prices still further. The domestic supply in market centers is said to be unusually low, considering the season, and a week or ten days of severe weather would exhaust the supply.

Minneapolis—St. Paul

There is a decidedly improved condition to be noted in the coal trade of the Twin cities. Retail orders have been coming in at a good rate, not in a rush, as is the case when a severe cold snap occurs, but rather a steady flow which the retailer has been able to keep up with. This is well, for the roads are in very poor condition for heavy hauling.

These two growing centers of population are evidently looked upon as natural outlets for dock coal, being but 150 miles from the head of the Lakes where an immense tonnage of both anthracite and bituminous coal is held in storage for distribution. It is estimated Minneapolis uses, in round numbers, 900,000 tons yearly, about 200,000 anthracite and 700,000 tons of bituminous. St. Paul uses about three-fourths of this amount to supply its fuel needs, and there is a healthy increase in tonnage yearly.

St. Louis, Mo.

Illinois Central mines are working about two days a week, and reliable reports state that approximately 400 cars per day, of Illinois Central equipment, are being pushed on side tracks in bad order. There is no improvement in strike conditions on that road, despite the statements of the company, and it is the general opinion that, unless the strike is settled in a few weeks, more than two-thirds of its coal equipment will be tied up.

There is some car shortage on the Iron Mountain and a lack of motive power on the Chicago & Eastern Illinois. Other roads are taking care of the business offered.

The prevailing prices per ton are as follows:

Franklin County:	
6-inch lump	\$1.65@\$1.75
3x6 egg	1.60@ 1.70
No. 1 nut	1.50@ 1.60
No. 2 nut	1.35@ 1.40
Carterville:	
6-inch lump	\$1.50@\$1.60
3x6 egg	1.45@ 1.55
No. 1 nut	1.20@ 1.30
No. 2 nut	1.00@ 1.10
Mine run	1.05
Screenings	0.55
Big Muddy domestic lump	\$2.10

All the above taking a 67c. freight rate to St. Louis.

Standard:	
6-inch lump	\$1.10@\$1.15
2-inch lump	0.95@ 1.00
Screenings	0.30@ 0.35

Gas-house and byproduct coke is moving freely, and smokeless is somewhat hard to get.

Colorado

The first snow storm of the year has just been experienced in this vicinity and while the snow was not general, a decided drop in temperature is reported from all districts, creating an increased demand for domestic coal for prompt shipment. Mines are not being forced to full capacity, but are enjoying a better business than has been evidenced for some time. Winter prices are now in effect at 25c. per ton more on all grades than the ruling prices of a year ago.

Effective Oct. 23, Northern Colorado lignite advanced 25c. per ton on the Denver market, and the better grades are now selling at \$2.80 per ton f.o.b. mine. The retailers have increased their prices correspondingly and are asking \$5.25 per ton, which is 75c. per ton higher than prices in effect a year ago, and 25c. per ton more than has been asked for several years past. A large percentage of the domestic coal used in Denver is of this grade and the Denver market practically consumes the output of these mines. Labor trouble reflecting increased costs and uncertain supply, is responsible for the advance.

Salt Lake City, Utah

Idaho dealers are beginning to realize that one mild winter with plenty of coal for everybody does not assure them a continuance of that condition for the following year.

Telephone and telegraph are kept busy these days with messages from the towns in that State, begging for coal of some description. Many dealers have paid visits to Salt Lake to make their appeals personally. With Utah dealers still unsatisfied, the prospects for any great amount of coal being shipped to surrounding States from Utah mines is not very great.

A large Nevada consumer this week offered \$3, f.o.b. mine, for 1000 tons. Retail trade is not strong, but as good as retailers can look for under mine conditions. There are rumors of an advance in the mine price, but nothing has been announced as yet.

Portland, Ore.

The coal trade here is not unusually brisk at this time because of the fair weather. The Diamond Crest Coal Company, 325 Railway Exchange building, is placing on the local market a coal from its mines at Tenino, Wash., for \$6.50 per ton in order to get it introduced to the consumer. It is said that the coal is a high-grade lignite and the company operates three mines.

Following are the prices asked here, per ton, including cost of delivery to points within the city proper:

Japanese	\$7.50	
Washington lignite	\$7.00@ 7.50	
Australian	10.00@10.50	
Rock Springs, Wyo.	10.00@10.50	nut \$9.50
Diamond, Wyo.	10.00	
Carbon Hill, Wash., lump	10.50	
Carbon Hill, steam	7.50	
Newcastle, Wash.	7.00	
Beaver Hill, Ore.	9.00@ 9.25	
Blacksmith coal	17.00	

San Francisco

The arrivals for the week by water are very light, consisting of but two small shipments, one from British Columbia of 1506 tons, and the second from Washington of 1000 tons, making a total of 2506 tons.

There is ample coal in stock to supply all immediate demands. Retail dealers continue storing for their winter needs.

Prices for the week remain unchanged, and are as follows, per short ton:

Wellington—clean	\$8.00
Wellington—average	7.50
Australian—clean	8.00
Australian—average	7.50
Seattle—clean	6.50
Seattle—steam	5.00
Utah, Wyoming and New Mexico—clean (for domestic use only)	8.15
Pennsylvania anthracite	15.00
Welsh anthracite	13.50
Colorado and New Mexico anthracite	12.50
Cumberland—smithing	12.50

Alphabetical Index to Advertisers

Classified Index to Articles Advertised

Scientific Mine Management

Scientific Management—the cutting down of unnecessary expense and the obtaining of highest efficiency in order to secure maximum output at lowest cost—

Scientific Management is the thing today—in the Coal Mine as elsewhere.

The Boiler Plant is the Heart of the Coal Mine. High efficiency in the boiler plant is an essential part of Scientific Mine Management.

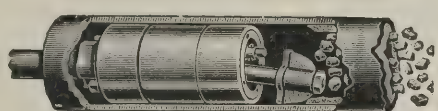
In no part of mine operation is the efficiency factor of Scientific Management so necessary as in the power plant, where the energy is produced for the running of the mine.

And in no part of the mine is efficiency so hard to procure as in the boiler plant, because of the unsatisfactory feed water conditions encountered near coal mines which, unless strong precautions are taken, cause scale to form on the boiler tubes, lessening the efficiency of the plant and so reducing the output of the mine.

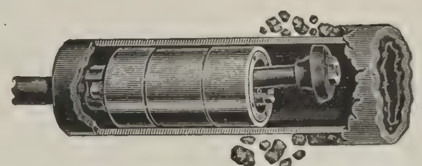
Scientific Management of the Coal Mine demands that the boilers be kept free from scale—not in any haphazard way, but in a *sure*, conclusive way.

The easiest, the quickest, the most economical and above all the *surest* method of keeping the boiler tubes free from scale is

The Dean Boiler Tube Cleaner



The Dean removing scale from the tube of a water tube boiler.



The Dean removing scale from the tube of a return tubular boiler.

We cannot emphasize too strongly the fact that the operator who runs a Dean through his boiler tubes *knows*, not *thinks*, that all scale has been removed. This is the difference between the Dean and other methods.

We can tell of one case where an Engineer of a plant purified his feed water, cleaned out his boilers frequently, and was even complimented on the condition of his boiler by the Inspector.

Yet we put a Dean in on trial and before his very eyes took out from two boilers 400 pounds of scale which had been reducing the efficiency of his plant and the presence of which he had never suspected.

The Dean operates on the principle of "broken-up vibration," caused by the striking of 3000 to 6500 light blows a minute. It goes where no inspector can and finds the hidden scale. It makes no mistakes. It cleans 10 to 30 tubes an hour, leaves every tube through which it travels as clean as a gun barrel.

Trial Offer And Guarantee

We sell the Dean Boiler Tube Cleaner entirely upon its merits.

We send it for trial on one boiler to let the purchaser see how it operates and prove to his own satisfaction that it does remove all the scale.

We sell it under a guarantee that it will pay for itself within six months or we will refund money.

The Mine Operator, Superintendent, or Manager who realizes the benefit of high efficiency in the plant of the coal mine will send for a Dean on trial.

The Wm. B. Pierce Company

335 Washington Street, Buffalo, N. Y.

CA

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 5.
Issued Every Saturday.
HILL PUBLISHING COMPANY.

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CA

COAL AGE

Vol. 1 NEW YORK, NOVEMBER 11, 1911 No. 5

I remember a man who bossed a small mine; the hardest kind of mine to run, if you ask me. But it was a brand-new proposition and we are looking for such to try our skill on. Everywhere you wander, the cry is, "Wish I didn't have to grow fruit on old dead limbs."

So this foreman was favored, and thought a royal flush was in his hand. He pulled 150 tons per day in small cars out of that mine with one mule. Both he and the "super" wore an ever-happy smile and believed they were being vindicated.

Moreover, it didn't faze the mule—this boss wouldn't misuse any dumb animal, and the driver was as kind as a trained nurse, getting good service with a cheery "Git up." The animal seemed to feel it was a pleasure to pull for him, and clipped a few seconds off his "reaction time" which, in a mule, is long for the brain and surprisingly short in the heels.

The mine was a simple problem: coal averaging 400 ft. from daylight, and a gravity proposition to the tipple. That foreman got a cost of coal he could never attain again. He had made a record and was now in the 2:10 class where prizes are high, but victories come hard.

Oh! he was not without troubles. There was a dip lower than the level of his ditch, and a lot of water too, but he put in a pump run by steam from outside because it was cheaper than to build a new drain. You see, it was a temporary plan, but he figured that perhaps a deeper dip lay to the left.

Then the haul was getting harder, but it didn't seem well to blast rock for so small a tonnage. And there were a lot of leaking doors and brattices, but 95 per cent. of all the current was traveling right up to the faces, and most anyone can pick a hundred mines operated under 1911 standards by technical grads, circulating only 75 to 80 per cent. of the air.

And he could have put in overcasts, but the mine wasn't big enough—yet. Outside there wasn't much track-room, not for a good mine, but he could provide that when he would. The drift leaked and the approach slopes were three to one instead of one to three, but it was summer and the banks didn't break with frost.

There was logic in it all, and, with delight, this foreman whittled that club, "cost of coal."

The tale is all told except to the dullard. That cost of coal didn't always remain so low, and the smiles left the foreman's face.

The dip got deeper, and then he couldn't get an appropriation to ditch it, although, of course, it was ditched later. Also, the grades had to be improved when the bulk of the coal came that way. He learned that his leaky stoppings were now putting only 50 per cent. of the air to the face, and a scant 25 tons was the output for a mule per day, since they had to "double" on the hills.

The mules' shoulders and flanks didn't any longer suggest trained nurses, and each animal divided its time between pulling the cars and trying to kick the lamp off the driver's cap. It was also discovered that the slowest mule, or the one that balked on the hard grade, set the pace for the "pit."

Many things went awry, and evils were left uncorrected, but how could it be otherwise? This foreman had his cost figure in mind; if I recall correctly, it was 0.754732, and that's a hard one to beat unless you want to go upward.

So no grading was done, and passing places weren't provided; stoppings were made of single boards and indifferently clayed; rails and timbers were left lying at random and all energy was concentrated solely on getting out tonnage.

Ab uno, disce omnia, from one learn about all. I tell of a little mine, for if I should relate about a large one, the story would but fill a bigger page. The first man on a job is tried, not by the right standards, but by his own. He runs ever to beat his own record. When he fails in that, there's likely to be a change in the personnel of the staff at that mine.

The record for a day is enticing, but it's the final result that counts.

The Fairmont, W. Va., Coal Region

By R. Dawson Hall

This region is on the southeastern edge of a coalfield stretching beyond the confines of the State. The mines show careful planning of the inside work for economy and safety. The alternating-current transmission is in accord with the most recent developments of electrical science.

The town of Fairmont lies on the Monongahela river, one and one-half miles below the junction of Tygarts valley and what is known as the West Fork. The two great anticlines of the Appalachian system lie to the southeast, and none but the more inconsiderable rolls lie to the northwest. The measures gradually dip as they are followed from Taylor county, so that northwest of the Monongahela river and its West Fork, the Pittsburg coal is unbroken, passing without trace of erosion beyond the confines of the State.

The Pittsburg coal is so even in quality and continues so unerringly wherever the surface has sufficed to cover it that where it occurs it is rarely possible to make out separate geologic areas unless we are willing to discuss very large bodies of coal. So the Fairmont coalfield must be regarded as merely a trade or economic designation arbitrarily applied to an ill-determined section of the unbroken field lying northwest of the line of the West Fork of the Monongahela river between Morgantown and Clarksburg and to that other and much broken field lying to the southeast of the same dividing line. Like all fields it is named after the natural line of approach rather than on any more scientific basis.

The Bed Mined Is the Pittsburg

The coal bed mined is the Pittsburg, but in one place coal is being taken from the Sewickley. Within the limits described, no attempt is being made to mine the Redstone. The Pittsburg coal is a good clean bed, the analyses of 51 samples taken by the W. Va. Geological Survey from as many different mines averaging as follows:

ANALYSIS PITTSBURG COAL

Moisture	0.7
Volatile matter	38.5
Fixed carbon	54.5
Ash	6.3
Total	100.0
Sulphur	2.25

The amount of volatile matter increases to the south of the field and the fixed-carbon content decreases. The sulphur percentage toward Fairmont is only about 1.2, and for the whole area north of Clarksburg it is only 1.7, but south of Clarksburg the percentage will equal nearly 3.2. It might be well to quote here the figures prepared by the Fairmont Coal Company, which is now merged into the Consolidation. This concern, before and after merging, mined only the Pittsburg bed. At 51 mines the average percentage ran as follows:

ANALYSIS FAIRMONT COAL COMPANY'S COAL

Moisture	1.43
Volatile matter	37.47
Fixed carbon	53.83
Ash	7.27
Total	100.00
Sulphur	2.59
B.t.u.	14,014

The thickness of the coal is about 8 ft. 6 in. At a hight of 4 ft. 6 in. above the bottom is a band ¾ in. thick, surmounted by about 6 in. of coal and another ¾-in. band; then follow 30 in. of coal of good quality, overlain with 12 in. of less desirable coal which is not persistent in its thickness.

The Sewickley coal in places runs as thick as 5 ft., but so far it is not favorably regarded for operating purposes.

Fig. 1. Consolidation Coal Company, Mines 43 and 63, Monongah, W. Va.

Coal Is near Water Level

The coal goes beneath the West Fork just above Watson, and emerges just above Monongah. Immediately below Worthington it again sinks below water level, emerging above Hutchinson near the line between Marion and Harrison counties. South of this point the Pittsburg bed is everywhere above water level, and this is also true below Watson except for a short length of immersion between Fairmont and Montana.

Thus it happens that nearly all the mines have slopes by which the cars are lifted to the tipple hight. The valley being narrow, in many cases, mines are opened on one side of the river and the coal dump and plants are situated on the other, with bridges connecting the opposing river banks.

Methods of Extracting Coal

The Consolidation Coal Company so completely dominates this region that a description of the methods and developments of that company is virtually a description of the district.

The mines have usually seven or eight headings in parallel for the main haulage roads and their airways. In the accompanying drawing, which shows a typical development, there are a manway and three main-haulage headings in the center, with two pairs of airways on each side of these four, one pair serving to feed the air to the south-face headings, and the other performing the same office for the north-face headings. These airways do not meet until they reach the shaft. The air is fed in every case by blower fans, so that the haulways carry return air. It may be said that the Consolidation Coal Company regards what little coal gas is in their mines as of small importance compared with the coal dust of which they have had such distressing experience at Nos. 43 and 63. However, the recent explosions of No. 49, arising from the entry of gas escaping from nearby wells, has somewhat modified the situation, the outflow from these being larger and less regular than that of the gas from the coal. Before this the company had been successful in keeping the percentage of gas in the returns down to a certain safe figure, far below possible danger. Every precaution is being made to remove the natural-gas menace and I do not know a place where the methods adopted to protect the mines against leakage from wells, have been more carefully considered. And if the present plans are consistently followed, it is unlikely that there will be any further explosions from that cause. The favor shown the blowing fan largely arises from the fact that the air can be saturated with water vapor before it is passed through the headings when the air is blown into the untraveled airways. It is impossible to humidify effectually where men and mules are passing. At best the heading can be made wet, but the air is not so filled with moisture that it is prevented from drying out the dust in the rooms.

The face headings are as a whole driven in pairs, the air traveling in by the airway and out by the haulway. These face headings are set at 1500- to 1800-ft. centers. The butt headings from them are 300 to 350 ft. apart. These butt headings are also in duplicate. But they are worked in groups of three both for purposes of ventilation and coal extraction. One current ventilates three pairs of headings passing up the airway and down the haulway of each in turn, but not returning to the main butt heading, being passed from airway to airway by rooms, driven specially for that purpose, just short of the face heading.

By this means, doors are kept off the important roads and if left open do not destroy the ventilation of the whole panel, but only of the three butt headings which form one unit.

Fig. 2. Consolidation Coal Company, Mine 26, New England, W. Va.

Narrow Chain Pillars

It is interesting to notice the narrow chain pillars 15 ft. wide, the headings being 25 ft. from center to center. This is good practice. It is safe to say that if the wing pillars are not competent to uphold the weight, no chain pillars can make up for their weakness. There is no lack of strength in the wing pillars. Note the pillar 175 ft. wide flanking the main butts. The block of coal guarding the face heading from the weight of

the secondary butts is never less than 100 ft. thick. The curves to these butt headings are quite sharp, being struck off at a radius of 63 ft.

The last rooms in the butt headings are driven first and run completely through to the back heading. As soon as they reach their destination they are drawn, the withdrawing line being at about 45 deg. to the line of the face. Thus there are but few men in any heading and the combining of the three headings in a common split is in accordance with good practice. In other regions the angle with the face is much less and consequently a large number of men work in each heading, which plan influences the splitting provision.

Recovery Nearing 95 Per Cent.

It will be seen that with rooms only 20 ft. wide and placed at 60-ft. centers,

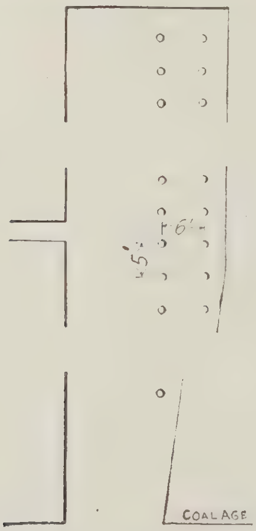


Fig. 3. Room Posting

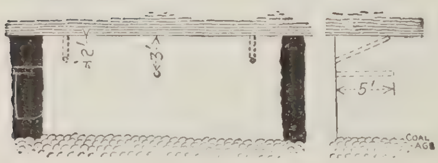


Fig. 4. Placing Shots

the recovery of first mining is nearly 33 per cent. As the cover is about 250 ft., it will be realized that a conservative method of work is being followed. In many cases the proportion of coal finally extracted in the new development is 93 per cent. of the whole coal even where the roof is weak. In much of the old work in the region, rooms have been driven up and allowed to stand with the pillars intact, but these are now being drawn. It is a clearly demonstrable fact that conservation pays, not merely because it saves coal, but because it enables the most to be gotten out of improvements and developments and staves off by some few years the unwelcome day when haulage, drainage, ventilation, power transmission and equipment of all kinds become burdensome in the extreme as the workings are pushed further and further from the original point of development. Many mines come to an untimely end because lack of conservation has made costs of production so high that they can no longer be worked at a profit.

Underground Workings Have Paramount Consideration

To promote this conservation, the Consolidation Coal Company has made a study of the best methods of mining, and has not left the manner of working to the individual discretion, or rather, as it is too often, to the individual indiscretion of the miner. Thus room driving, post setting, pillar drawing and placing of shots is regulated, and from this close surveillance comes the high percentage of coal saved. In many recent mines, there has been a notable and deplorable tendency to give a scientific treatment to outofdoor problems and to leave the subsurface operations to the mine foreman as soon as the shaft bottom has been laid out. Yet the underground problems are the most important of all those pressing for consideration, and should receive first place.

In Fig. 3 is shown the ordained method of placing props in a standard room which measures from 18 ft. to 20 ft. wide.

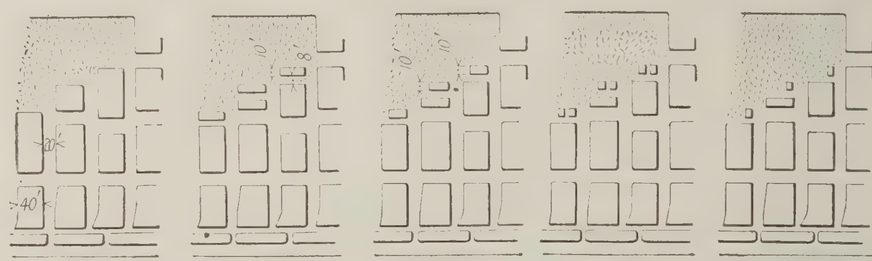


Fig. 5. Fig. 6. Fig. 7. Fig. 8. Fig. 9.

Method of Extracting Pillars, Fairmont, W. Va.

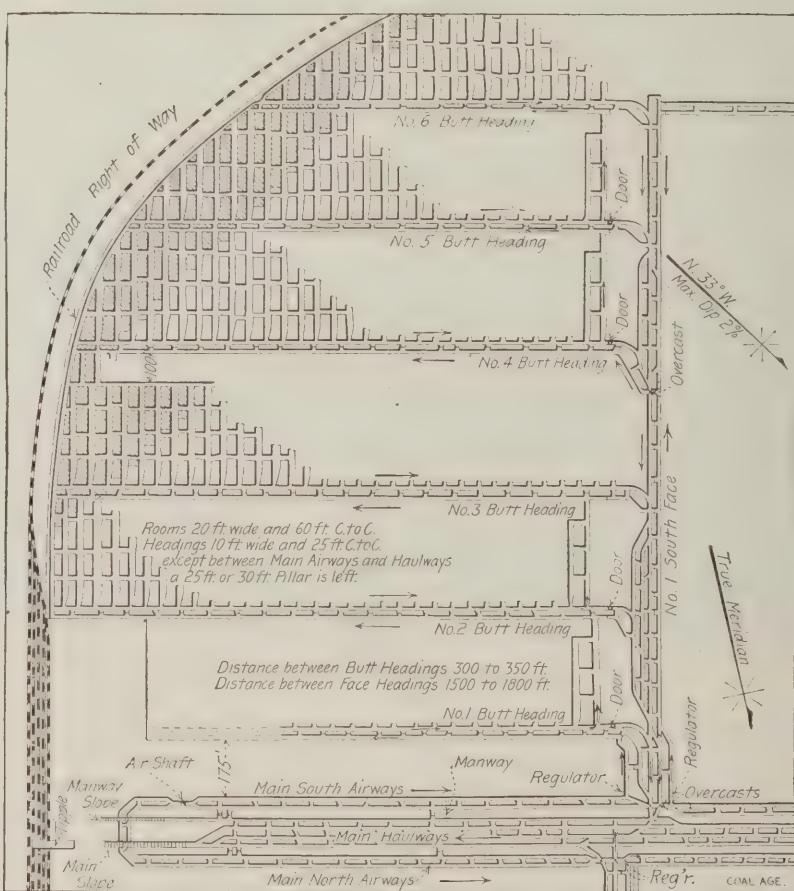


Fig. 10. Method of Mining in Fairmont Field—Retreating in Blocks of Three Headings

These props cost about 12c. apiece and are used with economy. About 63 per cent. were recovered in Mine No. 25. The miner is paid 5c. for every prop he saves. In Fig. 4 is shown the method of placing boreholes after undercutting.

The so called "gut-shot" is placed first, level and centrally located, and the two rib shots are placed next in boreholes bearing up toward the roof which they reach at their further extremities. The rooms are all widened in the direction of advance of the pillar drawing. There is no departure from this rule, which is essential for complete extraction.

Method of Pillar Drawing

Fig. 5 shows a condition in pillar drawing which is, of course, never reached in practice. Three room pillars are drawn fully across from room to room simultaneously. This synchronism is used here to simplify description, and the same objection may be made to all the following figures, and the same reason must be held to extenuate the variation from actual practice. Fig. 6 shows the appearance after a crosscut 8 ft. wide and the full width of pillar (40 ft.) long has been driven so as to leave a 10-ft. strip fronting on the caved area. This strip is reduced by extracting 8 or 10 ft. of the far end or as much of it as is possible. This is shown in Fig. 7. In Fig. 8 this block is shown split by a narrow crosscut leaving two pillars almost

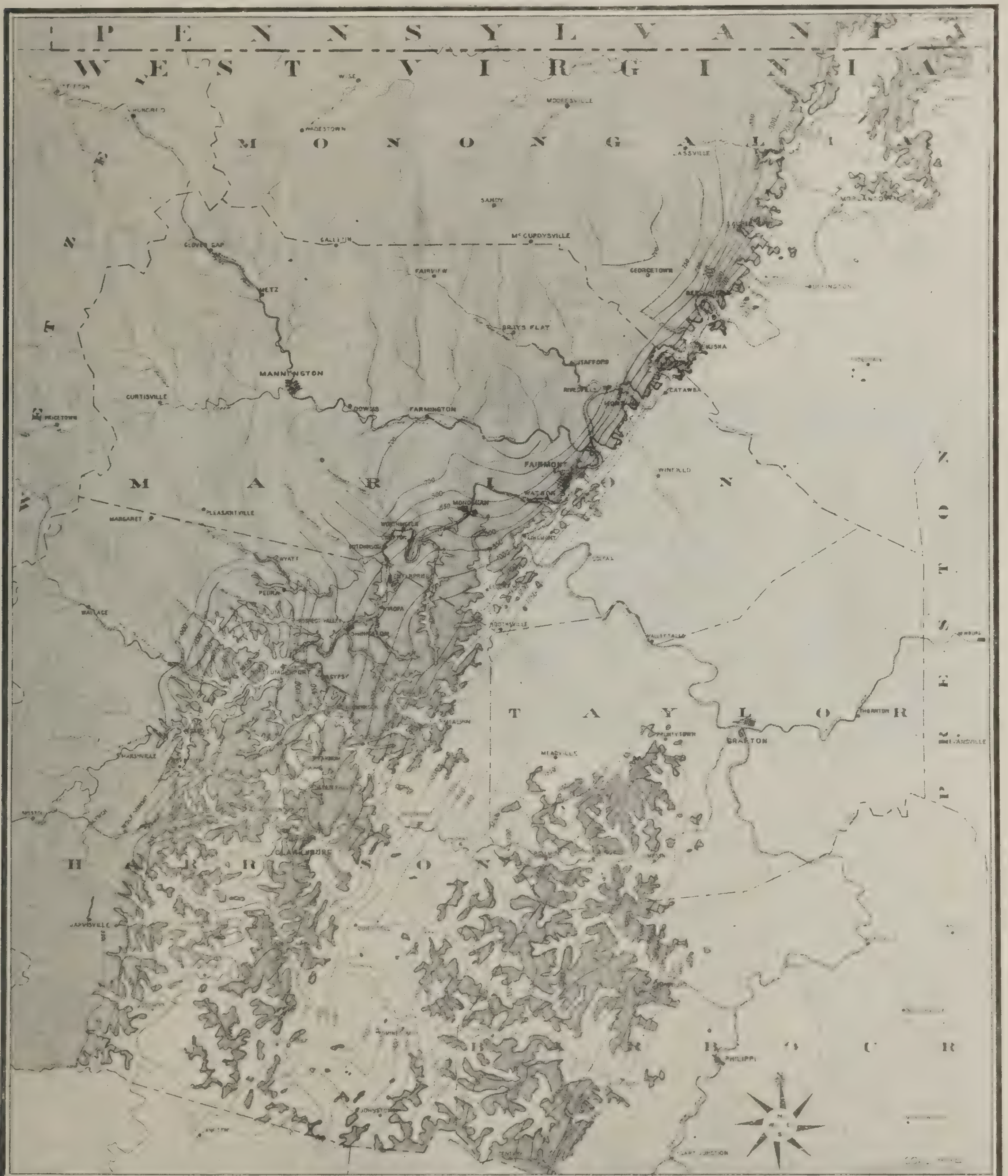


Fig. 11. Pittsburg Bed with Contours, Fairmont Region, W. Va.

square. In Fig. 9 the remoter pillar has been withdrawn, and all that remains to be done is the removal of the nearby pillar. After all, this is the most difficult work and it is here that what little coal is lost, has to be left in.

Fans Fixed and Portable

The fans used are powerful and housed in housings with roofs so weak that they are expected to be lifted off the building should an explosion occur. However, these mine safety valves are loaded more heavily here than in most regions, and it is questionable whether a happier mean could not be struck between the overlight explosion door of the fan makers and the roof which here finds favor as a release valve. It is not easily replaced. Its resistance is not easily measurable. The average explosion door is excessively sensitive, and perhaps the method here preferred may be ample to safeguard the fan. It may be said here that the Consolidation Coal Company has a portable fan loaded on a truck ready to be hauled to any of its mines should one of its fans become disabled. There is no lack of intelligent foresight being used to prepare for the possibilities of a disaster. Humidification and permissive explosives have been adopted for the prevention of explosions, but the belated cures have not been overlooked, for the owners and managers know that the best laid plans are liable to fail under stress of certain combinations of circumstances.

Separate and Connected Mines

As merely a sample evidence of that caution may be mentioned the barrier pillar between Mines 43 and 63. This is in one place only 12 ft. thick. An undercut 6 ft. deep, tapering down to nothing at the rear, is cut from No. 4 south-face heading of No. 63 mine and another like cut is made from No. 3 south-face heading of No. 43 mine. The two mines are disconnected by this barrier so that the misfortunes which may happen to one mine will not involve both, but at the same time in a short while rescuers could pass from the one uninjured mine to the very forefront workings of the other.

There seems to be all through an earnest attempt to determine a course of action before a disaster occurs, and only when this is done will rescue work be really effective. In passing, it may be said that the Consolidation Coal Company's officials firmly favor reversal of the fan in cases of explosion and recently had brilliant confirmation of their reasoning in the successful recovery of No. 49 mine after a severe natural-gas explosion.

The coal gas in the mines is easy to control as it occurs not in the falls, but in the virgin mineral and does not escape in blowers. There are no safety lamps used. Horses and mules are used for gathering, but motors are used for the main hauling, bringing their loads to the foot of the slope. From thence they are drawn out by rope.

Passing Railroad Cars under Tipples

The older mines of the region have wooden tipples, long and high like those of all regions where coal has to be sized. There is no need for cleaning other than such as is performed by the car trimmers. Perhaps the most noteworthy feature is that most of the tipples have conveniences for the lowering of railroad cars without recourse to the inefficient pinching bar which is always dull and uncertain in action. Here either the car is pulled forward by a rope or else the grade is enough that the car constantly needs restraint. In the latter case no reliance is placed on the car brake, but a clever patented clutch device with a long lever handle is used on a third rail. This is worked from the ground. One man can handle three or more cars. He passes for this purpose from track to track and employs his entire time on this service. The device which is moved with the car is attached by a chain to the drawbar of the gondola; thus the feed can be made absolutely certain. The device is to be commended as it saves labor, time, life risk and expensive wrecks.

The Purposed Electrical Development

The Consolidation Coal Company is endeavoring to bring its electric work into line with recent developments and it is now taking current at 22,000 volts from the lines of the Fairmont & Clarksburg Traction Company. It is using 2200 volts for its main pumps and 250 volts for mining machines, haulage motors and the smaller pumping equipment.

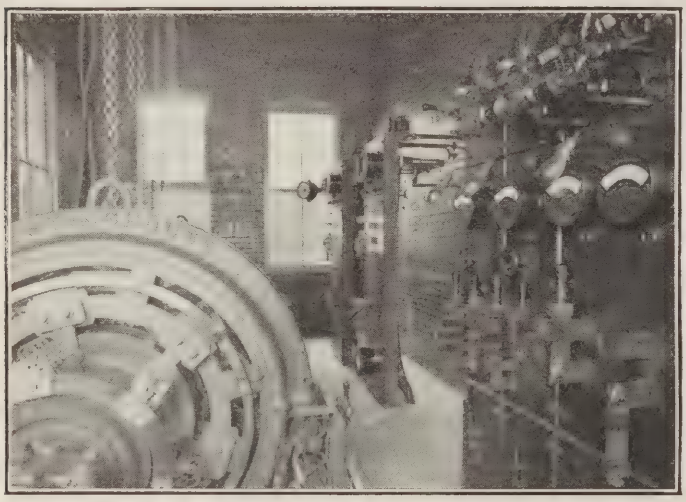


Fig. 12. Rotary Room at Mine No. 63

Fig. 13. Transformer Room, Monongah, W. Va.

The following description of the plant that it is about to install was given me by one of the officials of the company: Three gas engines of 1500 h.p. per unit will operate three-phase 2200-volt 60-cycle generators and the current will be stepped up in the power plant by means of single-phase transformers connected in delta. By this means the current will be raised to 22,000 volts. All transmission lines will carry this current. In the substations it will be stepped down by transformers to 185 volts of alternating current, then by means of rotary converters it will be changed to 250 volts direct current. This covers the main system. The copper conductors carrying the full current of 22,000 volts will aggregate in length, 31 miles. Wherever it is considered economical for the reduction of the amount of copper necessary in the feed wires, substations will be placed within the mine. Where that is done the current will be transformed from 22,000 volts to 2200 at the surface.

The power will be taken into the mine through three-conductor armored cables placed in a bore hole located exactly over the substation. Where there are large pumps of 100 h.p. or over, they will be operated by 2300-volt induction motors. Wherever practical, the pump and substations will be placed close together for operation by one man. Telephones will be put in substations within the mine connected with the outside.

High-tension Substations

Wherever 22,000 volts are to be taken to a substation a separate high-tension room is used. This room will contain electrolytic lightning arresters, except where these are placed on the roof. This room will also protect the oil-circuit breakers and substation transformers. The low-tension room will contain rotary converters and a switchboard. In each rotary room a triplex chain block, mounted on a trolley, will be used for placing and handling heavy machinery. For use in switching on the 22,000-volt transmission line, three-pole single-throw and three-pole double-throw and fused horn-gap switches will be provided. These will be mounted directly on poles and will take the place of special switching towers which contain the usual oil or stick-type circuit breakers. It will be seen that this proposed plant is to be fully uptodate and its successful installation and operation are anticipated with interest. The illustrations show parts of the plant already completed and in operation. These receive power from the F. & C. Traction Company.

A cordial recognition should be given to Everett B. Moore, chief engineer of the Consolidation Coal Company, for assistance in obtaining the foregoing information. It would be hard to acknowledge duly the many courtesies extended by a host of others during my trip of inquiry.

Proposed National Coal Combine

By Walter Williams*

Mr. Williams shows the necessity of a national organization of the coal operators, such organization to be subject to the restrictions of a Government commission.

*President, Hart-Williams Coal Company, Chicago, Ill.

NOTE—Paper read before recent meeting of American Mining Congress, Chicago, Ill.

The conditions that have brought about our present status in the mining industry are merely discovered between the vested rights of property and the rights of men. We are only reaping the whirlwind that has been sown. The tremendous opportunities for industrial development in this country following the Civil war, caused the creation of great corporations, such as the Standard Oil Company and the great railroad systems of this country, and they have abused the privileges that were theirs, as men always do. They are not to be blamed, because the law permitted it and the people are to blame because they made the law or failed to make the law, and the condition that confronts us today we cry out against. The assault upon capital, the assault upon the railroads, the assault upon corporations is merely the natural result of the great combinations in this country.

The Sherman antitrust law was a blind effort on the part of the great masses of the people who felt the repression, who felt the effort of these gigantic corporations to get control of the sources of supply, the necessities of life, the transportation of the country, and feeling that the Sherman antitrust law was a blind effort on their part to check it, and naturally such blind effort was not constructive in its nature. As one of the speakers said, it was repressive, and the Sherman antitrust law was merely a blind strike in the dark on the part of the great mass of people to check this.

The Present Law

The Supreme Court of the United States in my judgment could not do anything else than what it has done. The purpose of the Supreme Court is not constructive, it is merely interpretative. This law is put on the statute books and it is theirs to interpret and the executive of this country to enforce; neither the Supreme Court nor the President are to blame. They can do nothing else under the circumstances than just what they have done. Mr. Taft and Mr. Wickersham are merely following out their plain duty, when they say that these gigantic corporations must be dissolved.

Now what must be done? They are doing their duty, but it is not going to relieve the situation in this country. It is not going to relieve the fearful condition that the coal business of this country presents. The constructive part must be done by the legislatures of this country, and now that the Sherman antitrust law has been interpreted, and now that the effort is being made to enforce it, the people are becoming aroused to the futility of the enforcement of that law and the tremendous loss that is going to come if it is enforced.

Combinations in this country are inevitable. All we need, or the thing we need, is not to do away with combinations. The thing we need is to do away with unreasonable oppression which combination gives an opportunity to put into effect, and combination must be permitted.

It is futile to expect a congress that is made up of a changing body of men, changed every two years, to investigate the industrial condition of this country and construct laws that are going to meet the needs of this country. What can a man from any district know about legislation, and what can he know about constructive statemanship? What if he does know can he accomplish in that time? We must resort to some form of commission, a scientific commission, a commission that will be appointed or constituted to exist over a term of years, who shall go into this question and study it to the botom, study it from the scientific standpoint and arrive at a just conclusion as to what is right between all the parties interested.

Restrictions Necessary

Now you men who are in the coal business are clamoring for an amendment to the antitrust law that will permit you to combine, and there you stop. You must be satisfied also to not only be permitted to combine, but to be restrained from plundering the great body of people by the use of strong combination or a too powerful one. I am a coal operator myself and I see the necessity for combination, but, gentlemen, we must take with it the inevitable consequence that will follow, the restrictions drawn around us so that we cannot in certain seasons of the year exact an exorbitant tribute.

Why have we not acted? A large measure of blame was put on us as well as the Government, and one reason why we have not acted we realize the condition is because we are born gamblers, and there is not a man in the coal business today, and bad as the condition is, but what hopes that the recurrence of that high tide of prosperity that occasionally comes to the industry will arrive before he is forced into bankruptcy, and out of business. We are satisfied in the summer time to trade a dollar for ninety cents, in the hope that when September and the winter months come we may trade the dollar for $1.75 or $2. Business will have to be put on a basis of reasonableness, which shall prove to be permanent.

Now with the desire for combination must come also the recognition that there must be restriction of an unlimited profit. That has come to the railroad. The com-

mission has fixed certain maximum prices that they can charge for the service they render. It would not be a bad thing for the coal industry and I offer it as a suggestion. Suppose we had a commission that would fix the maximum price that we could charge for our product, and that this price was fixed after an intelligent study of the business by all of the parties interested; the operator, the workman and the public; and fixed so that there would be a reasonable profit, because the hazards of the business demand that the profits shall be more than comes to the ordinary business. Then permit combinations whereby the maximum price that the commission fixes shall be the minimum price that the operators will charge to the public. The commission idea is the one that is going to make itself felt in every line of endeavor. I am a democrat in politics, but I am heartily in favor of Mr. Taft's idea, and this is in opposition to many of the ideas of the party that I represent. I can see a certain amount of justness in the attitude that he has assumed with regard to the revision of the tariff.

Concerning the Illinois Legislature

The legislature of Illinois, as at present constituted, is as wholly incompetent to deal with this question as a new-born babe. Its shame is written broadcast all over this country, and how can you expect a body of men such as that to deal with a question that is fundamental in its nature, and that affects the business interests and a tremendous capital and a tremendous body of men.

Over 50,000 men are working in the mines of the State of Illinois, millions of dollars are invested, the great population is dependent upon the industry in this country for its fuel, and tremendous industries are dependent upon it for the power to turn their wheels. Now to submit this question to a body of men elected haphazardly, this year in and the next year out, would be disastrous. It must be submitted to a body of men who can investigate it and who will do it and bring in a report, bring in constructive legislation that will have in mind the rights of capital to a reasonable profit upon their investment and upon mental toil; and, on the other hand, of labor to a reasonable share of the profits in the industry in which the men toil, not only for their daily bread, but an opportunity to lift their eyes above the ground occasionally and see a glimpse of an opportunity for education, and some of the cultural things of life.

We cannot continue as we are. We must be allowed to combine. If we are not allowed to combine the ruinous competition in which we are engaged will wipe the industry out of existence, so far as those engaged in it are concerned. The industry will not be wiped out, but new capital will come in and reorganize it upon a new basis. Let me say to you that those who today have opposed the enactment of any law permitting greater profit to the business, who would oppose any change in the Sherman antitrust law, would be short-sighted.

Let me tell you they will pay high interest for every dollar's worth of coal that they are buying for 90c. For every dollar's worth that they buy for 95c. they will pay $2, and why? Simply because the profits that have been lost must be made up. The bankers must be repaid the money that has been borrowed, the red ink must be written off the ledger, and the tremendous waste in the industry as it is today constituted must be paid for in the future; and we have no right and those who are buying coal today have no right to plunder the resources of this country, to waste the heritage of those who shall follow, in a crazy desire to buy a thing for less than it is worth, a thing which is one of the greatest necessities of human life.

Anthracite Miners' Demands

Special Correspondence

The convention of the anthracite miners' union, districts Nos. 1, 7 and 9, was brought to a close at Pottsville on Nov. 3, after formulating ten demands which are as follows:

1. We demand that the next contract be for a period of one year, commencing April 1, 1912, and ending, March 31, 1913.
2. We demand a work day of not more than eight hours for all inside and outside day labor, with no reduction in wages.
3. We demand recognition of the United Mine Workers of Districts Nos. 1, 7, and 9 as a party to negotiate a wage contract and the right to provide a method for the collection of revenue for the organization.
4. We demand a more convenient and uniform system of adjusting local grievances within a reasonable time limit.
5. We demand an advance of 20 per cent. on the rate of wages for all employees over and above the rates awarded in 1903.
6. We demand a minimum rate of $3.50 per day for miners and $2.75 for laborers.
7. We demand that the system whereby a contract miner has more than one working place, or employs more than two laborers, shall be abolished.
8. We demand that the rights of the check weighman and the check docking boss shall be recognized, and that they shall not be interfered with in the proper discharge of their duties.
9. We demand that all coal shall be mined and paid for by the ton of 2240 pounds, wherever practicable.
10. Your committee would recommend that a joint-scale committee, composed of the executive board of the three anthracite districts, together with the national president, be appointed by this convention and clothed with discretionary power to negotiate an agreement on the basis agreed to by the convention, and in the event of their being unable to do so, they shall be empowered to order a suspension of work in accordance with the laws of the organization.

The demands are much more radical than any of the delegates to the convention anticipated. They were formulated by the executive board of the three districts and were practically accepted without discussion or mitigation by the convention. After the convention had adjourned, the delegates seemed to be very reluctant to discuss them. All who were approached on the subject said that they approved of them heartily; that while they might be modified in this direction or that as a result of the negotiations with the operators, yet that on the whole they were equitable and that they must be conceded in principle if a strike was to be avoided.

President White aroused the enthusiasm of the delegates when he declared emphatically that the Conciliation Board must be wiped out and that the executive boards of the district unions must be recognized by the operators as representative of the national organizations. On the whole, however, he was optimistic as to the outlook for a peaceful settlement of the demands which had just been officially issued and seemed confident that the task of arranging an agreement on the basis of these demands would be easier than in 1900 and 1903.

Consternation In Business Circles

On the other hand, the demands have caused consternation in business circles in the anthracite regions. Business men recognize that the operators are in no humor and in no position to grant even a moiety of the demands, and they anticipate a prolonged strike if the last agreement is not accepted as a basis of the next.

An official of one of the largest anthracite-coal companies said: "The demands of the convention are preposterous. These demands simply amount to a requisition that we hand over the control of our property to the miners' union and that we act in subordination to them as their selling agents. We are not going to do anything of the kind. We are prepared to take into consideration any reasonable demands that the representatives of the miners make for an increase of wages on the basis of the existing agreement but we cannot and will not go any farther."

The Bituminous Coal Trade

By A. J. Moorshead*

A review of the Illinois coal industry from its infancy. Some startling comparisons are shown regarding cost of production and selling price. The evils of overproduction are discussed and remedies suggested.

*President, Madison Coal Corporation, St. Louis, Mo.

Note—Abstract of paper read before the American Mining Congress, Chicago, Ill., Oct. 25, 1911.

So varied are the underground conditions and methods employed in coal mining in the State of Illinois alone, both with reference to the seams worked (from 30 in. to 10 ft. in thickness); the wide range of prices per ton paid to the miners; difference in quality of product; the variable cost of putting the coal into the cars for the market, that it makes a somewhat intricate and difficult subject to handle, particularly when coupled as it is with the attempt in our dealings with the Mine Workers' organization to make each district fairly competitive with all others in the marketing of the product; therefore, the subject covering the entire country can only be reviewed in a general way.

With the exception of two or three States and some particular districts in some States, the industry was in a reasonably prosperous condition prior to the fall of 1907, when a general business depression occurred, and, with others, the coal industry suffered a material curtailment in production and a general lowering of values at that time. During the following year the production declined some 64,500,000 tons, but this loss in production has been subsequently overcome, and the figures for 1910 record the largest tonnage in the history of the industry.

With the further decline in prices during the current year, the situation has become a serious one, and in certain competitive districts where competition is unusually keen and where low prices have steadily prevailed for the past four years, many of the operators are dangerously near complete bankruptcy, and some means must be devised to relieve this situation if it is possible of accomplishment; otherwise the failure will be seriously felt by manufacturers and retail dealers everywhere.

Data Collected

In order to obtain the most authentic information possible along these lines, the secretary of this Congress sent out blanks to all the principal coal operators scattered throughout the country, making inquiry along the following lines:

1. Capital invested in business.
2. Average total cost of production.
3. Average labor cost per ton (mine workmen only).
4. Average cost of administration.
5. Average selling price at mine.
6. Estimate of increased cost necessary to meet demand for conservation.
7. Average depreciation of values per 100 tons daily capacity.
8. At what price coal must sell.
9. What percentage of coal is sold at a loss.

Briefly stated, these statements revealed the following conditions:

That for every ton produced annually, there is an average investment of $1.41 in coal lands, machinery and equipment necessary to that production. These statements show that increases in cost of production have been general in all States, varying from a fraction of a cent in States like Tenessee and Kentucky, to 28c. per ton in the southwest. The average increase is near 7c. per ton in all fields.

Increased selling prices are generally reported for 1910 averaging 4c. per ton, but it is not sufficient to offset an increase of 7c. per ton in production costs, during the same period, so the year as a whole shows a decline in profit.

During 1910 the total cost of production is estimated at $1.07 per ton. The cost of mine labor and mine supplies total 95c. per ton, and the cost of administration, such as office expense, sales expense, accounting, insurance and taxes, legal expense, etc., usually classed as general expense, was 12c. per ton. This does not include interest, depreciation or profit.

The average price obtained at the mine was approximately $1.11 per ton. The increased cost necessary to meet the demand for conservation was estimated in different fields from 2c. to 15c. per ton, with a possible average of 5c. in the country as a whole. The depreciation of coal reserves and plant equipment would require a fund of approximately 4c. per ton.

The increased prices necessary to make the business show a fair return on the money invested ranged from 5c. to 25c. per ton in various regions. The average increase requested would approximate 12c. per ton.

Over Production

Statistics show that while our bituminous coal production increased rapidly from nothing in 1821 to 1,111,156 tons in 1842; to 10,625,381 in 1865; to 105,268,-963 in 1891; to 306,138,096 in 1906; and to 415,500,000 tons in 1910; our consumption kept ahead of or apace with production until 1891. In 1821, consumption was 19,617 tons in excess of production; in 1842, it was 123,879 tons in excess of production; but in 1891, the total consumption was only 105,016,407, or 252,556 less than production, and the difference has steadily increased until in 1906 consumption was 6,002,051 less than production. The excess of production over consumption has steadily increased each year, and has resulted with mines operating to a restricted capacity.

A further example of our over-production and still greater over-capacity was demonstrated during the strike period of 1910 in Illinois, Indiana and the southwest:

Illinois was idle six months of the year, but produced 45,900,246 tons as compared with 50,904,990 the previous year, working twelve months.

Indiana was idle some thirty days and produced 18,289,815, as compared with 14,834,259 in 1909.

Oklahoma, Arkansas, Kansas and Missouri were also idle six months in 1910, due to the strike, and the production showed an average decrease of only 20 per cent. under the figures for 1909.

The possible capacities of West Virginia mines is fully 75 per cent. over the present total production. The Pittsburg and No. 8 Ohio districts are reduced to 30 per cent. operation during 3 or 4 months of each year, while navigation is closed on the lakes. There are very few properties that have operated over 225 working days per annum during the past three years.

Tonnage Increase

This over production and over capacity to produce has resulted in a ruinous competition to obtain business. Many of our coal properties have fixed charges in the nature of bonds and other obligations, such as minimum royalties, and in many cases the management figure their losses less by taking the low prices and operating full time than by obtaining their proportion of profitable domestic business.

The develpoment of so many new high-tonnage plants in recent years has also had a marked effect upon the industry. When it is realized that our production and consumption to date have practically doubled every ten years, the large increase in the number of new mines can be appreciated. The "deadwork" haulage, drainage and ventilation costs are always lower in new development, on account of the concentrated area under operation, and they are able to produce coal much

cheaper than their older competitors. They fix the prices in the markets, which must be met by the older mines, but in time they have the same situation to face.

To meet this competition, underground development is too often carried on in such parts of the mines as can be made to produce cheaply and in order to escape the heavy yardage prices, excessively wide entries are driven, and this condition coupled with the narrowing of pillars in order to lessen the cost of operation, ultimately causes heavy falls and squeezing to such an extent that the mines are robbed of half of what would otherwise be their natural existence, and in their early abandonment large acreages of coal are wasted without hope of recovery.

Price Fluctuations

Statistics show that the average prices received at the mines during the past seven years are as follows:

1904	1905	1906	1907	1908	1909	1910
1.10	1.06	1.11	1.14	1.12	1.07	1.11 est.

The average price for the entire period has been $1.10 and the fluctuation between the maximum and minimum prices has been only 8c. per ton. It is also interesting to note that the prices for 1910 and 1904 and the average price for the period are practically identical.

During 1910 the increased cost of production as compared with the previous year is estimated at 7c. per ton in all fields. Some idea of the increased cost of producing coal can be obtained from the following table, which shows the mining rates in the four largest States operating with organized labor. All other districts show similar increase, but the amount is difficult to ascertain:

	Base Rate Illinois	Indiana Mine Run	Bitum. Lump	Thin Vein W. Va.	Hocking Ohio Lump
April 1, 1898, to April 1, 1900......	40c.	40c.	66c.	66c.	66c.
April 1, 1900, to April 1, 1903......	49	49	80	80	80
April 1, 1903, to April 1, 1904......	55	55	90	90	90
April 1, 1904, to April 1, 1906......	52	52	85	85	85
April 1, 1906, to April 1, 1910......	55	55	90	90	90
April 1, 1910, to April 1, 1912......	58	58	95	95	95
Increase, 14 years......	18	18	29	29	29
Equivalent on run of mine basis......	18	18	18.74	18.74	18.74

The above increase applies only to the "mining rate"—that is, the amount paid to the miner for loading one ton of coal at the face, and proportionately higher wages are paid to all other mine workers. The full increase in cost of labor per ton over this period is, therefore, 27c. per ton, and approximately 9c. of this increase has been taken since 1904.

With prices practically stationary during this same period the profit to the operator shows a net decrease of 9c. per ton.

We have already stated that for every ton produced annually, there is an average investment of $1.41 in coal lands, machinery and equipment necessary to that production.

The National Trade

Based on an annual production of 415,000,000 tons of bituminous coal, there is an investment in the business of some $585,000,000. An investment in an industry of this nature, carrying the risks to life and property which mining industry does, and the hazard of faulty conditions of seam, which no man can definitely foresee, should net at least 10 per cent. in return as interest on the capital invested, after setting aside a sufficient amount—estimated at 4c. per ton— to cover depreciation of equipment and exhausted coal lands.

The mining industry should net to the owner annual earnings of $75,100,000. They earned $16,600,000 in 1910, and the current year will show still further reductions. In other words our coal operators are absorbing as losses in excess of $58,500,000 per annum, or slightly in excess of 14c. per ton.

Over-production is the cause of this extremely deplorable situation. It has created a destroying competition in which only the strongest can survive. It has caused a general unrest in the industry and dissatisfication to mine owners and mine workers alike, and the question before us is how this over-production may be taken care of and the business placed on a remunerative basis. Two solutions are suggested.

Suggested Remedies

First. The creation of district sales agencies to handle the entire produce. These agencies would control the total output and name prices which would return a fair profit on the investment and at the same time permit the necessary expenditure for conservation of resources and careful and safe mining. Such agencies would result in a very large reduction of the present sales cost, and, by concentrating the mining operations, the ultimate cost to the consumer would probably show little increase. These agencies could maintain a more uniform distribution and by concentrated effort could probably reach new markets which are not being supplied from the United States.

This plan would require the alteration of the Sherman Anti-Trust Law and the creation of an Interstate Coal Commission. The commission would have to pass upon the justness of prices established by the various district agencies, to see that owners obtained fair prices only, and to hear the public voice in reference to such matters. The commission should also control the opening of new mines in such a way as to keep production and consumption apace with one another.

Second. The Government could assist in the development of foreign export trade. A large percentage of the total production of this country is available for profitable export, and by directing the surplus production from Eastern Pennsylvania and Eastern Virginia, which is now encroaching upon the trade formerly enjoyed by Illinois, Indiana and Ohio, the solution would at least be partly reached.

Foreign Remedies Used

Other countries have had their coal problems similar in all respects to our own, as now existing.

Great Britain met it by the most careful of mining methods and preparation of the product; and combination with transportation interests have gained for her the markets of the world for her surplus, at highly remunerative prices, and this result is only possible by continuous operations and large export shipments. British exports have been:

In 1907....................	63,600,947 tons
In 1908....................	62,547,175 tons
In 1909....................	63,076,799 tons
In 1910....................	67,085,476 tons

It took Germany many years to perfect a coal syndicate which, under a single sales agency, with the coöperation of the government, has produced substantial returns to the mining companies, and at the same time increased the export tonnage; and there was shipped in this particular class of trade:

In 1909....................	10,321,536 tons
In 1910....................	10,963,195 tons
In 1911....................	12,614,952 tons

It should be the duty of this congress to carefully consider ways and means of working out the problem; additional legislation is necessary and capital, together with labor and the consumer, should appreciate the benefits to be derived from placing an industry of great magnitude upon a substantial basis.

Wonderful results have been accomplished for the benefit of agriculture by the national government appropriating from $20,000,000 to $40,000,000 per year for the last twenty years for that particular industry, yet mining—important and hazardous as it is—has received but little consideration. This organization can, by thorough, concerted and determined action, not only arouse public interest in our cause, but the State and national legislators will, beyond doubt, when the condition of the industry is properly made known to them, afford relief no less generously than Great Britain and other foreign governments have done.

Compensation vs. Liability Acts

In presenting the result of the labors of the special committee appointed to consider and report upon the subject of a workmen's compensation act, I desire to call to your attention some of the things which form the basis of the reasoning of your committee.

The subject of employers' liability and workmen's compensation, in one form or another, has agitated the minds of men for years. The justice of it all is generally conceded, and American industry is still seeking the best direction in which to move to accomplish the object of its faith.

The coal-mining industry is no stranger to either "liability" or "compensation," nor did it wait for law to suggest, demand or compel a reasonable care, in one form or another, of those injured in the pursuit of the industry.

It is natural, then, that a subject of so vital importance to the industry should engage the serious attention of the Mining Congress.

One of the most important points in the whole matter is to decide upon the best direction to follow. On this point we have the experience and opinion of practical men in this and other countries. It has been stated that what has been done in England, and what has been done in Germany, are the most important types of action on this subject which we can study.

An English Opinion

A. H. Gill, member of Parliament, of Balton, England, says in substance: "In England, before the eighties, the common law was the only means of adjustment between the injured and his employer; when negligence of the employer was not apparent or proved, it was hard to get compensation. The working people became dissatisfied and began to agitate for a new law, and as the result an Employers' Liability Act was passed in 1880, and while it was an improvement on the common law, the act was not a success, as it embodied the doctrine that an employer should not be liable unless negligence was proved. It has, always, been difficult to succeed in an action under the act, as so many means could be found of resisting a claim. The result of the failure to secure compensation caused a further agitation for an improved method of dealing with the problem. This agitation bore fruit; for in the year 1897, an act was passed known as the Workmen's Compensation Act. This act did away with the doctrine of contributory negligence and made the employer liable to pay compensation to a workman who lost

By John H. Jones*

After reviewing the experience of various countries, a workmen's compensation act is urged as preferable to employers' liability from the standpoint of the mining industry. The former may prove difficult to frame. The latter is believed to be wrong in principle and practice.

*President, Pittsburg-Buffalo Coal Company, Frick building, Pittsburg, Penn.

NOTE—Address read before meeting of American Mining Congress, Chicago, Ill.

time through any accident which occurred while following his employment."

It is not necessary to enlarge upon this act, but simply to draw to your attention and emphasize the fact that 26 years of agitation by workmen, and 26 years of study and experiment, by practical men, resulted in a *Workmen's Compensation Act.*

This opinion is fully confirmed by Attorney Packer, of Washington, D. C., who was retained by the United States Government to investigate the matter.

Two Views on Liability Act

Another opinion dated Washington, D. C., Dec. 24, 1910:

"The Illinois legislature should enact a liberal employers' liability act at the special session and *then undertake an investigation with a view to the introduction of an automatic compensation law, for THAT view observers now regard as the most feasible and just solution of the vocational ills, accidents and death.*"

(Signed) Samuel Gompers, president American Federation of Labor.

And another:

"In spite of the fact that every one of the industrial nations of Europe has discarded the system of paying damages on the ground of the liability of the employer and has adopted in its stead the payment of compensation for industrial accidents: *in spite* of the fact that New York has adopted a Workmen's Compensation Act, and that both Wisconsin and Minnesota are considering compensation as the only feasible solution of this problem, the Chicago Federation of Labor and its representatives on the commission have taken a decided stand that the abrogation of the employers' defenses must precede any bill providing compensation.

"It is evident from the letter which the Federation submits that its officers are not only unfamiliar or unmindful of the economic waste involved in any employers' liability system, but that they have no knowledge of the total inadequacy of such a system, even when extended by such serious modification of the employers' defenses as the American Federation of Labor advocates.

"An employers' liability law meets none of the prime necessities of definite compensation, immediately and automatically paid. Under it every case is a gable." Signed by the six "employer" members of the commission of twelve, Illinois Employers' Liability Commission.

German Experience

Again, Major A. R. Piorkowski, representing the Frederick Krupp Company of Essen, Germany, and speaking for the German system:

"The German Accident Insurance had its predecessor in the Liability Law of 1871, by which the operators of industrial establishments were liable for the accidents caused by them. The injured workmen had to bring proof that the operator caused the accident, and the amount of compensation was determined by private societies. It is evident that such an institution could satisfy nobody. The consequences were long drawn out and costly law suits, by which the contrasting interests of employers and employee were glaringly brought to light.

"The more law suits between both classes, the more hatred and the less understanding there were for what was mutual in their interests. Employers, employees, and the Government looked eagerly for a better solution of the problem. Germans have been called a people of thinkers. They thought, and understood why the liability law did not answer the purpose, did not work for peace between capital and labor. It worked unjustly toward both of them. Therefore, the only logical and just way to compensate for the injuries done is by insurance.

"In 1900 this law received its present shape. All workmen and administrative officers—the latter, provided their annual earnings do not exceed 3000 marks —are insured against the results of accidents in the course of their employment if employed in mines, factories, and similar establishments specified by law. In case of disability, compensation is rendered from the beginning of the 14th week after the date of the accident."

Criticism of State Insurance

If any gentleman present imagines that the German system would be a success in this country, let me quote from *The New York Commercial*, of Friday, Oct. 20, 1911—under the heading, "Liability Men Criticize State Insurance System."

"Nearly every speaker, alluded to a recent review of the German state-insurance system, written by Dr. Ferdinand Friedensburg, who has recently retired after 20 years at the head of the senate of the imperial insurance office of the German Empire. Dr. Friedensburg does not find the German system, as it has worked out in practice, by any means ideal but does not condemn the principles underlying the workmen's compensation for accidents.

"Dr. Lott quoted him as saying that charity crept in and corrupted the system at the beginning;" that "employers do all that is possible to escape their burdens, which they feel to be unjust and in vain enormous sums are annually exacted from them in fines," that "industrial unions and insurance institutions have been repeatedly on the brink of bankruptcy."

"Dr. Friedensburg points out that the excessive cost of the insurance system, which is one result of the degradation of the system into charity, is complained of by employers, and that state insurance therefore, reacts injuriously upon Germany's industry."

He says: "As a result of the costs of insurance which have gradually become monstrous, German industry is put at a disadvantage and is hampered to the extreme in its competition with foreigners."

Caused Rise in Prices

Indeed, Dr. Friedensburg makes the astonishing statement that the German system of workmen's compensation is held responsible for the marked rise in prices which is felt to be oppressive by all classes of the German population.

Mr. Wolfe is of the opinion that whether the state will undertake the employers' liability business to the exclusion of the companies depends upon the attitude of those companies and their disposition to coöperate with the state in the solution of the economic problem. He said that employers' liability insurance represents more than one-half of the entire liability business transacted and consequently the question of state insurance is of vital interest to the underwriter.

While heretofore the question may have seemed to the underwriters a fad or a form of socialistic doctrine and an interference with the right of contract, a discourager of thrift and an encourager of malingering and intentional accidents, public opinion is overwhelmingly in favor of entering the cost of human accidents as a part of the cost of production, and the underwriters, in the opinion of the speaker, must face the situation accordingly.

Mr. Rowe stated that obviously the trouble with state insurance, viewed from an impartial angle, would be the mixing of politics with it. "Workmen's compensation insurance," he said, "can only exert its effect as a blessing if free from all exaggeration and particularly from the conscious or unconscious love-making with the "lower classes."

"Such insurance," he said, "must be issued by an independent institution free from all partiality."

Choice of Two Methods

Here then are introduced two methods, one the "Employers' Liability Act," which has been discarded by practical men, the other the "Workmen's Compensation Act," now before us, and between these two we are called upon to choose.

Your committee urges a Workmen's Compensation Act as best fitted, by experience and practice, to the mining industry.

The Liability Act appears, to your committee, to be unjust and unreasonable, in principle and in practice—the very mention of it suggests lawyers, courts, delays, annoyance, strained relations, expense to employers and loss to workmen. In one word it means "fight." The Compensation Act means "payment." The former is an unknown quantity; the latter is a fixed principle known and computed in advance, and provided for. The record of the Liability Act is said to be about 50 per cent. adjustment—the Compensation Act means 100 per cent. adjustment.

Adjustment under a Liability Act is reported, by one large coal operator, to be injurious in 80 per cent. of the cases in a large disaster, in that it would shower money into the hands of the inexperienced, where value is unknown, and where money and widows are soon parted.

Liability-law adjustment, in the judgment of the committee, is a mistake, is uncertain and unreasonable, is an injustice to all concerned, and is prejudicial to all the best interests of a miner's widow and children. It defeats a good intention, and does *not* insure the care, education and opportunities of life, supposedly vouchsafed to the husband and father, by a law which caused him to risk and lose his life in an honest belief, and a sincere endeavor, to provide for his family. In short, it looks as though the most ardent supporters of an Employers' Liability Law, are ambulance chasers, and those who could hope to profit by a disturbed condition, as between capital and labor.

Some Erroneous Conclusions

It is also conceded that labor is just as necessary for the maintenance of industry as any other commodity, and that the cost of compensation, as a fixed principle of industry, should be reckoned with in placing a price upon the finished product. Upon the grounds stated, we believe the Liability Act to be wrong in principle and practice, and that the injustice of it falls upon those who are least able to bear it on the one hand, and, upon the other hand, falls upon those who are supposed to be wealthy, but this supposition is based upon opinion thoroughly unfamiliar with the facts, and therefore incompetent.

Position of Mining Industry

The mining industry should stand ready to bear the burden of its own accidents—it should stand ready to pay a tax of one cent per ton of coal mined to meet the necessities of the case and to provide the necessary funds.

It should stand ready to have this fund administered wisely in the interests of the workmen and their families.

It has always stood ready to consider, and has introduced every known precaution to prevent these accidents, and to safeguard every man employed above or below the ground.

It considers all this right, reasonable and just, and that the best direction to move in, to accomplish the best results, is the passing of the Workmen's Compensation Act.

In the preceding argument we have referred to the best direction in which to move to accomplish the best results, and have clearly stated our reasons in favor of the Compensation Act. There is another important point to consider with reference to this Act, namely; the mining industry must give its best thought to the method of introducing and passing the Act, it cannot be left to the unfamiliar majority. The necessity for reasonably uniform legislation by the different States of the Union must not be lost sight of. Uniformity of legislation on all subjects of common interest is one of the most important questions of the times.

The necessity for careful study, for the wisdom which comes from the multitude of counsel, and for definite and determined action, is clearly evident.

The American mining industry should here go on record as favorable to that solution of this problem, which is right, reasonable and just to the industry, to the employer and to the employee.

A law that strikes at the life of the industry will be a calamity.

A law that does justice to employer and employee, that operates, and compensates, without delay, friction or loss, will be a blessing.

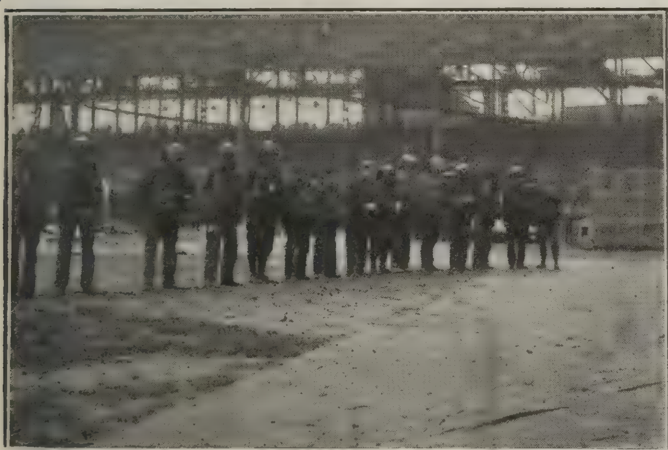
The Explosion at Bruceton Mine

By R. Dawson Hall

The Bruceton tests clearly develop the fact that under some conditions, an explosion may follow the return airway. The most clearly marked evidence of pressure was seen in a dusty part of the intake where there was a curve in the path of the explosive current.

An endeavor will be made in this article to treat the tests at the Bruceton mine in a somewhat more detailed manner than was attempted in the short description by J. T. Beard in the last issue. This article is to be regarded as supplemental only to his work and where details are missing, they can be supplemented by a reference to Mr. Beard's description.

The experimental mine is an honor to the Government's Bureau of Mines. Here are provided natural conditions, here all the conditions of actual work can be not only simulated, but actually reproduced. If a mine explosion occurs here, no specious critic can say, "You can do these things in a cylinder of boiler iron, but can they be done in a real mine?" The action of an explosion is a complicated thing; it can only be followed to its conclusions by actual observation in a mine where all the conditions prior to the explosion can be accurately predetermined—what doors were shut or open, what shot blew out, what powder was in it, how it was stemmed, what gas was present, what humidity prevailed and what air current was passing. Here stoppings and overcasts can be erected and their strength determined. One factor after another can be eliminated, till the basal actuating impulses of an explosion can be laid bare and their relative importance determined. No work of others can be duplicated here, for there is but one Bruceton. It will set the standards for all future work, until like mines are installed elsewhere.



Helmet Men Ready to Demonstrate Rescue Work

Showing Part of the Crowd at the Safety Demonstration

General Description of Mine

Bruceton is situated thirteen miles south of Pittsburg, on the Baltimore & Ohio railroad. The Bureau has there a mine, illustrated in the accompanying cut, which shows the whole development of the mine up to date. The main heading extends 715 ft. from the mouth. Three crosscuts connect it with the parallel airway to the left. The main gangway is open and unobstructed from end to end. The ends of both headings are 70 ft. clear of the last crosscut. The mine is faced immediately by a small spur of hill so that the flying débris resulting from an explosion is stopped before it can travel far. Fortunately, Bruceton mine has rural surroundings and no harm is likely to result from the spectacular explosions.

The main portal of the Bruceton mine is of concrete, well reinforced so that it can withstand all manner of stress, including upward and outward stresses which, in the design of most mine approaches, is not considered. The foundation is carried down to the Pittsburg limestone, which lies about 5 ft. below the Pittsburg coal. As shown, the concrete lining extends about 240 ft. in from the portal of the main tunnel.

The Recording Chambers in the Mine

On the left-hand side are two instrumental chambers, equipped by the Cambridge Scientific Instrument Company, of England, with pressure recorders which will continuously record the side pressure of the blast as it passes, showing on a chart, which revolves on a drum, the pressures at every interval of time. At these same stations are set wires from each side of the heading connected together across the roadway by a guncotton tie. This guncotton tie is burned by the blast as it passes so that an electric circuit is broken and the time interval is measured in the observatory on the hill.

In the airway, lying left of the main heading a sandbag stopping from 6 to 8 ft. wide, was piled at the edge of the oblique gallery. At the time of the visit two heavy canvas stoppings lay across the first crosscut, the second was completely filled with sandbags for 8 ft. of its length, the third, that is, the most remote, was open.

The Steel Dust Gallery

The steel dust gallery is as shown. It is made of half-inch boiler plate and is 102 ft. long and 6 ft. 4 in. in diameter. Beyond this typical explosions gallery is a movable section of 20 ft. followed by a 20-ft. concrete section covered by heavy plank and loaded down with dirt, so as to make it less likely that the steel section will have to bear strains beyond its strength. For about 200 ft. beyond the explosion door section, the gallery is extended underground to meet the airway. This 200 ft. of gallery is built of reinforced concrete. Two instrument chambers are set in the sides of this gangway, but they are not equipped with instruments, as funds at the disposal of the Bureau do not permit it.

Ventilation of Mine

There is a small blower fan near the steel gallery. It is a 36-in. Sirocco fan with 20-in. blades and was delivering 4000 to 5000 cu.ft. per min. at the time

the guests of the Bureau visited the mine, though it is competent to produce much more. A light corrugated-iron building covers the fan, so light that its destruction is assured whenever an explosive blast occurs. It may be added that the steel gallery was closed by a door and two light wood doors covered the opening to the airway though the large sandbag stopping further in made them useless.

The Inspection of the Mine

The visitors went in at the portal of the main heading and by the light of electric lamps passed on to the end. On either side were seen shelves, which were really mine rails, set on edge measuring 2½ in. by 4 in. These were supported by bolts projecting from the concreting or

An Irksome Delay in the Proceedings

The visitors were disposed on the hill back of the mine so that they could see the portals of the main heading and of the steel gallery. The location was not favorable as the rain had made the newly planted wheatfield undesirable for walking.

One shothole was charged, it appears, with 2 lb. of FFF blasting powder, with a tamping of 6 in. of fireclay, the whole being set within an inch and a half pipe to insure a blownout shot. The men left the mine and the circuit which was expected to fire the shot was closed. Nothing resulted; not even the sound of a shot could be heard. The miners of the Bureau again entered the mine and connecting the wires of the detonator to discover if the lead wires were short-circuited. In the hurried work of the last few days this feature was overlooked. A new circuit was then laid into the mine and this time, to make assurance doubly sure, the last hole was charged and the three holes connected in parallel.

The Explosion

There was no failure that time; all three exploded together, as has since been learned. A burst of devouring flame enveloped the little strip of woods, burning leaves at the top of the highest trees. A loud report, heard over five miles deafened the hearers, and a rain of sandbags, planks, shelves and what not, ascended 50 ft. in the air where they could be

President Taft; Governor Tener, of Pennsylvania; Secretary of the Interior Fisher, and Doctor Holmes Viewing the National Mine Safety Demonstration in Pittsburg

the coal as the case might be. They were covered by dust but it did not appear that there was much dust to be seen. The floor was clean. In fact, there was only 1 lb. of coal dust to the foot-run in the heading. At the end of the gangway, three holes had been drilled in the coal. Each hole was large enough to hold a 1½-in. pipe. The holes were drilled about 3 ft. above the floor in a horizontal line, and extended 4 ft. into the coal.

The concreted portion of the airway entry and of the oblique gallery had shelving of like character to that in the main entry, but the dusting only ran ½ lb. to the foot-run. No dust was distributed in the steel section. Some dust holders of the bookcase type ("transverse shelving") were put in the first crosscut between the main entry and its airway.

nected another line of wires with another shothole of like charging, and came out and gave the signal. Another moment of tense suspense—and nothing resulted. The people were wet and cold and they were afraid of missing the train, and considerably over one-half, among whom were many, including the helmet men, who had come hundreds and thousands of miles to see the explosion, left the field.

It was the opinion of the Bureau officials that there was a short-circuit or a grounding due to the trampling of the people who went through the mine. The wires were only properly guarded where set in a pipe within the concrete and were not protected against injury where the headings were not cemented. No test apparently was made before con-

plainly seen in the brilliant glare. The flame crossed the ravine in front and licked up the vegetation for a distance of 200 ft. A mine car, with its light weight of gravel, weighing about 2000 lb., stood about 20 ft. from the mine. It was lifted off the track, thrown bodily over the rock dump; it somersaulted several times, and struck the ground 200 ft. from the mines to make two more complete somersaults clear of the ground before it lighted with its wheels solidly embedded in the sod. Another car, with its load of coal, weighing two tons, was 75 ft. from the main entry and was lifted off the track and moved 20 ft. The fan house was demolished and the explosion relief-section unroofed. The sight of these missiles barely 50 ft. away and 50 ft. above ground warned the people to run and,

though no one was frightened, there was a politic retreat in which at least one man was knocked down.

After the Explosion

A rough survey was made of the outside, the openings were closed up and the mine left for the night. A later investigation shows that the stopping in the airway was entirely removed and blown out through the doorways, the wood doors swinging open without injury. The sand bags were found strewn in the mouth of the airway.

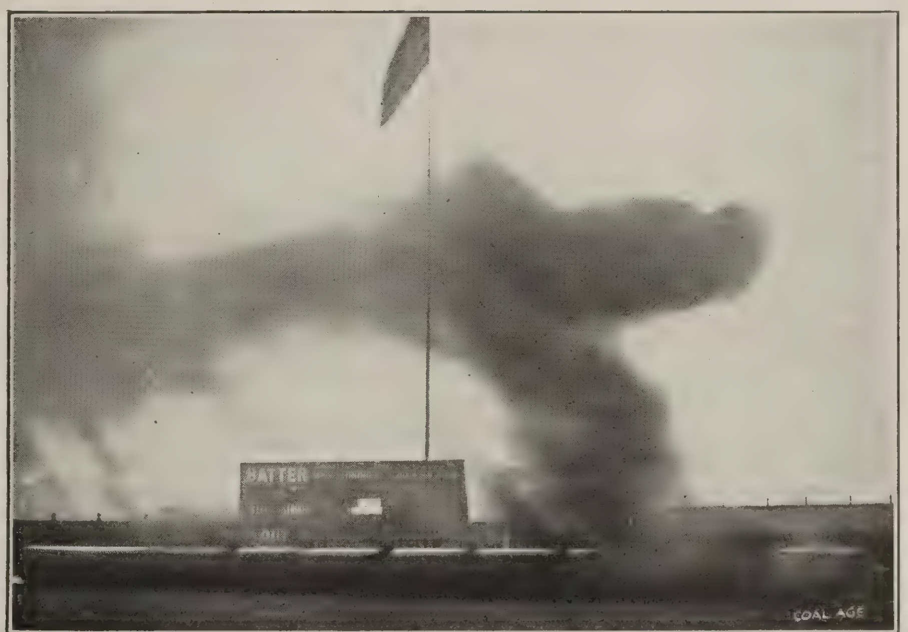
It must here be stated that the fan blew air directly into the steel section. This air passed up the oblique gallery to the parallel airway, up that heading to the last crosscut, and thence to the main heading and out. The shots, therefore, were fired into still air, the blast having to travel 70 ft. before a current of air was met. The explosion appears for the most part to have followed the return current. It was here that it had dust to feed on. There was no dust in the parallel entry, inbye of the first crosscut. Nevertheless the explosion crossed over to the airway at the inbye crosscut. There was evidence of coking of dust on both sides of this connecting airway and the coal had a bright silvery metallic luster in places, very different from the black luster of the unaffected coal, and strongly contrasting with the dull-looking face where the coal had been exposed to smoke.

Waiting For the Coal-dust Explosion in Bruceton Mine

The Fire Dies in the Intake

Though there was a small fall of draw slate in the airway, there was no evidence of violence between the first and last crosscuts and it is probable that the blast soon died out on the intake as it had little to feed on, soon burning or depositing what it had and finding no more. The unused "bookshelf" dust holders in the face of the airway were standing almost without distortion, though built in a way that makes them easily deformable.

To return to the blast passing out at the main entry, it passed the second crosscut without disturbing the stopping, but it blew through the first breakthrough where nothing but a canvas intervened. At the end of the concrete tunnel, the wires for shot-firing emerged and at that point a notch had been made in the rib. There was a plug set in the pipe at the time of the explosion and apparently a vacuum action removed the plug which was found lying loose in the notch just mentioned.



Showing Coal-dust Explosion in Forbes Field

The Concrete Tunnel Is Severely Cracked

At the point where the blast made the turn to the oblique gallery the force was perhaps the most apparent. In concreting the tunnel every effort was made to put the grout up to the roof so that the concrete would be in perfect contact. This was not always successfully accomplished, with the result that both in the explosion of the 24th and 30th, there were places where the concrete lining was lifted and badly cracked. One big crack showed at the sharp angle where the right side of the airway and the left side of the oblique heading intersect, using right and left in the sense of an observer going to the outside. In this crack a plug of wood was so forcibly driven it could not be pulled out. The concrete had evidently been lifted and in settling again had retained in place, not only this piece of wood, but some pieces of bag and twine as well. In one place the reinforcement was disclosed.

Pressures and Velocities

At present writing it is not known what pressures and what velocities were reached. It will take some time to ascertain these, as they demand some careful calculation, but in the explosion of October 24, the time of its passage from the face of the main entry to the inbye instrument station was 1½ sec., and the mean speed 406 ft. per sec. There is no question but that this speed was very much exceeded near the instrument mentioned and was not nearly reached at the point of ignition. Between the last two instruments the speed averaged 1900 ft. per sec., which accords well with the speed recorded by J. Taffanel and W.

E. Garforth, at the Liévin and Altofts galleries, respectively.

The pressure measured at the first explosion (that of the 24th) at the outbye station was 41 lb. per sq.in. That exhibited at the inbye station was over 50 lb., that figure being the record limit of the instrument. The pressure rose suddenly to that figure and it is likely that the actual pressure was much higher. As the first explosion was probably as severe as the exhibit explosion, and of like character, and did as much damage, it seems that the pressures must have been about equal on the two occasions. There will be several who will fail to accept such results as correct. The pressures surely should be greater than three atmospheres. It is probable that the pressures normal to the direction of the air current are small comparative to the pressures produced by the direct blast despite the general law of gas pressure, and it is possible that in the small fraction of time during which the pressure continues, the instruments lag in recording it, but it is not safe to make that statement with any assurance.

Action at Face of Main Gallery

There were long filaments of dust hanging from the roof and coal in the *cul de sac* beyond the last crosscut in the main entry. These were not visible further out. Evidently, the speed and force of the blast were not severe in the end of heading and probably the combustion itself lagged in the absence of a feeding current of air.

The deductions are as follows:

(1) The explosion near the point of ignition did not do much damage. It is only putting it in another way to say that the speeds and normal pressures were lower at the point of ignition than at the end of the assisted travel of the explosion.

(2) The explosion followed the coal dust even where the coal dust was placed along the return.

(3) There was no evidence of extended explosive action toward the intake where the intake formed a dustless zone. But it must be remembered that the explosion probably entered the dustless zone with only about 70 lb. of coal-dust fuel. Had it broken through 200 ft. below into a dustless zone, the result might have been different.

(4) Gas does not need to be present to act as a medium to ignite coal dust. There was no gas in the Bruceton mine.

(5) The dusty intake induced at least as severe an explosion as the dusty return.

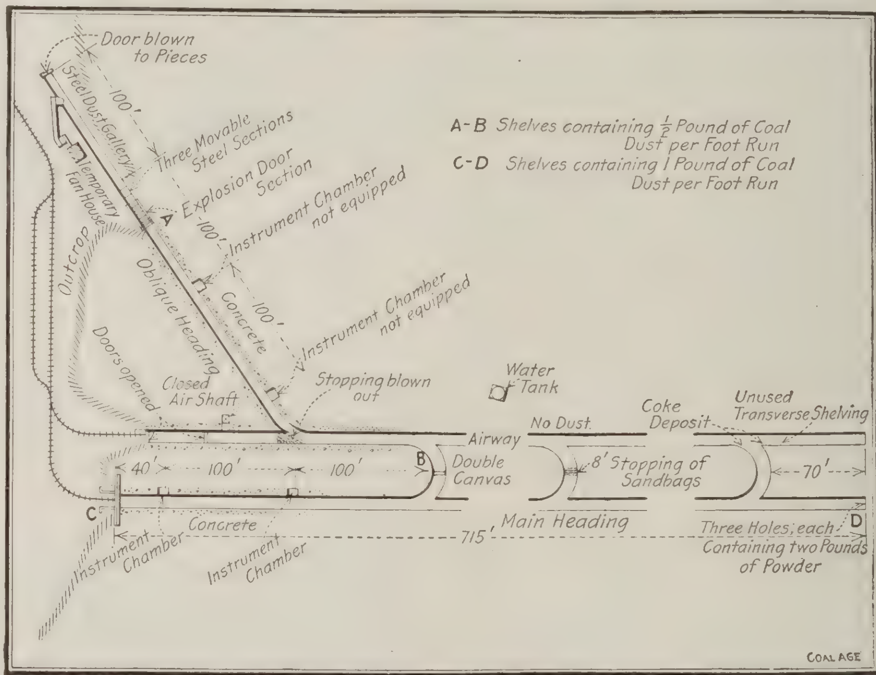
(6) Stoppings of unusual strength are needed for resistance to explosions.

The explosion confirms rather than establishes what has long been held: that an explosion under favorable circumstances will follow the return, and under unfavorable circumstances will not follow the intake; that the explosion will not traverse a dustless zone in the absence of gas, especially when the dust content of the blast is low and, moreover, that the initiating point of the explosion is often accompanied with as little flame, as little force and as little speed as any portion involved in the catastrophe.

The intention is to install a Jeffrey fan, capable of giving a speed of current of 2000 ft. per min., and thus to test the action of high-speed air currents. This fan will be reversible so that the explosion may be toward the intake as well as toward the return.

It is not likely that the humidity of Monday checked the explosion in any way. The value of humidity is not to dampen dust, but to keep it damp. Dust does not take moisture from the air readily, and it is fair to assume that the dust used was absolutely dry. It was prepared from Pittsburg coal, ground down so that 95 per cent. would go through a 100-mesh sieve.

It may be suggested, finally, that a favorable vantage point be selected for a view of the explosions and that all trees interfering with the view be removed. There is no question but what, if the experiments are continued, outraged nature will attend to the removal of the trees, but it would be better to forestall this result and make the view less restricted. If some arrangement could be made to provide a substitute for the mellowed mud of a recently plowed field, the thanks of the public would be freely accorded to the bureau for this improvement.



New Map, Showing Bruceton Mines Just Prior To Explosion of Oct. 30

Ammonium Nitrate Explosives

The consumption of ammonium nitrate explosives is steadily increasing both in this country and abroad, especially in the mines of Austria and Germany. Favorable conditions for the manufacture of these compounds also seem assured, since it has been demonstrated that nitric acid and various nitrates can be produced from the nitrogen of the atmosphere. For a time recently, fears were entertained regarding the production of all explosives except chlorates and perchlorates because of the impending exhaustion of the Chilian saltpeter deposits and the consequent rise in the price of nitric acid.

By ammonium nitrate explosives are meant those which contain ammonium nitrate as their chief ingredient, and not as merely a contributing addition. This class in common with other permissible explosives possesses qualities of great merit from the standpoints of safety in handling and transportation, and security against ignition of gas. Ammonium nitrate compounds are detonated only by a strong initial impulse, as compared to that required for dynamite, and are practically flameless. Unlike dynamite and some other permissible explosives, the gases formed are not as a rule noxious or toxic. In the event of their incorrect composition, however, these compounds may give off nitrous gases, which are particularly treacherous and far-reaching in their effects. The chief feature in this class of explosives is the suppression of the flame in blasting.

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CIRCULATION STATEMENT

Of this issue of COAL AGE, *we will print 6000 copies. No copies will be sent free regularly. There will be no back numbers. The figures which will be shown here each week will represent live, net circulation.*

This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

The Hard Coal Trust

The case of the Federal Government against the anthracite coal-carrying railways, or the so called "hard-coal trust," has been reopened by the presentation of briefs before the Supreme Court of the United States. The Circuit Court, which tried this case last year, sustained the prosecution in only one of its several charges, and the whole case has been appealed substantially as it was originally presented.

It is generally known and acknowledged that the several defendant railroads do, in fact, control their affiliated coal-mining companies through stock ownership or otherwise; that a combination of their interests was effected by means of the Temple Coal and Iron Company, which the specified companies established as copartners; and that the practice of taking over the output of independent mines at a uniform rate is in general operation. Whether or not these matters, as well as those set forth by three other charges which have been entered, will be judged illegal and in restraint of trade, will doubtless soon be determined.

The effect of a decision adverse to the coal and railroad interests involved, is a matter of conjecture, but it is interesting to recall that at one time the conditions under which anthracite coal was mined and marketed were similar to those which prevail at present in the bituminous field, and that these conditions made for waste and industrial uncertainty, although they did not make particularly for low prices.

The present coalition of interests in the anthracite field was not conceived as an altruistic measure for preserving the country's resources from waste; but neither was it launched, full grown, with the object of squeezing an unmerited revenue from the public purse. Like many large industrial enterprises it has grown up gradually through efforts to meet existing conditions step by step. The small operator with a short-term lease wasted 1½ tons of coal for every ton sent to market. The large company, with adequate capital and extensive holdings, has been able to reduce this waste by half.

A study of the conditions in the anthracite field by no means supports the idea that the public is being robbed. An immense amount of money has been invested in preliminary deadwork and costly equipment, all to the end that reckless spoliation and extravagant methods of mining may be eliminated. By this the public eventually profits no less than the operator.

It is, however, quite possible that the present desirable state of affairs in this field, from the standpoint of conserving its resources and ameliorating the conditions of mining, humanly speaking, as well as in a commercial sense, can be maintained with the industry on a basis more severely competitive than at present, and should the necessity arise, it is to be hoped that this will be the case. The large unit has definitely proved itself to be both necessary and desirable, but the amalgamation of large units may yet be shown to be neither.

The Preparation of Coal

There is little mutual comprehension between the anthracite and bituminous fields. Both are enlarging and developing without much help from the other. At times it seems as if there was more inspiration received in Pittsburg from Cardiff than from Scranton, so far is the northeastern field separated from the main Appalachian development. It is hard to explain why this should be.

In the matter of preparation of coal in the anthracite region, the large sizes are cleaned wholly by visual methods, the smaller sizes being cleaned by visual, superficial and physical processes. The superficial classifiers cover such separators as depend on the fact that slate slides on a chute with more friction and less speed than coal. The ability of clean coal to jump a gap into which dirty coal falls is due to the greater speed it attains on the chute, which lengthens its trajectory. Similarly the coal in the spiral picker runs so much faster than the

slate that its centrifugal tendency, so called, makes it rise up a slight incline and leave the inner spiral for the outer.

The only true physical process, which is based on the internal composition rather than the external appearance, is some form of washing device. Such devices in the anthracite region are used for all sizes from buckwheat to egg inclusive with diameters ranging from 5/16 to 3¼ in. The coal of the anthracite region is not often subjected to chemical analysis, but to purely visual tests, so much slate and so much over-size or, under-size being permitted in the sample taken.

On the other hand, in the bituminous region, except for the washing of slack, there is never anything but a picking belt or table. Yet the test of the coal is always chemical as far as it is tested by any recognized method. Physical preparation more nearly approaches the chemical than any other. It alone considers the whole mass of the coal body and overlooks its outward appearance. Some pyrites is crystalline and is readily rejected, some is colloidal and looks harmless in comparison. It may be regarded as being in passable proportion, because not so easy to distinguish.

It would appear, offhand, that a coal to be visually tested like anthracite, should be visually prepared, and that a coal chemically tested should be largely physically prepared. Though in any case the combination of methods, ocular and physical, would be better than either.

Counting the Cost

The fact that the present agreements between operators and mine workers in both the anthracite and the bituminous coalfields of this country expire simultaneously, March 31, 1912, seems to be obtruding itself more and more on the public consciousness. From increasingly diverse and widespread sources come indications of awakening interest in this matter. Many who are more immediately concerned have had the fact in mind for a long time and doubtless, for some, it has formed the basis of conjectures and plans, during the greater part of the past six years. Recently, the union locals have been considering and formulating their proposed demands and the operators have been storing coal and taking other precautionary measures.

Without attempting to discuss the present status of the controversy, the probability of its ultimately developing into an actual and momentous issue, or the strength and attitude of either side in this latter event, it may be pertinent to suggest that the time to count the cost is preferably before and not after a conflict.

The cost of the Welsh collieries strike which lasted the greater part of the past year and terminated without a decisive victory for either side, has been estimated at $15,000,000. Whether or not this figure is accurately determined is a matter of secondary importance in comparison with the obvious fact that the cost of such a strike is enormous.

Broadly speaking, the cost of an industrial struggle of this kind may be measured by the losses sustained, taking normal working conditions as a basis of comparison, and by the expenses incurred, which are, in a final analysis, productive of neither useful work nor a valuable commodity. To enumerate all of the various items which go to make up this total cost would be a difficult and intricate matter, so complex and far reaching are the interests concerned, but a few of the more easily apparent expenditures and losses may serve to indicate the magnitude of the whole.

Of prime importance to the workmen is the loss of their usual earnings. This is also, almost in its entirety, a loss to the various communities and the country at large since the cost of subsistence for the men and their dependent families during the period of enforced idleness, whether defrayed by the savings of the men themselves, the contributions of their confederated fellow workmen, or the extended credit of landlords and tradesmen, represents a reduction in the aggregate wealth of the country; and the increment of national wealth normally accruing from the miners' labor is likewise lost.

On the other hand, the owners and operators must inevitably regard with particular concern, the fact that the total amount of capital invested in the idle portion of the industry is deprived for a time of its usual and expected earnings. This applies not only to the mining operations, but also in a somewhat less degree, to all the various transportation, sales and distributing interests which are involved, because the reduction in their expenses by no means corresponds to the reduction in the volume of their business, and because a large percentage of their capital, if not the entire amount, is dependent on this business for its earnings.

Then there are the many actual expenditures which from the standpoint of usual working conditions yield no permanent or valuable return. The maintenance of the organized executive, clerical and other forces of the various companies is at such a time largely a dead loss. Additional police protection is an important item of expense to both operators and State. The cost of employing firemen, pumpmen and other unproductive labor is considerable. But lacking these measures, the almost incalculable losses consequent upon drowned-out mines, abandoned machinery and the destruction of other valuable property must be taken into account; and at best, the impaired condition of plants by reason of disuse and neglect will represent no inconsiderable expense.

To the foregoing may be added a great number of other items, all more or less susceptible of being expressed in terms of dollars and cents, but whether so expressed or not, definite and substantial contributions to the total cost. The migration and emigration of the laboring element whereby organized forces of experienced workmen are broken up and disbanded; the lawlessness engendered by idleness and want; the baleful effects of strife, riot and bloodshed; the insiduous degradation of the whole community; are a few such items.

Beyond doubt, if several hundred thousand men and several hundred million dollars are kept idle for any great length of time, the cost is bound to be prodigious. The important question then becomes, not how much this cost will be, but how may it be avoided. Nine years ago arbitration was scorned and scoffed at by many operators and a multitude of miners, but it has since been admitted to possess merits; and in these days of conservation, strikes and lockouts have come to seem particularly crude and wasteful means for the settlement of a dispute.

COLLIERY NOTES and COMMENTS

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

Experiments have shown that a 10 per cent. greater weight of briquets than of lump coal can be stored in a given space.

The motto of the H. C. Frick Coke Company should be the guiding principle of all mine foremen: "Safety the First Consideration."

The increase in temperature proportionate to the depth attained in deep mines is due to the secular heat of the earth, the presence of highly pyritic or carbonaceous shales, or the percolation of warm springs.

Hoisting rooms and power plants should be well supplied with metal cans for holding greasy, dirty waste. They should be emptied frequently as an accumulation of such material is a possible source of fire.

Experience has shown that non-mechanical storage plants are economical only for small installations since their cost of operation and maintenance is high, the amount of breakage is large and rescreening is difficult or impossible.

When quick-burning briquets are wanted remember that large briquets are harder to light than small ones, and that inorganic binders tend to make the briquet slow to fire. An increase of the inorganic matter in the slack also retards combustion.

Where there are dangerous accumulations of gas, in mine workings or the gob, which cannot be removed by the air current, boreholes put down from the surface will allow it to escape, thus rendering safe what would otherwise be dangerous working places.

Coal companies should furnish all of their mine superintendents with a classified monthly list of all mine accidents occurring in company mines; this is an inducement to greater forethought and care, the avoidance of similar accidents and the preservation of life.

With longwall mining, 6-yd. packs on either side of the haulageroad will add greatly to the safety of the mine and the workmen. Generally speaking, all packing should be kept within a distance of not more than 6 yd. from the face. Haulageroads should not be more than 30 yd. apart.

Signs, warning of danger, or suggesting correct mining practices, printed in different languages, and hung in conspicuous places in the mines, boiler rooms, pump rooms, and at the entrance of the mines are silent reminders of ever present danger which confront the ignorant or careless workman who is responsible for the high death rate of the American mines.

The reason that explosions in bituminous mines are more apt to occur in late fall and winter than any other season, is because the mines are drier in winter. Cool air contains less moisture than warm air, the warmth of the mine raises the temperature of the entering, cold, winter air, and as the air becomes warm, it absorbes water, thus taking up the moisture and depositing it outside.

In gaseous mines, where the system of ventilation is of the utmost importance, remember that the longwall system of mining greatly simplifies ventilation, as most of the air passes along the working faces in one continuous current, diluting the gases as they are given off. The absence of sharp turns and narrow passages reduces resistance and hence increases the efficiency of the ventilation.

The importance of immediately investigating the appearance of smoke in a mine is well illustrated in the Delagua, Colo., mine fire. Smoke was noticed in the return end of the crosscut, but the driver who first saw it did not stop to investigate; had he done so the lives of 79 men who perished might have been saved. Impress on all underground employees, the importance of instantly investigating the slightest indication of fire.

Calcium chloride is vastly superior to common salt for the treatment of dust on roadways or in rooms, as salt itself has no affinity for moisture, although the small amount of magnesium chloride contained in it attracts a slight amount of moisture, which is thrown off at every small rise in temperature above normal. On the other hand, calcium chloride holds moisture tenaciously even at a temperature above 350 deg. F. It is used in the tube system of New York City to reduce the dust and moisture.

Locked gates, placed at the ends of switchboards carrying high-potential lines, will prevent accidents, due to persons coming in contact with the uncovered conductors at the rear of the board. Rubber mats placed in front of switchboards are a means of preventing possible accidents. All mine transformer stations should be surrounded by a strong fence. If the transformers are placed on a platform above the ground, the danger of shock, from coming in contact with a high-tension wire will be eliminated.

Engine rooms should be equipped with water taps located at the intake opening near the sheave wheel. Such taps so located would be of inestimable value in case of engine-room fires. In order to overcome the strong drafts that often pass through engine rooms and fan slight fires into disastrous conflagrations, a door should be erected in the cross heading which connects the engine room with the passing branch. During the absence of the engineers from the engine room this door should be kept closed.

Experiments made at Pittsburg show that ordinarily, coal dust to be explosive must have originated from coal containing at least 10 per cent. of volatile matter. Dusts with a high percentage of volatile matter, other things being equal, are more sensitive than dusts derived from low-volatile coals. With coals that do not easily yield their gases, large intense flames are necessary to start an explosion. Experiments made by M. Taffanel have clearly shown that anthracite coal dust will not spread an explosion, which fact seems to prove that it is the volatile portion of the dust and not the fixed carbon present which spreads explosions.

Figures, issued by the Federal department of commerce and labor, state that coal mining in North America, in the 20 years from 1888 to 1908, resulted in the loss of 29,293 lives or 3.11 for each 1000 men employed. From 1896 to 1906 the average death rate, due to accidents in the coal mines of North America was 3.13 per 1000 men. During this same time the rate in the United Kingdom was 1.29; in France, 1.81; in Austria, 1.35; In Prussia, 2.13. The yearly average of fatal accidents in the entire North American coalfield has been about 3000 persons. In 1908, 567 persons out of the total 171,185 employees of the anthracite mines were killed. From 1896 to 1908, 46.6 per cent. of all coal-mine accidents in North America were due to roof falls, 25.2 per cent. were due to explosions and 12 per cent. were due to mine cars. During 1908, 10 children of 15, 14 and 13 years of age were killed in or about coal mines.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

W. Va. Fireboss Questions

Handling Mine Gases

Ques.—(a) Which is the most difficult to remove from the mine—firedamp or blackdamp? (b) Why is this? (c) Which, in your opinion, is the most difficult gas to contend with in mining? Explain fully.

Ans.—(a) This depends on the density of the gas with respect to its location in the mine. Blackdamp (carbon dioxide) is most difficult to remove from dip workings, and marsh gas is most difficult to dislodge from high falls or the face of a steep pitch. (b) Because the heavier blackdamp tends to fall back down the dip nearly as fast as the air-current can remove it; and, likewise, the lighter firedamp (marsh gas and air) tends to rise on steep pitches and high falls almost as quickly as the current can dislodge it. A strong current well directed by temporary brattice is required, in each case, to sweep away the gas. (c) The most difficult gas to contend with in mining practice, when it is present, is carbon monoxide (whitedamp); because it may be present in dangerous quantity, and its presence not be suspected before it has produced fatal effect.

Explosive Mine Gases

Ques.—(a) Name and describe the explosive gases usually found in coal mines. (b) Under what conditions do they become explosive and nonexplosive? (c) How are they generated in mines? (d) Where are they generally found and how can they be expelled from the workings? (e) What effect have these gases on the health and safety of the workmen?

Ans.—(a) The explosive gases found in coal mines are marsh gas, carbon monoxide, and sulphureted hydrogen. (b) These gases become explosive when mixed with air in the proper proportions; the explosive mixture, however, is rendered nonexplosive by the addition of sufficient quantities of such extinctive gases as nitrogen or carbon dioxide. Carbon monoxide is also nonexplosive in the absence of moisture (dry air). (c) Marsh gas issues from the pores of the coal and contiguous strata, in mines where it exists as an occluded gas. Carbon monoxide is produced by the combustion of carbon, in any form, in a limited supply of air, which makes the combustion incomplete; it is also formed, in some mine explosions, by the reduction of carbon dioxide in presence of incandescent carbon or coal dust. Sulphureted hydrogen is formed in mines by the action of the air and water on the iron pyrites (sulphur balls) in some coal, or is liberated from mine water containing sulphur. (d) The several mine gases are found in those parts of the mine where they are generated in considerable quantities, or where they accumulate by reason of their density with respect to air. Marsh gas is formed in largest quantity in new workings and freshly exposed faces of coal, or on the falls in abandoned workings, and in rise workings or at the face of steep pitches. Carbon monoxide is formed in abandoned workings and poorly ventilated places where slow combustion is in progress, or shots have been recently fired. Sulphureted hydrogen is formed mostly in low, moist places or swamps where the coal contains much sulphur, and in the region of drainage sumps or pump lines. All these gases are removed from the mine by an ample and well distributed air-current. (e) Pure marsh gas suffocates by excluding oxygen from the lungs, but when diluted sufficiently with air, it produces no ill effects. Carbon monoxide and sulphureted hydrogen are both extremely poisonous, but fortunately do not often occur, in mines, in quantities to prove dangerous.

Interesting Questions

Duties of a Mine Foreman

Ques.—What are the duties, in general, of a mine foreman?

Ans.—The duties of the mine forman are to devote his entire time to the supervision of the operation of the mine of which he has charge; to personally direct every branch of the work; hire and discharge the workmen; inspect daily all ventilating, hoisting, haulage and pumping or drainage machinery and appliances. To inspect personally, at least each alternate day, as far as possible, all working places, airways, roads and travelingways in the mine, and make the necessary air measurements to determine that the required quantity of air is passing in each split; to remove, or cause to be removed, all dangers as quickly as such are reported to him or found to exist in or around the mine. In case such danger cannot be promptly removed, it is the duty of the mine foreman to see that suitable danger signals are placed in conspicuous places so as to warn all persons of the danger; or, if necessary, to withdraw the men whose lives or health would be endangered. In case of serious accident to workmen, the mine foreman must attend to their prompt rescue and removal, and see that the injured receive proper first-aid treatment and care till medical help arrives. He must report such accidents to the district mine inspector, attend all inquests, and give the testimony required.

Hangfires in Electric Blasting

Ques.—Explain the three conditions that may cause a shot to hang fire in electric blasting in mines.

Ans.—Hangfires are less frequent in electric blasting than in blasting with fuse. They have occurred, however, with fatal results in many instances. There are different kinds of electrical fuses, chiefly classified as (a) *low-tension* fuses, in which the two terminals embedded in the exploding cap are connected by a metallic bridge of fine wire; (b) *high-tension* fuses, in which the terminals are bridged by a combustible having a conductivity such as to produce a somewhat high electrical resistance. It is possible when no detonator is used to explode the cartridge, that a hangfire may occur, owing to the powder being damp.

A misfire may result from the detonator not being of sufficient strength to explode the charge; and this may even cause a hangfire if the explosion of the cap has set up a deflagration of the dynamite, which may shortly detonate the charge. The same deflagration, followed by the detonation of the charge, may result from a damp, or poorly mixed, or insufficient priming. Bad electrical connections may delay the explosion by allowing the passage of a current of too feeble intensity, generating only heat enough to warm the bridge, and requiring a longer time to explode the charge.

The three conditions that may cause a shot to hang fire may be stated, therefore, as follows: (1) The powder used in the primer may be sufficiently damp to smolder or burn slowly. (2) The cap used to detonate the charge may be of insufficient strength. (3) Poor electrical connections may allow of the passage of a too-feeble current.

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

Y. M. C. A. Progress in the Bituminous Coalfields

It is now a little over nine years since the State Y. M. C. A. of Pennsylvania sent C. L. Fay into the bituminous coalfield to organize the Y. M. C. A. work. Greensburg was chosen as headquarters from which to launch this new enterprise. From the very beginning it met with hearty and immediate response upon the part of most of the operators and the men.

At first the volunteer form of organization was adopted, and 25 or more of these associations carried on a creditable work, the stronger ones finally developing into regular or secretarial associations. Among these were Greensburg, Punxsutawney, Latrobe, Monongahela, Ebensburg, Somerset, Myersdale, Export, South Fork, Patton, Barnesboro, Fayette City, Winburne, Philipsburg and Windber.

New Buildings

Some of these associations now own their own buildings or have the money with which to erect them. The plant of the association at Punxsutawney is valued at $50,000, Ebensburg, $35,000, Fayette City, $12,000, while Greensburg has had a bequest left to it of approximately $200,000. Indiana and Scottdale have recently conducted campaigns, securing $50,000 each. The Latrobe and the Monongahela associations are looking forward to the time in the near future when they will also have their own buildings. In the last nine years Connellsville, Washington, Du Bois and Clearfield secured their own buildings and Uniontown has a fund subscribed for a large building to be erected in the near future.

At the time the mining department was organized, none of the associations in this field were attempting any work for the miners. But today there is hardly an association in the whole bituminous coalfield that does not include in its program some special work among the mining population. Among these are Pittsburg Central, Johnstown and Washington.

Mining Classes and Institutes

The bituminous committee, through its secretaries, is reaching scores of smaller towns, where no large buildings have been erected or even association rooms provided. This is done by organizing mining classes and mining institutes, which meet in the school houses or hall or some place provided by the coal companies. It would not be overestimating if we were to say that no less than 600 men hold certificates today as a result of the classes organized through the help of the mining department of the State Y. M. C. A. Hundreds more have been greatly benefited and helped through the annual and monthly institutes. Some of the best papers that have come to our notice in recent years had been prepared and read by members of the Y. M. C. A. mining institutes.

Hundreds of non-English speaking men have been gathered into classes and taught English by means of the Doctor Roberts system. What this has meant to the individuals themselves and to the whole mining fraternity will never be fully written. For who can tell what new ideas, ambitions and resolutions have been let loose in the minds and souls of these honest, industrious, hard-working foreign miners.

First Aid

Take the first-aid work. In 1907, the Latrobe association began a regular monthly series of first-aid lectures, followed by demonstrations. Then they became a regular part of the monthly program in the local mining institutes. The mining department of the State Y. M. C. A. was, therefore, the pioneer of first aid in the bituminous coalfield. It paved the way and made possible the now sweeping interest in this humanitarian work so forcibly signalized at the first-aid demonstration at Forbes field, Oct. 31, 1911, by the Bureau of Mines and the other coöperating agencies.

Banquet of Wilkes-Barre Mining Institute

The present board of management is composed of John M. Jamison, Greensburg, Penn., chairman; L. C. Walkinshaw, Greensburg, Penn., recording secretary; Fridolin Miller, Greensburg, Penn., treasurer; other members are: George F. Huff, Greensburg; J. C. Stineman, South Fork; L. B. Huff, Greensburg; E. M. Gross, Greensburg; E. S. Wallace, Pittsburg; Austin Blakeslee, Du Bois; R. H. Jamison, Greensburg; A. P. Cameron, Irwin; F. C. Keighley, Uniontown; F. R. Lyon, Somerset; A. W. Calloway, Punxsutawney; F. M. Semans, Jr., Uniontown; W. W. Keefer; Pittsburg; W. R. Cal-

verly, Windber; Thomas B. Dilts, Greensburg, and E. E. Bach, field secretary, Uniontown, Pennsylvania.

Every coal company, every individual connected with coal mining, as well as everyone interested in the welfare of humanity in general, ought to encourage this unselfish and unexploited form of social service.

The Company House

The words of an acquaintance occur to me in this connection: "I arrange always to be in debt, so as to stimulate steadiness and frugality. When I can make a first payment on a bond or a house I do so, knowing that the instinct to save what I have will prompt me to prepare for the following instalments." He was a quiet man, no roisterer nor slave to social pleasures, probably as well known as any mining man in the anthracite region; but while it was true of him that debt steadied and balanced him, it is even more true of men of wild habits who are lacking in self control.

The company house in the company village, with company streets and a company store, does not furnish the needed opportunity for the expenditure of money in desirable ways. The man, who can buy no land, who can build no house, who expects to move any day, has no incentive to buy except to gratify the impulses of the moment. In fact, to him money loses much of its real value. He desires to get away, if only for a day from that undesirable place. He does not call it a home.

The Problem of the Company House Is an Open One

It must be confessed that it is a problem what the coal corporations can do toward the housing problem; if the companies build their own dwellings, the men are listless and their work is irregular; if the company waits for the town to grow, the increment of tonnage is painfully slow and the profit distressingly small.

On the whole it does seem that the better plan where there is a village nearby is to put the money often spent in company houses into the plant. Or again it is better where good rates can be secured to haul the men at a low figure several miles over the railroad to their work as the Consolidation Coal Company is doing at some mines in Maryland. The advantages of life in the larger villages, in no "one man's town," are always appreciated and preferred to life in the company town. In the neighborhood of Sligo, Rimersburg, Oak Ridge, New Bethlehem, Du Bois and Reynoldsville, Penn., to mention a few instances coming readily to mind, men frequently travel three miles, to and from their work, solely because life in those larger villages appeals to them. Some walk, some drive. In the last two cases mentioned, longer journeys, yet, are made on street cars.

The incentive to save, to form part of a self-made, self-advancing community provokes sobriety, steadiness and frugality. The presence of sober, steady, frugal men is a nucleus around which others of like kind can be gathered.

The Difficulties Surrounding the Company Town

The dominant note of the company town is coercion. It is not the dominant note so much because of the frailty of the operator but because coercion becomes almost necessary under the conditions obtaining. He must, for the safety and success of the community, keep out speakeasies and questionable characters. He must assume that dominance which inevitably arises from keeping, in close propinquity to his operations, the men to be employed therein. Moreover, the landlord must to a degree supervise the actions of the tenants in his houses and on his property.

His difficulty resembles in many ways the still unsolved domestic problem. The best workers refuse domestic service because it involves a dominance in matters which the individual regards as his inalienable personal rights; the householder must, however, retain such dominance because of the close personal association resulting from such service. If a town is built it must be policed in some sense by the operator, and when it is so governed, it is a corporation town and in some ways not desirable.

Difficulties Resulting from the Sale of Small Holdings

It is possible to build a town and sell lots around it with restrictions on the sale of liquor, but these restrictions, as far as speakeasies are concerned, are largely inoperative. A freeholder cannot be ordered out like a thirty-day tenant and a case against a man running a speakeasy for foreigners only, is hard to prove. Moreover, the company consenting to sell lots is then suspected of desiring to sell them and of discrimination in apportioning work to purchasing leaseholders and, even if discrimination is not desired, the denunciations of the company by a purchasing leaseholder on his discharge would be reëchoed by the nonpurchasers till discrimination unfailingly resulted.

And if the corporation builds a little town and lets others sell to the company employees, the corporation may be hampered in future unforeseen development; the presence of speakeasies and saloons may embarrass its operations and the time may come when the preference for

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J. H. Dague, Director Association of Scranton

noncorporational houses, shanties or huts, may make the company regret it ever built a single tenement. To keep its tenements full, discrimination naturally results.

On the whole, it seems that, whether saloons are few or many, speakeasies thriving or nonexistent, despite the discouragements of hampered development, the company usually gains by not dabbling too freely into the private life of its employees, even in the most disinterested ways. The best of men dread the eye which follows them night and day.

Anthracite First-aid Teams in Competition at Shamokin, Penn.

Labor and Wages

The most interesting question in connection with employment of labor is whether or not wages are increasing. A man may receive today \$20 for a week's work, with prices of food and commodities high. The same workman 20 years ago receiving \$15 per week, with low prices, might have fared better, so far as the general purchasing power of his earnings is concerned. Another point to be considered in the wage question is the "lost time" of workmen. A man who receives \$5 per day and works half of the time is only a little better off than the workman who is employed full time at half the wage. Such modifications of the wage question have greatly puzzled economists and statisticians in their efforts to ascertain and compare average wages today with earnings of workmen in the same industries years ago.

The percentage of increase of wages in general, from 1860 to 1891 is shown by the report of the Senate Committee on Finance, the wages for 1860 being considered as normal, or 100. On this basis, wages in 1840 stood at 87.7, 100 in 1860, 152.4 in 1866, 160.7 in 1891. Since 1891 there has been a steady increase so that at the present time the average of wages for all occupations is higher than at any time in the history of this country. It is also true that since 1860, the hours of labor have been reduced 10 per cent.

The workingman today demands not only the necessities of life, but something beyond,—a surplus which shall go to the support of his spiritual nature; that is, not merely sufficient food, a dwelling and a variety of clothing, but opportunities for reading, amusement, recreation and, above all, a better chance for his children. He desires to surround himself not only with necessities and conveniences, but demands a fair proportion of the luxuries of life; and every right-minded person must admit that this modern demand of labor is a proper contention.

The assumption of the present-day workman that he is more than a human machine is based on the soundest of democratic principles; the resulting change that is gradually taking place is sure to make wage-earners (skilled and unskilled) more valuable and intelligent citizens.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Strength of Stoppings

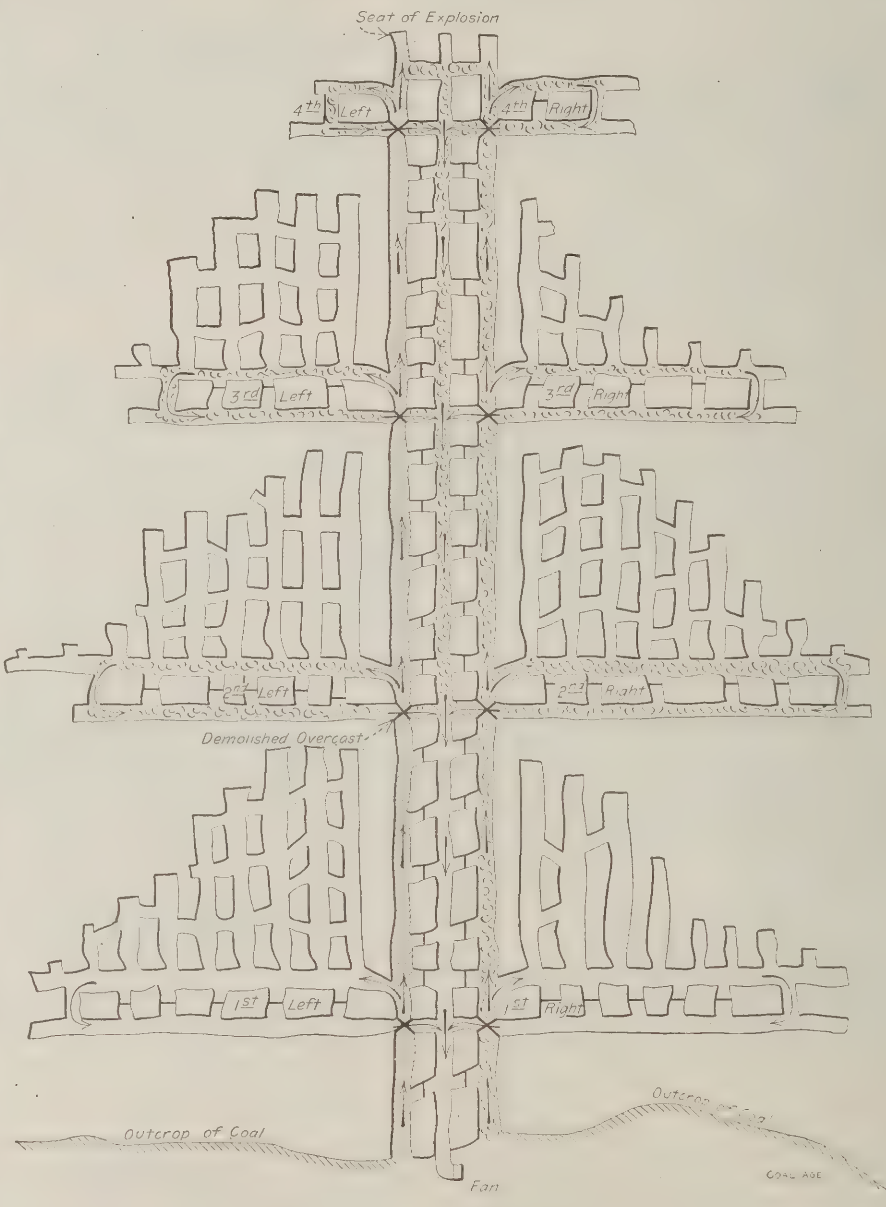
M. Taffanel, the French coal expert, makes the statement that explosions travel more frequently by intake airways than by returns and the Bureau of Mines asserts that the most usual direction of an explosion is toward the intake. I desire to point out later how apparent exceptions may possibly be regarded as mere exemplifications of the rule they appear to refute.

In the accompanying diagram of a mine in which the headings are enlarged, the arrows show the course of the air in circulation before the explosion. I have shown the seat of an explosion as the end of the left-hand face heading. The explosion is in a split of comparative unimportance so that the case is somewhat extreme, but the principle is not affected by that fact. The blast of exploding gases will pass out along the gallery from end to end, opposing the intake air and being prevented from entering the other airways. The causes, preventing the entrance to other airways, are two. At the mouths of some headings, the resistance of the stoppings is the excluding factor, at others the air is receeding from the blast, which for that reason shows only a moderate desire to enter. The blast regards the latter as returns and not intakes. In the sketch the airway affected by the blast is hatched with fine diagonal lines.

A Return May Appear to an Explosion as an Intake

What results if an overcast or a stopping blows out? Let us suppose an airbridge blows down at the 2d Left. Immediately the explosion meets the return air current at the overcast and regards it as an intake, for it is an approaching current. The whole of 2d Left is involved and that fact is indicated by the volumes of smoke curling therein in the illustration.

But as the overcast is completely demolished the explosion can travel toward the return airway. It does not *prefer* to do so, according to the best authorities, but it does so travel for a short distance. Here the distance is about 50 ft., certainly not enough to reduce appreciably the explosive force. Reaching the return, it cannot pass far to the right because the air is receeding, but on the left the return air is approaching and the explosion views it as an intake and runs back with increasing violence perhaps to the airways from the 3d and 4th Left and 3d and 4th Right. It has previously faced, of course, the return of 2d Right. The explosion spreads up the returns and then up the intake airways of all these headings because in all, the air current is contrary in every case to the blast's forward motion. In the illustration they are shown full of smoke. To make the illustration plain, the smoke has been confined to those headings where the blast opposes the air current, but as a matter of fact it will spread somewhat beyond those limits.



Suggested Course of an Explosion which Opposes Intake

And these considerations may well justify the belief that airways are sometimes affected by two or more explosions of contrary sign. Not only may explosions in embryo create more violent explosions at foci along their path, creating backward blasts over already traversed areas, but the explosion may travel around a circuit and arrive on a crossing of its former path and spread the débris anew so as to make the ascertainment of the initial focus well nigh impossible.

The principal value of strong stoppings is the fact that they preserve in-

violate the integrity of splits and so prevent the extension of an explosion. Had none of the stoppings blown out it is probable that the hypothetic explosion would have been less general and involved little more than the main-left gangway; it is certain the main-right gangway could not have been affected.

It is frequently thought that the value of a strong stopping is the probability of its preservation through the catastrophe to aid in rescue work.

But there are periods after an explosion when the safety of the men in the mine may be actually jeopardized by ventilation. It was the lack of ventilation which proved the one source of hope to some of the men entombed in the Cherry mine. Stagnant air was better to them than the air actually circulating. It must not be thought that if it were not for their help in reducing the area covered by an explosion, I would advocate weak stoppings, but I would point out that their main value is their power to fence around a blast so as to keep its devastation from involving the whole mine.

I hope you will publish this article despite the fact that it views the statement that the "air travels back on the intake" in the sense that it opposes the approaching air current. This is not the view, apparently, which is favored by the Bureau of Mines. George S. Rice leans at present to the opinion that the relative dampness of intake and return airways determines the direction of the explosive action. M. Taffanel gives no approval to any of the proposed determining factors. While not desiring to elaborate on the question, I favor the view that the direction of the air current is the main determinant of the direction of action of the explosion and that the chemical constituents of the air and the condition of the airways are but secondary considerations.

F. A. Boag.

Indianapolis, Ind.

What Constitutes a Good Air Current?

I note in the first issue, the reference of Francis N. Goff to the fact that "Advocates of unsplit air-currents are influenced too much by the brisk breezes of air, which are used in continuous current mines." The statement is justified, I think, by the experience of many mine managers.

I recall a superintendent of long experience who related with gusto, a story illustrative of the tendency to judge the strength and gage the value of an air current merely by its "feel," if I may so express it. Some of his men were loafing in a bar room and overheard the conversation of an Irish miner, who was busily discussing the superintendent's many demerits and incapabilities. Among other things he said:

"Oi had driv' a bit br—reast forninst a counter. The owld man come aroun' an towld me to make a bit ov a hole to pass the air through the pillar. I druv' the hole and the dr—raft was that bad it 'ud blow the cap aff yer head. The owld man kep' a comin' in, and tellin' me to 'Widen 'er out!' When Oi had it six fate wide and coal high, he towld me 'Alright,' but divil-a-bit of air was goin' through. You couldn't see it on your light at all, and he call himself a minin' boss."

J. G. Timpson.

New York City.

Burns from Firedamp

Some time ago at No. 7 pit, Netherton colliery, Dudley, in England, an explosion occurred, in which five men received injuries. Two of these men died later, and at the customary inquiry into the cause of death, a new and possibly important medical theory was advanced by Doctor Paddom, senior house surgeon at the Guest hospital.

The names of the deceased miners were White and Ball, and the doctor said White would not, in all probability, have died from the effects of the burns if he had not had a serious illness before the accident, which rendered him a weakling. Ball, however, was a strong man, and in his case there was no scorching of the hair or charring of the flesh. There were simply large burns, due to great heat. Ball and White had sufficiently recovered from the burns to have some of their dressings removed, and they were considered to have passed the dangerous stage, so far as shock was concerned. In neither case was a fatal issue expected.

These were the circumstances, and Doctor Paddom gave it as his opinion, and also that of a medical man of far greater experience than himself, that there was something more than the severity of the burns to account for death.

Naturally, underground life might lower the powers of resistance of miners as a class, so that they have not the reserve fund of strength of men living in the open air; but the doctor was not justified in stating that this possibility might have operated in accelerating the death of Ball. In both cases there was evidence of the men being adversely affected by something more than their burns, and Doctor Paddom believed there was, at least in the nature of the explosion, something poisonous, which acted adversely to their chances of recovery. The doctor certainly did not expect a strong man to perish so long after the burns were inflicted, and while unable to say whether it was possible for the poisoning to have been caused by firedamp, he certainly thought a toxicologist should make investigations in Ball's case. The jury in returning the verdict added a rider, adopting the latter suggestion.

R. L. Lawrence.

Bristol, England.

[Our correspondent unfortunately neglected to give sufficient details to make the matter clear. There are a number of causes to which death under these conditions might be attributed: Gas poisoning, as suggested, the gas being carbon monoxide, resulting from combustion of the firedamp; second, shock which may be likened to heart failure, and third, the inhalation of flame. We would like to hear from any reader who may know of such a delayed death from a like accident. A statement of the causes to which death was attributed would be valuable.—Editor.]

Advocating Reduced Splitting

The effect of heated and moist air on human endurance is more marked than that of air containing 3 or 4 per cent. of carbon dioxide, even when produced by human exhalations and containing all their foul products. Leonard Hill has repeated the well known experiment by Doctor Haldane, of shutting men in an air-tight chamber. They experienced no distress so long as the heat and moisture were kept normal and the air moving.

I would like to call your attention to the bearing of this fact on the splitting of air, which was discussed in your first issue. A slow air-current in the mines always means excess warmth and a lack of due evaporation from the human body and is, therefore, to be condemned.

Hill even recommended, at the September meeting of the British Association, the use of stirring-up fans in submarine tunnel work, suggesting that it would agitate the inclosed air in a place where it was difficult to provide sufficient ventilation from outside owing to the extremely high pressures at which the work had to be conducted.

He stated, quoting the *Colliery Guardian*, "that the warm moist atmosphere brought much blood into the skin and depleted the viscera which perfected the blood and robbed the brain of ample flow." The human body demands air movement and it is also necessary to produce the proper admixture of gases in the mines; diffusion failing to produce that admixture adequately.

G. E. Algernon.

Chicago, Ill.

If all hoisting drums were surrounded by good stout railings many accidents might be prevented. If thin board partitions with canvas tops reaching to the rafters of the hoisting room are placed between the hoisting drum and the engineer, the particles of dust given off by the hoisting ropes cannot find a lodgment in the engineer's eyes and the danger of overwinding will be greatly reduced.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

Inspection of Yellow Pine

I am receiving a large quantity of yellow-pine lumber for construction work and find the requisitions call for "merchantable inspection." Will you please tell me exactly what this means?

FOREMAN.

The 1905 rules of the North Carolina Pine Association, Inc., which are generally adopted, and in use, read as follows in regard to merchantable inspection. All sizes under 9 in. shall show some heart for the entire length on one side. All sizes 9 in. and over, shall show some heart for the entire length on two opposite sides. Wane may be allowed to cover one-eighth of the width of the piece, measured across the face of the wane, and extending one-fourth of the length of the piece on one corner, or its equivalent on two or more corners; provided, that not over 10 per cent. of the pieces of any one size shall show such wane.

"Heart" means wood from the heart of the tree; it contains the least amount of resin or sap in the pores and is stronger and more durable than sap wood. "Wane" means bark, or lack of wood for any reason, on the corners of the timber.

Energy Lost on Climbing Grade

If a trip, which will just run by gravity on a grade of 1.5 per cent. be landed at the head of a plane at 10 miles per hour on to an up-grade of 0.5 per cent., how far will the trip travel? R. F. B.

The resistance the trip would make on an even grade to motion would be $1\frac{1}{2}$ per cent. of its weight. On a 0.5 per cent. up-grade it would require a pull $= 1\frac{1}{2} + \frac{1}{2} = 2$ per cent. of its weight. Hence the force acting against the trip of which the weight is $W = W \times 0.02$. The energy this force would exert in a distance of s ft. would be $W \times 0.02 \times s$. The cars would lose this energy, continuing to run until it was all expended.

A speed of 10 miles an hour $= \frac{10 \times 5280}{60 \times 60} = \frac{44}{3}$ ft. per sec. The stored energy in the cars = ½ mass × velocity squared.

$$Mass = \frac{weight}{32.2} = \frac{W}{32.2}.$$

Therefore,

$$Stored\ energy = \frac{1}{2} \times \frac{W}{32.2} \times \left(\frac{44}{3}\right)^2 = W \times 3.34.$$

But the energy lost by the cars equals the stored energy when the trip is stalled. Hence,

$$W \times 0.02 \times s = 3.34\ W.$$

Canceling W,

$$s = \frac{3.34}{0.02} = 167\ ft.$$

The cars would run 167 ft. at which time all the stored energy would be expended.

An Inside Pumping Problem

I have a shaft mine with workings in two seams. At present the water from the upper seam runs to a large pump in the lower vein, but I want to send it from the upper vein directly to the surface. The lift will be 225 ft. and I find that a sump about 10x10x8 ft. fills in 12 min. What size pump will I require? R. P. K.

A sump 10x10x8 ft. holds 800 cu.ft., and since it fills in 12 min., there is an inflow of $\frac{800}{12} = 66\frac{2}{3}$ cu.ft. per min. For convenience and an added element of safety, it will be assumed that the inflow per minute is 75 cu.ft.

To determine the required size of pump let:

A = Area in sq.in. of water piston or plunger.
D = Diameter in inches of water piston or plunger.
A_1 = Area in sq.in. of steam piston.
D_1 = Diameter in inches of steam piston.
S = Piston speed in ft. per min.
P = Water pressure in lb. per sq.in.
P_1 = Steam pressure in pounds per sq.in.

The piston speed S, that is, the number of feet that the piston travels back and forth in a minute is usually taken to be 100 ft. per min., for medium-sized pumps. Using this value, the amount theoretically discharged by the pump piston each minute is.

$$100 \times \frac{A}{144}\ cu.ft.,$$

as a matter of fact, however, the actual discharge will usually be about ¾ of that amount because some water always slips past the piston and valves or otherwise leaks. Thus placing $\frac{3}{4} \times \frac{100\,A}{144}$, equal to 75 cu.ft. (the required amount), enables the value of A to be determined as follows:

$$\frac{3 \times 100 \times A}{4 \times 144} = 75,$$

$$A = 144\ sq.in.,$$

and the diameter

$$D = \sqrt{\frac{A}{0.7854}} = 13\tfrac{1}{2}\ in.$$

The hight of the column of water against which this pump has to work is 225 ft. + 10 ft. = 235 ft., 10 ft. being the probable hight of lift in the suction pipe should the sump run nearly dry.

The pressure resisting the motion of the pump piston is, therefore, theoretically $235 \times 0.433 = 101.75$ lb. per square inch where 0.433 lb. is the weight of a column of water 1 in. square and 1 ft. high. Friction in the pipes and at the valves, however, will probably increase this amount by 20 per cent. so that 125 lb. per sq.in. may reasonably be taken for the pressure.

The steam pressure carried at the boiler house will, lacking definite information, be assumed to be 100 lb. per sq.in. Probably 80 lb. per sq.in. is all that can be expected down at the pump and although small and medium-sized pumps do not as a rule use steam expansively, an average or mean effective pressure in the cylinder of 60 lb. per sq. in. is all that can safely be counted on. The total pressure against the steam piston has to balance the total pressure against the water piston, overcome the mechanical friction of the pump and also provide a surplus for starting up under load.

A fair allowance for the last two items is 20 per cent. of the whole. Then of the total pressure A_1P_1 exerted against the steam piston 8/10 A_1P_1 is the portion which can be relied on to balance the water column. Therefore, 8/10 $A_1P_1 = A\,P$ and substituting the values of P, P_1 and A

$$\frac{8 \times A_1 \times 60}{10} = 125 \times 144,$$

from which $A_1 = 375$ sq.in. and

$$D_1 = \sqrt{\frac{A_1}{0.7854}} = 22\ in.$$

These figures would indicate a simple double-acting pump having a 22-in. diameter steam cylinder and a 14-in. diameter water piston or plunger. The length of stroke would be determined by the design and proportions of the pump in accordance with manufacturing standards;

it would probably be between 14 and 18 in. but within certain limits the exact value is immaterial.

A pump of this type and size, 22x14x18 in., is, however, rather unwieldy and also likely to be wasteful of steam. A duplex pump, consisting of two smaller single pumps would undoubtedly give better results, in economy, regularity of flow, and facility in starting up.

To determine the size of such a pump, it is only necessary to find the diameter of two water and two steam pistons, the combined area of which will be equal, respectively, to the water and the steam pistons of the simple pump. Let d be the diameter of the water piston and d_1 of the steam pistons, then

$$d = \sqrt{\frac{A}{2} \div 0.7854} \text{ and } d_1 = \sqrt{\frac{A_1}{2} \div 0.7854}$$

or $d = 9\frac{1}{2}$ in. and $d_1 = 15\frac{1}{2}$ in. These figures indicate a duplex pump having 16 in. diam. steam cylinders and 10-in. diam. water pistons or plungers. As before, the exact value of the stroke is immaterial but would probably be about 12 inches.

The cost of briquetting in France, is placed at from 24 to 40c. per ton; in Germany, from 22 to 24c. per ton; in England, it is stated to be 24c. per ton. The Bureau of Mines gives the following estimate of the cost of manufacturing briquets in this country.

	Western States	Eastern States
Labor, including stacking...	$0.16	$0.20
Oil and grease..............	0.006	0.01
Sundry stores	0.01	0.01
Steam (fuel)	0.04	0.17
Depreciation	0.05	0.10
	$0.266	$0.49

Indications of Fracture

How can you tell where a bone is fractured?

FIRST-AID STUDENT.

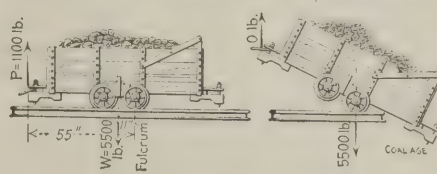
It is not always easy to tell that there is a fracture of a bone. But it is important to know, so that the fracture may not be followed by a cutting of the flesh while handling the patient. The indications are as follows: 1. The patient feels pain at that particular point and the point hurts when touched. But this is true of other forms of injury. 2. The broken ends of the bone may be felt. 3. The significant "crepitus" or rubbing of one part against the other may be heard. 4. The part may be altered in shape or shortened. 5. There may be unusual movement at the place where fracture occurs. The muscles acting on the bones under natural conditions are like ropes acting on a steel or wood structure. They cannot control the part of the body where a fracture has taken place, because the stiff part on which they act has collapsed. 6. Some inequality may be felt as you run your finger along the skin covering the broken bone. This will be more apparent soon after fracture, because swelling does not immediately arise to disguise it.

Rock Dumping with Gallows Dump

A car weighing 1500 lb. is loaded with 4000 lb. of rock, in a symmetrical manner, so that the vertical through the center of gravity falls midway between the axles when the car is level. The axles on the car are 22 in. apart between centers and the distance from the center line of the front axle to the point of attachment of the hook at the rear of the car is 4 ft. 7 in. It is purposed to tilt the car by pulling upward on the rear end of the draw bar by a chain maintained in a vertical line. What must be the pull on the tilting chain?

B. M. C.

The fulcrum or revolving center, on which the car is tilted, is the axle of the front wheels. The lifting force (P lb.) is situated 4 ft. 7 in. or 55 in. from that axle. The moment or leverage of $P = P \times 55$ expressed in inch-pounds.



UNLOADING A CAR OF ROCN

The weight of the car is 5500 ib., and its moment or leverage is $5500 \times$ half the distance between the axles, or 5500×11 in inch-pounds.

These leverages are equal when the car is about to move; that is, $P \times 55 = 5500 \times 11$, wherefore $P = 1100$ lb. It will be necessary for a lift of a little over 1100 lb. to be induced in the tilting chain in order that the car may be lifted.

The second figure illustrating this answer shows that by reason of the fulcrum, the load and point of attachment of the chain not being in one straight line, a little tilting of the car makes a great change in the lift required, even without any accompanying spilling of rock through the door or over it. The center of gravity of the car is high, and a tilt of 25 deg. in this case has made the load line, dropped from the center of gravity of the car, pass through the front axle; so that it no longer has any moment or leverage. It is not necessary under these conditions for the lift to have any moment and so P can be made zero. The car is balanced.

Example—In a similar case to the above, let the wheel base be 18 in. and the distance from the front axle to the rear hook 4 ft. 6 in. If the car weighs 5400 lb., what pull on the chain attached to the draw bar will upend the car?

Answer—900 pounds.

Grade on Rock Dump

We have been having trouble with our rock dump. We have read somewhere that the best grade for a road was 1.5 per cent. That is the grade we put in and now we find that occasionally the cars run without pushing toward the dump and are quite hard to push back; what grade should we have installed?

As the cars just run without pushing at 1.5 per cent., that shows that the resistance of the car to motion is 1.5 per cent. of its weight. Let us suppose your car weighs 1500 lb. and is loaded with 8000 lb. of rock. Then the resistance of the loaded car to motion, as it approaches the dump, which is the same as the frictional resistance on a level, is 9500×0.015 lb. $= 142.5$ lb. The gradient being x ft. per foot, the gravity impulse urging the car forward is $9500 \times x$. Therefore, the push demanded from the rock dumper must be the difference between the resistance of the car to motion and the gravity impulse helping it forward $= 142.5 - 9500 \times x$ *pounds*.

On returning the empty car the frictional resistance to motion $= 1500 \times 0.015 = 22.5$ lb. The resistance afforded by the car against its rising on the upgrade $= 1500 \times x$. The rock dumper has to combat both these resistances or give a push $= 22.5 + 1500\ x$.

Assuming that he can push in both directions with equal facility, the impulse will be the same in each direction.

That is,

$$22.5 + 1500\,x = 142.5 - 9500\,x$$
$$1500\,x + 9500\,x = 142.5 - 22.5$$
$$11{,}000\,x = 120$$
$$x = 0.010909$$

The grade should be 1.0909 per cent., say 1.1 per cent. instead of 1.5 per cent.

Heating Value of a Briquet

What advantage results from briquetting a coal that has a low heat value?

L. B. F.

The heating value of a briquet equals the heat units of the coal used plus the heat units contained in the binder. The heat value of organic binders is as great or greater than that of the coal used, hence they add slightly to the heating value of the briquet. Briquetting slack that is not especially high in heating value, permits a more complete combustion, and causes the coal to yield, weight for weight, an increased heating value. Anthracite slack is successfully briquetted in several localities.

If briquets crack in the process of manufacture the chances are that the right proportion of binder is not being used, the mixing is imperfect, or the compression is either insufficient or applied while the mixture is too wet.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

Chairman Graham, of the House committee which is investigating the Alaska coal-land situation, will return to Washington within a few days and the investigating committee will be reconvened almost immediately. Hearings will be resumed at once and it is expected that Secretary Fisher and Director Holmes, of the Bureau of Mines, will be summoned before the organization. They will be asked to state what they learned during their visit to Alaska during the past summer. At the same time it is probable that Gifford Pinchot, who has also recently returned from an Alaskan visit, will appear before the committee.

Secretary Stimson, of the War Department, has issued a statement declaring his acceptance of the Taylor system of shop management and giving the results of an experimental use of the system at the Watertown arsenal. The Secretary's indorsement of the system is accompanied by what amounts to an agreement to put it into operation in other arsenals and at other Government works under the direction of the War Department. This has called forth strong protests from labor representatives and it is now stated that these representatives will resume their attack on the system before the House committee on labor, making it if anything more severe than heretofore. Some leading labor representatives have already expressed themselves; and at sessions which are to be held about the time of the reopening of Congress, others will present evidence. The committee is expected to report against the Taylor system. Thus a sharp issue may be joined between the administration and the labor interests.

Petition to Dissolve the Steel Trust

Attorney General Wickersham, Oct. 26, filed a petition for the dissolution of the so called steel trust. The petition describes the processes by which the United States Steel Corporation was built up, reviewing much of the ground covered in the Bureau of Corporations' report but giving comparatively little attention to the coal lands acquired during the early history of the concern. In discussing the later developments more attention is given to coal, and special stress is placed upon the fact that the present position of the corporation has been secured through the ownership or control of coal, coke, iron-ore and transportation properties.

In speaking of the Tennessee Coal and Iron deal the petition says that "by this purchase the corporation acquired 447,443 acres of mineral lands in Tennessee, Georgia and Alabama, containing approximately 400,000,000 tons of merchantable ore and 1,200,000,000 tons of coal, of which over one-third is coking coal. The Tennessee properties embraced 18 developed and active iron-ore mines and 23 coal mines, 16 blast furnaces, the ownership of several land companies holding extensive tracts of lands, and the Birmingham Southern Railroad Company, a terminal property of great value connecting the various mines and plants in the Birmingham district with all the diverging trunk lines. . . . ."

Later in speaking of the general position of the Steel Corporation, the petition says: "At its organization, it controlled the bulk of the best coking-coal lands in the Connellsville region and so acquired a great advantage over its competitors. In 1911, it made an important acquisition of coking-coal properties from the Pittsburg Coal Company. The control acquired of coking and other coal through the Tennessee company has added vastly to the strength of its position through absorption of raw material, thus locking it up and withdrawing it from the market, as an acquirement by its possible competitors."

Alabama

Birmingham—Announcement is made of the appointment of a protective committee, representing holders of the preferred stock of the Alabama Consolidated Coal and Iron Company who are dissatisfied with the proposed distribution of securities under the plan for the $30,000,000 merger with the Southern Iron and Steel Company.

California

San Francisco—The Pacific Coast Coal Company has concluded to retire from the California market, and has disposed of all its stock and transferred its interests to the Western Fuel Company.

The acquisition of the California business of the Pacific Coast Coal Company gives the Western Fuel Company control of all the existing bunker and lighterage facilities in the harbor of San Francisco.

Colorado

Denver—A temporary injunction has been granted by Federal Judge R. E. Lewis, prohibiting the Routt County Fuel Company from mining coal under 320 acres of land near Oak Creek. The injunction is also directed against the Union Land Company and the Continental Trust Company. Judge Lewis' decision is a victory for the Government in its campaign to prevent the alleged unlawful acquiring of valuable coal lands in Routt county.

Illinois

Mt. Vernon—Loren N. Wood has disposed of 7000 acres of Jefferson county coal lands to the Big Muddy Coal Company of New York. The purchase price has not been announced but is said to be more than $250,000.

Ottawa—A mortgage for the sum of $700,000 was filed in the recorder's office recently by the Chicago, Wilmington & Vermillion Coal Company. This large sum is for the purpose of purchasing 6000 acres of land in Franklin county, and developing it in the mining industry.

The St. Paul Coal Company has changed the location of its office from Chicago to Ottawa.

Indiana

Evansville—Two shot-firers were killed in an explosion resulting from a "windy" shot in the second level of the Ft. Branch Mining Company's shaft at Ft. Branch in the afternoon of Nov. 4, shortly after the miners had left the mine.

The United States rescue car from Evansville was soon on the ground, but because of the fall of timbers and débris that blocked the way the two bodies were not recovered until midnight.

Kansas

Pittsburg—The Hamilton Coal Company and the Girard Fuel Company have connected their main shafts and air shafts and are now working regularly.

Minden—The J. J. Pullen Coal Company, whose mine tipple was burned some time ago, will start to rebuild at once, having made a satisfactory settlement with the insurance company. As the mine is badly filled with water, it will in all probability not be ready for operation before Jan. 1.

Kentucky

Barbourville—The Martins Fork Company has bought a right of way from the main line of the Black Mountain & Wasioto railroad to the site of the mining

plant, near Harlan. Surveying on the spur line is now being done and the work of putting in the track will be started as soon as practicable.

Lexington—The Cambria Coal and Lumber Company filed articles of incorporation here recently. The business of the new company is to be the buying, leasing and operating of coal, coke, timber, oil and mineral lands. The capital stock is fixed at $500,000 and the principal office is to be in Lexington.

Missouri

St. Louis—It is reported that the Hawley-Erb syndicate has purchased the Novinger coalfields in Missouri. The same syndicate, it is said, will extend the Iowa Central to St. Louis, affording a through trunk line from Minneapolis and St. Paul to St. Louis, where connection will be made with the combination's Missouri, Kansas & Texas road to the gulf.

Maryville—More than 25,000 acres of land have been leased in Nodaway county in the last six weeks for coal- and oil-prospecting purposes. Work of drilling at various points in the county will begin within the next two weeks under the direction of R. W. Wallace, of St. Louis, who obtained the leases for an Eastern syndicate.

Ohio

Columbus—The Central Ohio Operators' association has filed complaint with the public service commission against the Baltimore & Ohio, Wheeling & Lake Erie and Pennsylvania railroads, charging that their rates on coal shipments are excessive, unjust and unreasonable. The association has a membership of operators in the Tuscarawas field.

Lore City—That portion of the Black Top mine of the Morris Coal Company which was on fire has been entirely sealed up and the burning portion thoroughly walled in. The mine has resumed operations.

Pennsylvania

Bituminous

Altoona—The Pennsylvania Coal and Coke Corporation, it is reported, will become the owners of the land and other properties of the old Pennsylvania Coal and Coke Company now held by a committee of the bondholders. The Pennsylvania Coal and Coke company controlled about 100,000 acres of coal land in Blair and adjoining counties. Of this acreage about 50,000 is being operated. Only the active land is included in the pending deals.

At a meeting to be held in Philadelphia, Nov. 10, it is understood the reorganization will be formally effected, an issue of stock authorized and a president and board of directors chosen.

The case of the Walnut Coal Company, a local corporation, against the Pennsylvania Railroad company for alleged discrimination in furnishing coal cars was recently brought to an end at Clearfield. The coal operators were awarded a verdict of $78,468, one of the largest awards ever given in a case of this character.

Uniontown—The H. C. Frick Coke company has fired 525 new coke ovens in the Uniontown and the Connellsville regions, making a total of 645 new ovens lighted last week. Placing in commission of these new ovens means the employment of about 1100 additional men.

Anthracite

Wilkes-Barre—Eight dredges have been at work for the past six months in the Susquehanna river near Bloomsburg and it is estimated that 10,000 tons of buckwheat and rice coal have been dug up. It is said that about 4000 tons more has been secured this year from the river near Danville.

G. B. Markle and Company have recently imported a number of negro laborers for work in driving a rock tunnel across the Highland basin. They are mostly expert rock men and their presence should not be construed as indicative of the intention to introduce negro labor in this field.

Pottsville—The tri-district convention of the anthracite mine workers, held here Oct. 31 to Nov. 3, formulated the demands which it desires to have made a part of the next agreement with the operators. The national president was empowered to order a suspension if these demands are not granted at the termination of the present agreement. The three most important of the 10 items are:—1. Recognition of the union. 2. An eight-hour day. 3. A 20 per cent. increase in pay.

Tennessee

Knoxville—The Bon Jellico Coal Company has been incorporated for $100,000. The purchase by this company of 1250 acres of virgin coal lands between Jellico and Williamsburg, Kentucky, is reported.

West Virginia

Wheeling—The sale of the coal lands and all properties of the Sleepy Mountain Anthracite Coal Company, of Morgan and Berkley counties, to Hay Walker, Jr., for the sum of $250,000, by special master in bankruptcy John C. Berry, was approved recently by Judge Dayton in the United States circuit court.

The Big Bluff Coal Company, of Huntington, has been incorporated to mine coal and manufacture coke and develop timber lands. The capital stock is $400,000.

Canada

Alberta—The strike of the coal miners of eastern British Columbia and Alberta, which has been in progress for nearly eight months, is at an end, and in the course of a few days it is expected that every one of the 25 mines in the district will be in operation, with 7500 men at work. The magnitude of the strike may be seen when it is stated that the mines represent an invested capital of $40,000,000, while the monthly payroll of the men totals in the neighborhood of a million dollars.

It is understood that an open shop is conceded to the operators and a nondiscrimination clause inserted in the agreement similar to the one now on file with the Department of Labor at Ottawa, also, that a uniform scale of wages shall apply, applicable to all mines in the association, said scale to be the scale of the Western Coal Operators' Association of the last agreement, with an increased percentage added.

Personals

M. S. Kemmerer, of Mauch Chunk, Penn., recently paid his annual visit to Kemmerer, Wyoming, where he has coal-mining interests. The town is named for him.

A. C. Leisenring, superintendent of the Upper Lehigh Coal Company, Upper Lehigh, Penn., has tendered his resignation to take effect Jan. 1. Mr. Leisenring has been connected with the anthracite industry for many years and now goes to assume management of a West Virginia Coal Company.

Announcements

The Book Department of the Engineering News Publishing Company, has been purchased by the McGraw-Hill Book Company, 239 West Thirtyninth street, New York. This adds to the list of the McGraw-Hill Book Company, a considerable number of important standard treatises, primarily in the field of civil engineering. The transfer of this business was made on November 6, 1911.

The U. S. Civil Service Commission announces an examination to be held Nov. 25, to secure eligibles from which to make certification to fill a vacancy in the position of assistant mechanical engineer in the Bureau of Mines, at a salary of from $2000 to $2750 a year. The duties of the person appointed to this position will be to assist and participate in the investigations of mechanical-engineering subjects connected with the mining industry, especially along lines relating to haulage and hoisting equipment. The examination will consist of the subjects mentioned below, weighted as indicated: General education and technical training, 40 points; professional and technical experience and fitness, 40 points; publications and official reports, or thesis, 20 points. Applicants must have reached their 25th, but not their 40th birthday. Examination form 304 and special form.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The optimistic views for an active winter trade are being slowly realized, particularly in sections where the recent cold wave was in evidence. The market, generally, is showing a better tone, with prices firm or advancing.

On the Atlantic coast, shortage of water transportation has resulted in light shipments, in most instances considerably below that of last year. Demand continues firm, especially for the better grades, with producers and railroads in good position to handle a large tonnage which it is thought will be greater this November than last. The slackening of lake shipments from the Pittsburg district has thrown an excess on the market with the result that prices are irregular, and mines only working from 55 to 65 per cent. capacity.

Lake shipments from Buffalo are a quarter of a million tons ahead of this time last year, but local trade is light. Reports from middle East points fluctuate almost directly with the weather, but are generally good, although prices are inclined to be irregular.

As a result of the cold snap in the middle West, there has been a noticeable strengthening of this market. Supplies are reported adequate, and the usual increase in prices is now effective in most sections, which is tending to retard buying.

In the Rocky Mountain States, trade continues active and there is a noticeable improvement in transportation facilities. On the Pacific coast, mild weather prevails and trade is therefore light, with slow rail shipments in the south due to the strike on the Harriman lines.

Boston, Mass.

The bituminous market is beginning to show signs of the advancing season. The colder weather has not been with us long enough to have any very marked effect on prices, but most of the larger shippers of standard Pocahontas and New River coals have advanced to $2.60, f.o.b. vessel at Hampton Roads.

There would soon be demand for Pennsylvania soft coals but for the fact that to get any advantage in freights their shippers would have to rely on Reading transportation, and the barges of that fleet are committed way ahead on anthracite requirements. The Somerset County coals are supposed to be on the basis of $1.20 at the mines now, instead of the $1.10 and $1.15 that obtained a week ago.

All-rail bituminous is practically unchanged. There is only a fair volume of coal moving, almost altogether on contract, and prices are still at low figures.

Reference to the following table will show the extent to which, on Oct. 1, the slow movement of transportation had affected the receipts of coal at the port of Boston, the figures being confined to domestic coal:

Anthracite receipts, September, 1911	125,436 tons
Anthracite receipts, September, 1910	153,516
Shortage, as against 1910	28,080
Anthracite receipts, 9 months ending September 30, 1911	1,358,925
Anthracite receipts, 9 months ending September 30, 1910	1,273,344
Excess, over same period, 1910	85,581
Bituminous receipts, September, 1911	316,039
Bituminous receipts, September, 1910	362,802
Shortage, as against 1910	46,763
Bituminous receipts, 9 months ending September 30, 1911	3,024,578
Bituminous receipts, same period, 1910	2,982,785
Excess, over 1910	41,793

In other words, while the total tonnage, in both anthracite and bituminous, in the nine months from Jan. 1, was considerably in excess of the receipts for the same months in 1910, yet the tonnage for the month of September was materially behind that of last year. October will show tonnages still further in arrears.

New York

Although the standing tonnage at the New York piers is somewhat above normal, the demand on contract is so good that standard-grade steam coals are moving from the piers with fairly prompt despatch and there is no unwieldy accumulation of these grades at tidewater. Inferior steam coals, however, still continue to be a drug on the market and shippers of this class of coal ought to realize that it is very poor policy to overship this market under present conditions.

There has been a little spot business in the market this week but the amount of the tonnage has not been large. The car supply in the regions shipping this market is reported satisfactory and mines have accordingly been in a position to work full time when required, although two church holidays last week had a tendency to decrease production. Railroad movement at New York tidewater is prompt, which is an aid to those producers who have heavily contracted, in the taking care of their obligations.

Demurrage coals, which are in practically every instance low-grade steam coals, are being offered at sacrifice prices. Quotations on other steam coals range about as previously reported, $2.35, f.o.b. for West Virginias (80c. at the mines); $2.35@2.45 for ordinary Pennsylvanias; $2.25@2.65 for good Pennsylvanias; and better-grade Pennsylvanias, $2.65@2.75.

Philadelphia

Temperature has not been a very potent factor in the coal trade during the last week, or even during the past month. The demand seemed to be altogether spontaneous, as if the householders had put off purchasing until the last minute, and then all wanted their coal at once. October was inaugurated with an unusual activity in the coal trade, which simmered down to a fairly active trade during the closing days.

The wholesale market has its work cut out for this month, if it is to show an advance over last year's business. November has started in auspiciously, as the reports already show very substantial increases over last year, and any kind of weather should enhance this, but the tonnage last year for this period was very good, and it will take some good cold weather to enable the market to keep up to the record already set. Line trade is reported fairly active, while the tidewater business is very good, orders being in excess of the ability of the companies to supply. Prices at tidewater: Broken, $4.50; egg and stove, $4.75; chestnut, $5. Line prices $3.75 for egg and stove, chestnut, $4; pea, $2, at the mines.

Pittsburg

Bituminous—Very little more coal will be taken up the Lakes this month, and none at all next month, the Lake insurance expiring Dec. 1. Besides the congestion at upper Lake points acting as a brake on the movement, Lake tonnage is difficult to secure as there is practically no possibility of vessels obtaining return cargoes of ore, and in many cases Lake vessels are being used for coal storage during the winter, being already loaded for their first trip in the spring.

Prices have become somewhat more irregular in consequence, and slack, which normally firms up at this juncture on account of greatly decreased production, is

no stronger than it was. We repeat former quotations, although they are probably being shaded somewhat more frequently than before: Nut, \$1@1.05; mine-run, \$1.05@1.10; ¾-in., \$1.15@1.20; 1¼-in., \$1.25@1.30; slack, 40@50c., per ton at mine, Pittsburg district.

Connellsville Coke—The market is devoid of important developments. Demand for spot coke, both furnace and foundry, is very light, but prices being already down to bed rock, the majority of merchant producers have not suffered. Consumption is unchanged, but is fully covered by existing contracts. More than one-half the total production of the Connellsville and Lower Connellsville region is by interests which are themselves consumers. Of the remainder, or merchant production, more than one-half is covered by contracts which will extend into next year, a few being twelve-month contracts running to July 1, 1912, but the major part are longer-term contracts either at a fixed price or at a ratio to the average prevailing price of pig iron. Thus while some important contracts will have to be made for the half year or year the tonnage involved will be a relatively small percentage of the total output. No serious negotiations have yet been undertaken and as there is an ample surplus of capacity, business may not be closed for 30 or 60 days yet. We continue to quote: Prompt furnace, \$1.50@1.55; contract furnace (nominal), \$1.65@1.75; prompt foundry, \$1.80@1.90; contract foundry, \$2@2.25.

The *Courier* reports production in the Connellsville and Lower Connellsville region in the week ending Oct. 28 at 320,301 tons, an increase of 10,000 tons, and shipments at 3947 cars to Pittsburg, 5028 cars to points west and 952 cars to points east, a total of 9927 cars, an increase of 164 cars.

Buffalo, N. Y.

There is still a slight increase in the movement of soft coal, and conditions are satisfactory with the exception of prices, which do not promise to improve much, for the operators are so situated and so minded that they will increase the output in direct proportion as the demand increases. So long as this condition exists there can be no rise in prices, unless something unusual happens to curtail the production.

There is some falling off in the trade just now because of election, but the general quiet state of business is accountable for most of the change in that direction.

Soft-coal prices are unchanged at \$2.50 for Pittsburg three-quarter, \$2.40 for mine-run and \$2 for slack, with Allegheny Valley coal from 15 to 25c. lower. Slack is still quite unsteady and needs cold weather to give it proper firmness. The coke trade is still dull, with prices on the basis of \$4 for Connellsville foundry and \$3.50 for stock coke. There is quite an amount of smithing coal sold here on the basis of \$4 for Georges Creek Cumberland, but dealers find that most consumers buy Cambria county smithing or washed slack, which sells all the way down to 50c. less.

Cleveland, Ohio

The Lake coal trade, with the exception of three or four concerns who are handling their own coal direct, is practically closed for the season. Considerable coal still remains on track and is now being loaded as quickly as possible in boats for storage during the winter months.

The domestic trade at this season should be much better than it is, but owing to the very mild weather during the month of October and up to the present date, the domestic demand has been very small.

There does not seem to be any improvement in the domestic trade or steam trade in the past week, excepting slack, which has advanced from 10 to 15c. The following are current prices per short ton here:

Ohio No. 8	
Mine-run	\$0.95@1.00
¾-in.	1.05@1.10
1¼-in.	1.15@1.25
Slack	0.50@0.60
Middle District:	
Mine-run	\$1.00@1.10
¾-in.	1.20@1.30
1¼-in.	1.45@1.60
Youghiogheny:	
Mine-run	\$1.10@1.20
¾-in.	1.30@1.35
1¼-in.	1.40@1.50
Pocahontas:	
Mine-run	\$1.00@1.10
Lump	2.10@2.25

Columbus, Ohio

One of the best phases of the business is the demand for immediate shipment. For a time domestic business was fairly brisk in orders for future shipment but the cold spell caused a rush of orders for immediate delivery. Prices are ruling strong in every grade and there is no complaint of price cutting in any section. The general tone of the market is better and the prospects for the future believed to be satisfactory.

The lake trade in all districts of Ohio continues active in every respect and the Toledo docks of the Hocking Valley railroad have been busy recently, loading boats for the Northwest. During the week ending November 4, 56,000 tons were handled by the Toledo docks while the previous week the record was 71,000 tons. Since the opening of navigation the tonnage handled at the Toledo docks has been 2,225,000.

Production in various Ohio fields has been slightly above that of the past few weeks. In the domestic fields such as Jackson and Pomeroy Bend the output is about 85 per cent. of the average and in the Hocking valley the output is about 80 per cent. In eastern Ohio the output ranges between 70 and 80 per cent. of the average. In other fields there is a slight increase in the production due to the better conditions of the trade.

The retail trade is on the increase. The cold wave has caused a rush of orders and dealers are busy taking care of deliveries. There is a good demand for the fancy grades of coal, particularly the splints and especially prepared varieties. Stocks in the hands of the dealers have been quite short and this means a rush of orders to the operator and wholesaler. Farmers are also buying much better since they have their work in hand better. Retail prices are strong but have not yet reached the winter level.

The fine coal market is slightly improved and prices show more firmness. The supply is still large and there are many cars in storage. Nut, pea and slack are selling at between 40 and 50c. and coarse slack between 35 and 40c.

Prevailing prices are as follows:

Hocking Valley:	
Domestic lump	\$1.50
¾-in.	1.35
Mine-run	1.10
Eastern Ohio:	
Domestic lump	1.65
Nut	1.15
Nut, pea and slack	0.45
Coarse slack	0.40

Cincinnati, Ohio

This is distinctly a weather market, with demand slightly better, as to both steam and domestic fuel, although, of course, the former is dependent upon general industrial conditions, which have not changed sufficiently—either for better or worse—to make a noticeable difference in the steam demand. The weather has been favorable for domestic demand. The temperature was considerably below freezing several nights last week in this immediate market and north of here the weather has been more severe.

Coal men never rejoice at anyone's misfortune, but they are human—at least the Cincinnati ones are. Consequently when, Friday of last week—all day and evening—a break in the gas main in West Virginia practically cut off the city's entire supply of gas there were lots of "I told you so" from coal men when they had time to say it between filling rush orders for fuel demanded by former customers who had been induced to substitute gas. Several business concerns in the city were forced to practically shut down and in one city institution at least—the city hospital—there was decided inconvenience.

Charleston, W. Va.

With the lake shipments practically at an end for this season, shipments are not now as heavy as they were. Some coal is still going to the lakes, but the re-

duction in the amount is not balanced by the increase for winter consumption, and, therefore, it is contended that at present there is a decrease rather than an increase in shipments. There has, however, been an increase in shipments other than to lake points.

No change in prices is reported. Instances are cited where a slight increase has been secured, but others are also noted where new contracts have been closed for less than the old ones. As a general rule coal men are not inclined to change their views heretofore expressed, that the future is none too bright for their interests and that little increase in the price of coal can be expected for another year or year and one-half.

Indianapolis

The retail coal trade which now occupies the center of the stage as regards distribution of domestic coal has been greatly stimulated by colder weather over a wide area of country. In fact, reports regarding this branch of the coal business show a healthier tone than they have for many months.

The usual annual increase in the price of coal became effective in Indiana, Nov. 1. Consumers are now paying from 25 to 50c. a ton more than previous to that date. The local dealers say it is due to the advance in wholesale prices. No advance, however, has been made on Indiana coal at the mines. Present prices are said to be the same as at this time last year and the advance on eastern coal was wholly expected.

Chicago

Weather, the car situation and quality of coal are the three dominant factors in the Chicago coal market at present. The recent drop in temperature brought brisk buying with the result that the wholesale and retail markets have been active. There has been a noticeable strengthening in the country districts, this being due to a limiting of the car supply for movements westward. The increase in country prices has ranged close to 25c. a ton.

Lump coal is not moving very rapidly in Chicago, and while some concerns are making an effort to maintain $1.75, others are offering $1.65, with differentials of 10c. below that figure on egg and nut. The result has been an increased demand for egg and nut and a weakening in the price on lump.

Prices direct from the mines in net tons to retail dealers and steam users on spot shipments are as follows:

	Chicago	F.o.b. Mines
Sullivan County:		
Domestic lump....	$2.35@2.45	$1.50@1.60
Egg..............	2.25	1.40
Steam lump......	2.10	1.25
Screenings........	1.22@1.32	0.35@0.45
Springfield:		
Domestic lump....	$2.22@2.47	$1.40@1.65
Steam lump......	1.92@2.02	1.10@1.20
Mine-run.........	1.82@1.87	1.00@1.05
Screenings........	1.22@1.32	0.40@0.50
Clinton:		
Domestic lump....	$2.17@2.37	$1.40@1.60
Steam lump......	2.00@2.20	1.25@1.45
Mine-run.........	1.82@2.02	1.05@1.25
Screenings........	1.27@1.37	0.50@0.60
Pocahontas and New River:		
Mine-run.........	$3.00@3.10	$0.95@1.05
Lump and egg....	4.05@4.30	2.00@2.25
Coke:		
Connellsville......	$4.50@4.65	
Wise county......	4.50@4.65	
Byproduct, egg and stove..........	4.95	
Byproduct, nut....	4.55@4.65	
Gas house........	4.85	

Minneapolis—St. Paul

The expected turn for the better in the coal trade has happened, and the wintry blasts, with a slight fall of snow, should have credit for the change. After all is said, no one other influence stimulates the coal trade as generally as a continuous spell of cold weather.

The wholesale trade is showing a marked improvement. The buying has been slower than usual by the country dealer. They were stocked up as strong as they cared to be until the consumer showed some inclination to buy. The advance of winter has brought this about and now the dealer is reordering to fill up bins being depleted. What is known as the Line House trade have been liberal buyers within the past 10 days. These are the large retail-lumber companies and the elevator companies who are located with principal offices mainly in Minneapolis conducting a line of yards throughout the Northwestern States.

The steam market continues to be the discouraging feature of the trade. No change is looked for this year. There seems to be a rivalry between two or three dock companies and it looks like a fight for supremacy in this market. The larger companies are taking the lead in setting the price on steam trade and the jobber is practically out of it.

St. Louis, Mo.

Country demand for all kinds of coal is especially good and a large tonnage is moving through St. Louis to the Northern and Western market. The prevailing prices are:

STANDARD	
6-in. lump	$1.10@1.20
3-in. lump	1.10@1.15
2-in. lump	1.05@1.10

Mount Olive and Staunton District coals are still holding at about $1.25@1.35 for domestic sizes. There is a good demand for the higher-grade coals from the inner district at from $1.90@2.25. The above coals take a rate of 52c. to St. Louis.

FRANKLIN COUNTY	
6-in. lump	$1.60@1.75
3x6 egg	1.55@1.65
No. 1 nut......................	1.50@1.60
No. 2 nut......................	1.20@1.30
WILLIAMSON COUNTY	
6-in. lump	$1.50@1.60
3x6 egg	1.45@1.55
No. 1 nut......................	1.15@1.20
No. 2 nut......................	1.00@1.10
No. 3 nut......................	0.90
Mine-run	1.05
½-in. screenings	0.45

The above coals take a 67c. rate to St. Louis.

There is a good movement of Big Muddy coal from the Murphysboro field and some coal moving in from the Harrisburg district.

During the past week there has been a heavier tonnage of Springfield coal moving in than at any previous time this season. There has been a decided scarcity of anthracite chestnut, and it is very hard to get. The other sizes are moving freely, and a steady tonnage is coming forward at the regular circular.

Salt Lake City, Utah

Lack of equipment is the only thing which seems necessary to make this a banner year for the Utah mines. The demand is good, labor conditions satisfactory and weather so far ideal.

Generally speaking the mines have been doing better with their productions the past week. Colder weather has increased the demand, however, and they are still far behind with orders.

Special efforts are evidently being made by the Denver & Rio Grande in transporting coal and the result has been a very marked improvement in the service.

Prices on wholesale coal were boosted by Wyoming and Utah mines about the first of the month. Lump is now $3; nut, $2.50; run-of-mine, $1.85, and slack, $1, f.o.b. cars at Wyoming mines. Slightly lower at Utah mines.

Retail trade is splendid in Salt Lake and some of the smaller dealers who had not much coal stored are hard pressed for coal to fill orders.

Retail prices are still the same, that is, $5.75 for lump; nut, $5.50; slack, $3.25 delivered.

Portland, Ore.

The coal market is dull locally, due to the fact that it is between seasons, the weather continuing mild. The summer storage supplies were removed Oct. 1, and the next change in values here will be an advance. How soon this will come depends altogether upon weather conditions. The fall weather has been ideal and hence few coal purchases have been made, those who buy for the month having no occasion to enter the market yet.

Little coal is coming in from Australia this season, and the railroad strike does not appear to have caused the Harriman lines any serious inconvenience in this section as yet. The country throughout appears prosperous, although some complaint is heard of dull business.

Following are the prices asked here per ton, including cost of delivery to points within the city proper:

Japanese	$7.50	
Washington lignite...	$7.00@ 7.50	
Australian	10.00@10.50	
Rock Springs, Wyo...	10.00@10.50	nut $9.50
Diamond, Wyo.......	10.00	
Carbon Hill, Wash., lump	10.50	
Carbon Hill, steam...	7.50	
Newcastle, Wash.....	7.00	
Beaver Hill, Ore.....	9.00@ 9.25	
Blacksmith coal	17.00	

Alphabetical Index to Advertisers

Classified Index to Articles Advertised

¶ The Mine Safety Number, November 4, of COAL AGE, is some evidence of the stuff the paper's made of. ¶ Coincident with the gathering at the National Mine Safety Demonstration, COAL AGE, appeared brimful of the latest and best information on the subject. ¶ It is proof that the paper is wide-awake to its opportunities, and neglecting none of them. ¶ Don't you think it will pay you to be a regular subscriber to a paper that is so thoroughly onto its job?

SITUATIONS WANTED

Advertisements under this heading 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Position wanted with coal company in West Virginia as mine superintendent, engineer or mine boss; have West Virginia mine foreman's certificate; age 33; 19 years' experience in mining; can furnish good references. Address Box 2, care COAL AGE. Nov. 25.

CA

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 6.
Issued Every Saturday.
HILL PUBLISHING COMPANY.

NEW YORK, NOVEMBER 18, 1911.

Ten Cents per copy
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Canada, $4; other Countries, $5.

CA

COAL AGE

Vol. 1 NEW YORK, NOVEMBER 18, 1911 No. 6

A young engineer, fresh from college, reported to the manager of a small coal company for his first-day's work. The task assigned was to map a virgin-coal acreage, paying particular attention to surveying and plotting the outcrop of the seam.

This youthful graduate hastened to consult his textbook, and found that in running a coal crop, he should—first, "pay close attention to the change in color of the vegetation overlying the outcrop"; second, "observe that the floor of the seam would be marked by iron and sulphur springs along the route." Thus enlightened, the task appeared easy and work commenced.

Suffice it to say—the change in the color of the vegetation was not discernible to human eye, and to judge by the springs on the hillside, the contour following the coal closely resembled a cross-section through the foothills of the Rockies. Not a bit discouraged, although isolated from helpful advice, this engineer (pardon me for calling him such; 'tis an evil custom fostered by our great colleges) totaled all his knowledge on the subject, seasoned the whole with practical common sense, and proceeded to solve the problem in his own way.

Trenches were dug at intervals and the coal partly exposed. Contours were taken above and below the seam and the outcrop satisfactorily plotted.

The lesson was a valuable one and taught our young friend that his textbooks might often prove a help, but not a panacea for all mental ills. He began to realize that his education was just beginning, rather than having been concluded; that theory is essential, but experience is hands and feet to every endeavor.

His next move was to resign as engineer for the company, and accept a job at half the pay, as backsight on the surveying corps of a larger concern in an older field. Here he associated with men wiser and more experienced than himself; the inspiration and knowledge gained were many times worth the price paid.

Lesson number two was now learned, and was the reverse of his first instruction. It had to do with experience minus theory. The teachers of this lesson were a few of the doughty sons of toil, who, because they lacked an early mental training, tried to induce the belief that education is purely physical, and that wisdom is never gained from books.

These men showed how to light a gas feeder and then beat it out with their coats; they were apt instructors in methods for opening safety lamps at the face when a naked flame was wanted to light a pipe, and the best part of their time, when not actually drilling or loading, was spent in condemning new laws or devising means to evade company rules that had been designed for their own safety.

And it wasn't the miner alone who taught him lesson number two; there were foremen and superintendents who believed it a crime to spend money grading roads when they might be driven water-level; splitting the air was a perversion, and a Jacob's-staff in the hands of a foreman, so they believed, was sufficient means for setting room and entry centers.

Don't imagine that our embryo engineer failed to discern the fallacy in their reasoning, nor that he neglected to profit by the error of their ways. It was plain to him there was little to choose between the theorist and the practicalist. Both were equally a menace.

The result of these observations led him to conclude that the combination to be sought embraces both book-learning and the wisdom born of practical effort, and that such an education develops a man to his highest capacity, increases his individual power of production and makes him a good companion for himself and others.

The sooner we mix brains and work, the greater will be the advance in coal mining. No matter whether we have come down from the college or up from the mines, the one essential to a prosperous issue is hard-headed common sense. The fellow who tries to get along only with his head or only with his hands, will travel about as fast as an automobile with the engine running and the clutch thrown out.

Anthracite and Bituminous Mining

By Eli T. Conner*

The central Pennsylvania bituminous field, while advantageously located near tidewater, possesses only thin seams of coal and mining here is commercially precarious. Coal-cutting machines and electric haulage are the most potent factors in securing economy. The fourth of a series of articles by Mr. Conner.

Bituminous coal is found in so many States of the Union, under such widely varying physical and geological conditions, that it will be impossible in the space at my command, to discuss more than one or two typical regions. Therefore, in the main, this article will be devoted to those coalfields in which I have had personal experience both in the development and operation of coal mines, and the manufacture of coke.

Pennsylvania, the leading State in the production of bituminous coal since the beginning of the industry, has naturally been foremost in the development of mining methods and in the education of all classes of coal-mining employees. In the pursuit of my profession, in many other States, as far west as the Pacific coast, and in the Rocky mountains of British Columbia and Alberta, it has been my good fortune to meet many foremen, engineers and managers whose early experience was acquired in the Keystone State. The cordial treatment I have received from these men has, perhaps, been due partly to a feeling of sentiment, as well as to business reasons, and remarks have frequently been made expressing pleasure at meeting an engineer from "back home."

This State, therefore, not only deserves credit for its great contribution of natural products to the economic development of the country, but still greater credit for its well trained, resourceful and energetic sons who are helping in the development of newer fields.

Collieries Nos. 3, 5, 6 and 8, Ehrenfeld, Cambria County, Penn.

The Pittsburg Bed

As is well known, the remarkable growth at Pittsburg of industries of all kinds, but particularly those of steel and iron, has been due almost entirely to the wonderful deposit of high-grade coal, known as the Pittsburg bed, which is conceded to be in every respect the most remarkable seam of bituminous coal found anywhere in the United States. The physical characteristics of this bed place it in a class by itself, in the matter of economical production. I shall not go into a description of development and mining methods in this bed, because I think it can, as a whole, be described better by men of wider experience in its operation, than has been my own. But in the interest of conservation, I desire to call attention to the most important feature of the mining practice in this region, as quite largely developed in the Connellsville basin.

Here, the original layout and projection of a mine is made with the view of ultimately securing the complete recovery of *all* the coal. Of course, this is the prime object in all coalfields, but the system of pillar distribution and reclamation of pillar coal, as practiced in the Connellsville field, results in an exceptionally high yield of the mineral in the ground. This is largely due to favorable natural conditions as to thickness and quality of coal, good bottom and the character of the overlying strata, which is of such a nature that generally, when pillars are systematically withdrawn the roof breaks properly, with a minimum of pressure on the remaining pillars. I mention these facts particularly because I think the methods that have been developed in the Connellsville field for the reclamation of pillar coal, constitute in the matter of yield almost as high a standard as does Connellsville coke in the market.

What is known as the Central Pennsylvania bituminous coalfield includes part of Center, Clearfield, Cambria, Blair, Somerset, Indiana and Jefferson counties. This field is the nearest of any in the Appalachian Range to tidewater, at New

*Consulting engineer, Real Estate Trust building, Philadelphia, Penn.

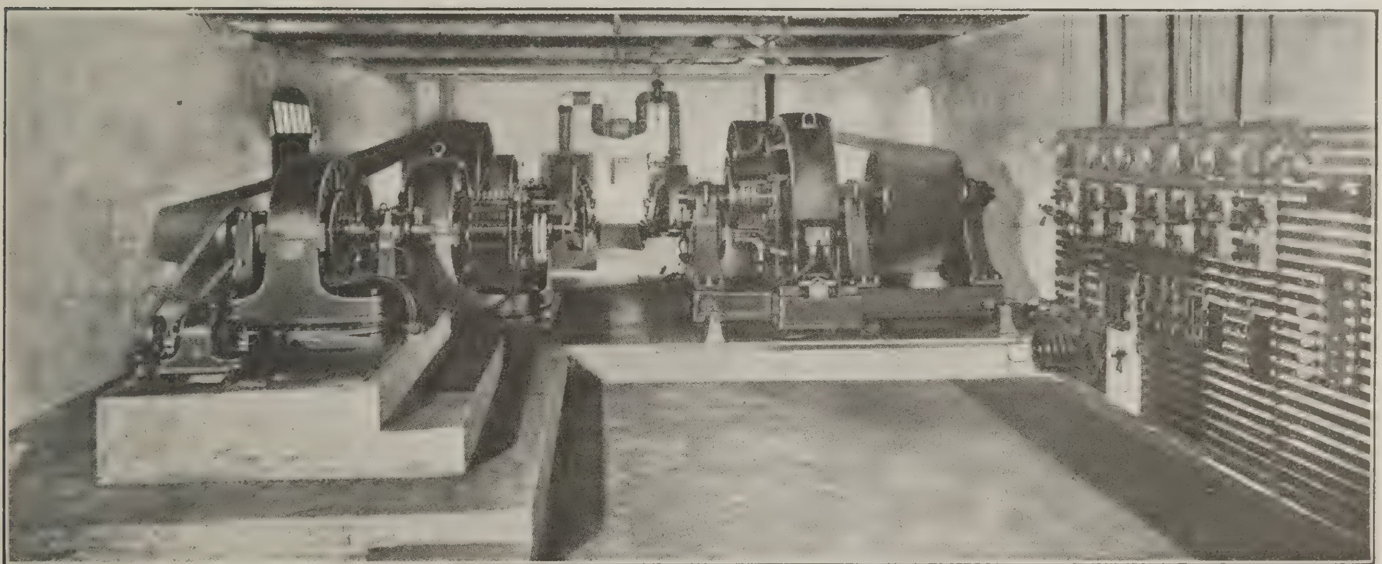
York, the average distance being 250 miles, which gives it a natural advantage over the other regions that are more favored than this as to geologic and structural conditions. The earlier developments in this region were made in the justly celebrated Moshannon or D bed, in Center and Clearfield counties. The quality of this coal is so good that very shortly after its first exploitation, it established a reputation in the market, which it continues to enjoy. However, most of this high-grade coal has been won and, comparatively speaking, there is but little of it now being produced.

Mining in Central Pennsylvania

The mining in central Pennsylvania is at present almost wholly in beds B, C Prime, D and E. The average thickness of each of these four seams of coal will not exceed 3 ft. 8 in. Notwithstanding this fact, central Pennsylvania is producing in the neighborhood of 45,000,000 tons of coal per year. In order to overcome the great handicap of such thin seams as are found in this region, the operators have been compelled to exercise much more ingenuity that is necessary in competing regions where the beds of coal are thicker. The success of these efforts upon the part of central Pennsylvinia operators, is deserving of great credit.

As is well known, the coal measures in this region are comparatively flat; pitches rarely exceed 15 per cent., and in most cases are much less. The earlier developments were naturally by drift from the outcrop, and were made by individual operators having comparatively small capital. With the gradual exhaustion of the above-water-level coal, developments have been made on a much larger scale by slopes and shafts, so that at the present time, there are in this region many plants of large capacity, constructed on the most modern lines.

Entries are usually driven in pairs, but where the ultimate distance to the boundary exceeds one mile, it has been found necessary to drive three and sometimes four parallel entries in order to provide sufficient area for ventilating purposes, without handling an excessive quantity of rock. In all entry work, in these thin seams, it is necessary to remove a sufficient amount of either top or bottom rock, the choice depending upon their relative character and hardness, to provide a clearance of about 5 ft. 6 in. over the rail. Entries are usually driven 12 ft. wide in the clear, and the best practice is to transport the rock which is removed, to spoil banks on the surface, although it is the custom in some mines to widen the entry in the coal sufficiently to make room for storing the rock removed from the roadway. This latter method I do not consider good practice, as it weakens the entry support and frequently results in falls of roof.



Electric Power Station, Pennsylvania Coal and Coke Company, No. 10 Mine, Gallitzin, Cambria County, Penn.

The room-and-pillar method of mining has been adopted almost universally. There is but one instance within my knowledge of consistent effort to introduce the longwall method, and that was at Vintondale, in Cambria county, under the supervision of C. R. Claghorn. This work was done in connection with a conveyer, designed and patented by Mr. Claghorn, which was used for transporting the coal across the longwall face, and discharging it into cars on the butt entries. I was privileged to inspect a mine where this system was in use, and was favorably impressed with its efficacy, particularly with relation to the winning of all the coal on first mining. The details of the system have been described in articles published by Mr. Claghorn and others, so that they need not be discussed here, and are only mentioned to bring out the point which, in my opinion, has been neglected too long by American engineers, namely, the advantages to be gained by the general introduction of longwall mining in beds of coal under 4½ ft. in thickness.

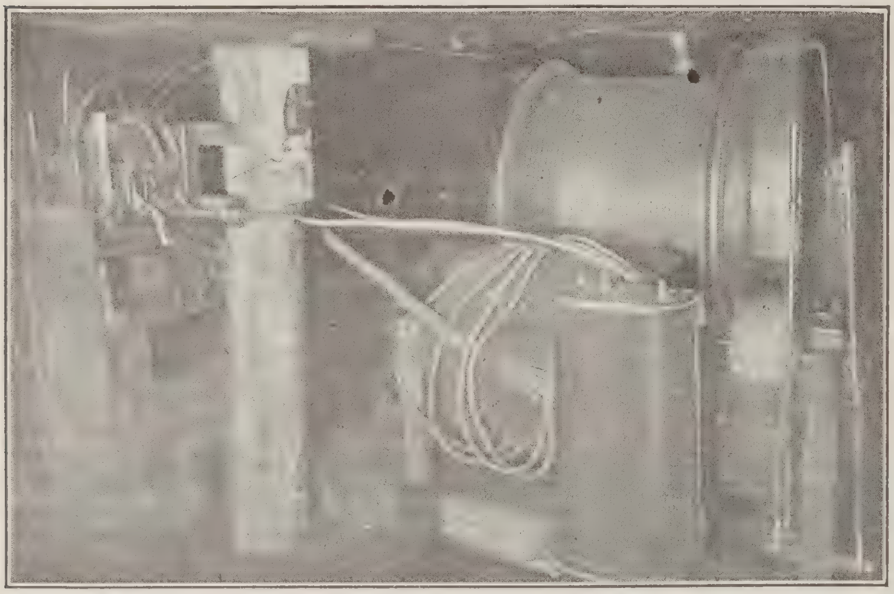
Removal of Rock

While there are many mines where it is customary to remove some roof or bottom rock in the rooms to make hight for cars and mules, this is not the general practice. It is customary to remove top or bottom rock merely at the entrance to the rooms, and thereafter the only excavation made is in the coal seam proper. The mine cars are usually constructed with a capacity of from 1¼ to 2 tons, and low enough to be handled in openings not exceeding 3½ ft. off the rails. All mine cars are equipped with brakes. The cars are delivered to the room neck, by motor or mule team, and pushed by the miner and his helper both ways in the room. The compensation for this labor of pushing cars is included in the mining price. This practice of pushing cars is not universal, since it cannot be carried on successfully where the grades exceed 3 or 4 per cent. In such cases, it may be necessary to brush a small quantity of roof rock from over the roadway in order to admit small mules, say 50 to 52 in. in hight.

In recent years, small electric locomotives have been put on the market, which are equipped with cable reels and are doing successful work in the matter of gathering from rooms. These locomotives are usually of about four tons weight, and low enough to be used in 3½-ft. openings.

I submit two statements showing in detail the transportation cost at a small bituminous mine where the seam is 4 ft.

thick, and where one side of the mine is operated by electric locomotives and the other side by animal power, from which it will be noted that over 6c. per ton economy is effected by the use of electric locomotives. This does not represent all the economy in this particular instance, since in a number of the rooms where mules are used there is some cost for removal of roof or floor, to make hight, but in compiling these statements, this was not considered.



Electric Hoist Underground at Colliery No. 3, Ehrenfeld

Motors vs Mules

Gathering coal with four-ton electric locomotive in 1st and 2d Left entries, and hauling same to the pit mouth by the same locomotive. Average distance coal was hauled, 3600 feet.

	Amount	Cost per Ton
Motormen, 553 hours, @ 22½c.	$124.43	$0.0307
Brakemen, 692 hours, @ 20c.	138.40	0.0342
Total labor	$262.83	$0.0649
Supplies	$18.42	$0.0045
Repairs and maintenance	18.00	0.0045
Power	20.00	0.0050
Interest 6 per cent., on $10,000	50.00	0.0123
Depreciation 8 years	35.42	0.0088
Total	$404.67	$0.1000

Tonnage handled, 4045.19 gross tons.

Coal hauled by mules to side tracks and from there by motors to the pit mouth. Average distance of mule haul, 1200 feet.

			Cost per Ton
Drivers, 250 hours @ 30c.	$75.00		
398 hours @ 18c.	71.64		
294 hours @ 19c.	55.86		
310 hours @ 20c.	62.00	$264.50	$0.0646
Stable boss		35.00	0.0086
Blacksmith, shoeing		30.00	0.0074
Feed		79.20	0.0193
Miscellaneous supplies		18.52	0.0043
Depreciation 5 years		25.00	0.0062
Interest at 6 per cent. on $1500.00		7.50	0.0018
Total		$459.72	$0.1122
Delivery by electric locomotive to pit mouth, 2500 ft.			
Motor men, 277 hours @ $2.25	$62.32		
Brakemen, 346 hours @ $2.00	69.20	$131.52	$0.0322
Supplies		2.65	0.0006
Power		20.00	0.0049
Repairs and maintenance		7.24	0.0018
Other repairs and maintenance		5.71	0.0014
Interest on investment @ 6 per cent. on $5000		25.00	0.0061
Depreciation, eight years		17.71	0.0042
		$209.83	$0.0512
Total		$669.55	$0.1634

Tonnage 4095.10, gathered by mules and hauled from sidetrack by electric motors.

Electric Power Station at Ehrenfeld, Penn.

The above comparison is given because the conditions under which the gathering locomotive and the mules worked, were almost identical, although the grades in rooms served by the gathering locomotive were somewhat heavier (12 per cent.) than on the other side of the mine, where mules were used.

From this and other experiences, I am quite satisfied that the use of gathering locomotives when properly installed, should result in an economy of not less than 4c. per ton, as compared with ordinary methods of gathering from rooms with mules.

It might be well to state that in the case just mentioned, particular attention was paid to the design and installation of tracks and switches. The track in the entry where the locomotive was used, was of 25-lb. steel rails, properly spliced at joints with fish plates. The switches and frogs were also of 25-lb. rail and designed the same in every way as the switches and frogs on standard-gage railroads. The minimum curve permitted was of 30 ft. radius. The tracks in rooms were laid with 16-lb. steel rail, fish-plated.

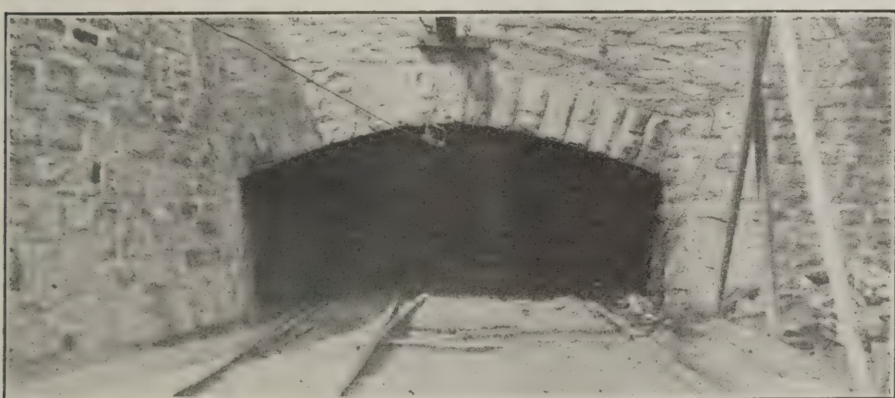
Before leaving the subject of transportation, it should be said that most of the important mines in central Pennsylvania have adopted electric transportation on all their main roads and find it profitable to go to considerable expense to grade and aline the tracks properly. One case in particular with which I am familiar, is the main entry in the B or Miller seam, at No. 3 mine, of the Pennsylvania Coal and Coke Company, at Ehrenfeld. Two tracks of 56-lb. rails were laid in this entry for a distance of about two miles, careful attention being paid to proper grade and alinement. On account of this excellent track it is possible for a 15-ton electric locomotive to bring out 100 mine cars with a capacity of two tons each, or including the weight of the locomotive itself, about 300 tons. The ordinary trip in this instance, however, is about 80 cars. There are in the region many other installations accomplishing equally good results.

Machine Mining

According to F. W. Parker, statistician of the United States Geological Survey,

there was mined by machines in the United States during the year 1910, 174,012,293 short tons of bituminous coal, an increase over the previous year of 31,515,415 short tons, or 41.7 per cent. The rapid growth of machine mining in the past ten years is decidedly gratifying to everyone interested in the industry, not only as an indication of progressiveness in the matter of lowering the average cost of production, and as a conservation measure, but also as tending toward increased safety of the men working at the face by reason of the discontinuance of shooting off the solid. Properly conducted machine mining, particularly where chain undercutting ma-

Coke Ovens, Moss Creek, Cambria County, Penn.



Mouth of Main Entry at Ehrenfeld, No. 3 Mine

chines are used, results in an increased yield of large coal and a decided decrease in the amount of coal, too often wasted by being thrown into the gob when solid shooting is permitted. According to my observation and experience, chain undercutting machines are to be preferred where the bottom is reasonably smooth and uniform, but in the B or Miller bed, in central Pennsylvania, this is not usually the case, as rolls or "horsebacks" are frequently encountered. Where this condition exists, punching machines driven either electrically or by compressed air, are preferable.

Questions are frequently asked as to what saving in mining cost may be effected by installing mining machines. It is not possible to give a flat figure that can be generally applied because the mining conditions are of such a varied character that methods found successful in one mine or bed, will be found unsuitable elsewhere, but from considerable experience, I think it safe to say that where properly handled an economy of about 10c. per gross ton below the pick mining rate is possible of attainment.

I have in my possession detailed figures of the mining cost at two operations, one where all of the coal is cut by electric chain undercutters, and the other where all of the coal is cut by air-driven punching machines. The pick-mining rate for the year when these statements were compiled was 62c. per gross ton.

Electric breast machines, output for one year 321,808 gross tons.

	Per Ton
Labor	$0.4134
Material	0.0259
Insurance and taxes	0.0009
Depreciation	0.0091
Interest charges	0.0025
	0.4518

Compressed-air punching machines, output for year 99,207 gross tons.

	Per Ton
Labor	0.4810
Material	0.0211
Insurance and taxes	0.0095
Depreciation	0.0132
Interest charges	0.0036
	0.5284

These two examples cannot be taken as a general average, because in the instance quoted where chain machines are used, the mining conditions are rather exceptionally favorable. In the other case, where punching machines are used, the conditions are about the same as the general average in that field.

Unprofitable Production

Notwithstanding the progressiveness and energy displayed by the operators of the central Pennsylvania field, they have for the past four years labored under insuperable difficulties, due to the great increase in producing capacity of mines in this and competing fields where the cost of production by reason of more favorable mining and geological conditions, is lower. It is contended by many of the operators in central Pennsylvania that they do not enjoy as fully as they should, the natural advantage the region has in lying nearer to the seaboard and the New England market than any other considerable field of bituminous coal. Based on the belief that the freight rate is discriminatory against central Pennsylvania, as compared with coalfields farther west, the Operators Association has recently brought a complaint before the Interstate Commerce Commission, from which it is hoped relief in this matter will result.

It is quite well known that in addition to this region others in the bituminous fields are suffering in like manner. The prices realized under the keen competition leave little or no margin of profit. It quite frequently happens that coal operators in preparing their cost statements, do not give sufficient weight to the items of "depletion of coal reserves" and "depreciation of plant and equipment," in other words, the monthly and annual statements of any coal-mining operation should invariably carry an item for amortization of capital account. This, of course, must vary according to the conditions at each particular colliery, but it should, under no circumstances, be omitted. Otherwise, the operator is almost certain to deceive himself.

Photographing Mine Maps

Mine maps should be made on more than one scale for convenience in handling, as well as for the psychological advantage that a small map fades the incidentals and brings the broad economic features to light. The larger companies are now photographing their big maps to reduce them to a more reasonable size, and to permit the filing of their records in a book about the size of a large sheet of typewritten paper, and an inch or so thick. The scale favored is 500 ft. to the inch.

The original to be photographed should be a tracing or map with unimportant details omitted. These details in a mine map will be the coal thicknesses, station marks, levels, progress dates, etc. The camera is set at a distance from the map so proportioned to the focal length of the lens that the reduction of the map is in some even proportion. The ratio can be so satisfactorily adjusted that old and new prints can be placed together, the break barely showing on the drawings.

The Consolidation Coal Company, Fairmont, W. Va., was one of the pioneers in the introduction and use of photography in coal-mine engineering. This company keeps its records as white prints and the officials are considering the construction of a graduated track on which camera display boards can be slidden, the lighting being by two pairs of mercury vacuum lights, in two reflecting cases set one on each side of the drawing.

Coal Handling at Power Stations

By Charles H. Hughes*

The handling of coal at power plants forms an important item in the total cost of power. The coal-handling equipments of four large New York plants are described. These are typical modern installations of recent design.

*82 Beaver street, New York.

One of the first considerations in locating a power station is accessibility from railroad and water connections, so that coal can be brought to it either by land or by water or if possible by both. The economical handling of coal is an important item in the cost of generating steam, which in turn affects the earnings of a company and the dividends which it can pay the stockholders.

The number of men employed should be kept at a minimum, and mechanical means adopted wherever feasible. Yet it is possible to use so many automatic and complicated devices that their cost may even exceed that of employing a large force of men; so the engineer, in laying out an installation, should make a careful study of the various steps necessary to get the coal from the car or barge, to the bunkers, selecting either men or machines, accordingly as they appear best suited for getting the coal to its destination in the quickest and most economical manner.

The coal-handling equipments described below were designed for some of the largest and most important power stations in New York and vicinity, and all, except the one at the Bush Terminal which is under construction, are in successful operation.

Hudson & Manhattan Railroad Power Station

The station of the Hudson & Manhattan Railroad, at Jersey City, N. J., supplies electric power for operating the trains in the Hudson companies' tunnels, connecting New York, Jersey City and Hoboken. It is advantageously located, being not only in the center of the distributing system, but also accessible to the railroads entering Jersey City, which makes it possible to ship coal directly from the mines to the station.

At present the station contains eight 900-h.p. Babcock & Wilcox boilers, the complete installation calling for 16. The boilers are all on the same level, and over them are the bunkers, having a capacity of about 4000 tons. Coal is dumped from the cars into hoppers, from which it is taken by conveyers and skip hoists to the bunkers. There are two separate duplicate systems, each having a capacity of 60 tons an hour.

FIG. 1. CABLE SYSTEM WORKING IN COMBINATION WITH HOIST AT PENNSYLVANIA RAILROAD POWER STATION, LONG ISLAND CITY

Referring to Fig. 2, cars are run into the low building in the foreground, and the coal emptied into the hoppers below, of which there are four, two under each track. As the systems are in duplicate, two of the hoppers belong to one system and two to the other. Each hopper is provided with a pusher feeder for regulating the flow of coal onto two (one for each system) 30-in. Robins belt conveyers, which rise at an inclination of 20 deg. to the tower in the station about 100 ft. away from the cars. The belts are driven by an electric motor.

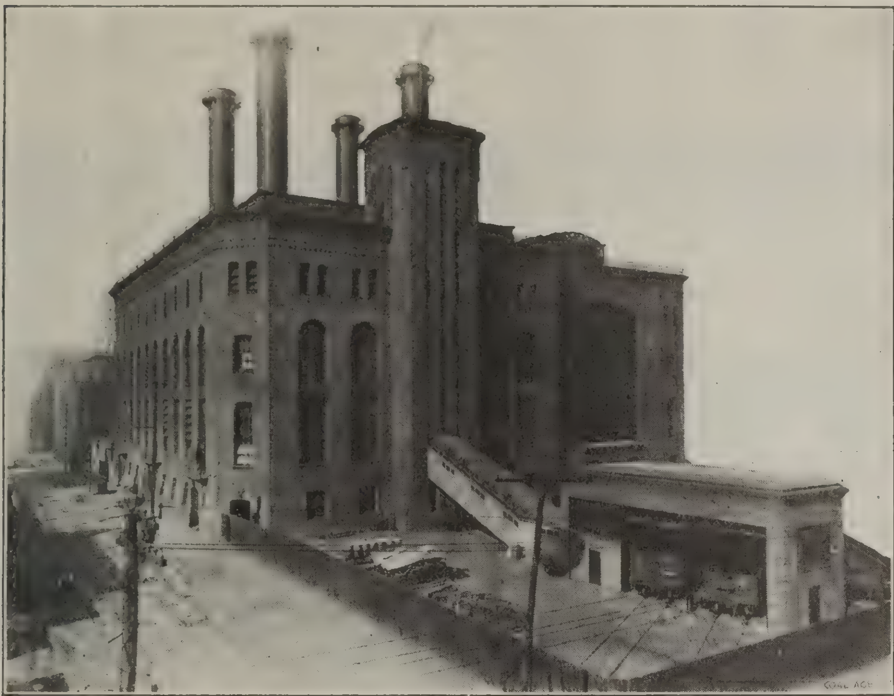


FIG. 2. POWER STATION OF HUDSON & MANHATTAN RAILROAD AT JERSEY CITY, N. J.

When the coal reaches the tower it falls from the belt into a hopper, at the bottom of which is a grizzly that separates the large pieces from the small, the large going through a crusher and meeting the small in another hopper. This hopper has gates communicating with either one of two weighing hoppers.

After weighing, the coal is dumped into receiving hoppers, provided with gates feeding into skips. These skips are raised 125 ft. to the top of the tower, and then discharged into the main distributing hopper. The gates in the receiving hoppers are opened and closed by the skip-hoist cars, the hoist being electrically operated.

The distributing hopper has spouts which feed into each wing of the station. The distributing conveyers of each wing are alike and consist of two 14-in. Robins belts running longitudinally over the bunker on opposite sides and a 16-in. belt which supplies one of the 14-in. conveyers just mentioned. Where necessary, automatic trippers are installed to discharge the coal into any desired part of the bunker, as shown in Fig. 3.

Either one of the systems, or both, can be operated by one man standing near the weighing hopper scales which are located in the tower at the basement or street level.

FIG. 3. BELT CONVEYER OVER BUNKERS AT PLANT OF HUDSON & MANHATTAN RAILROAD COMPANY

COAL POCKET FOR THE BUSH TERMINAL

The coal pocket shown in Fig. 7, located at the Bush Terminal, Brooklyn, N. Y., has a capacity of 3500 tons, the coal being used in the power station and for other purposes. The building is of reinforced concrete, the bins being elevated so that wagons can be driven beneath them.

The coal is brought in on the railroad track which runs parallel to the pocket at an elevation of about 9 ft. below the driveway, and is discharged from the cars to a scale weighing pit. From this pit it is drawn off by valves to a feeder, which fills the conveyer buckets running below it, and is so constructed that no coal is spilled during the operation. By means of the conveyer, the coal is elevated and discharged into the bins.

The conveyer consists of a number of sheet-steel buckets 30 in. wide and 35 in. on centers, suspended between steel links 17½-in. centers and carried on 20-lb. T-rails by 6-in. wheels. Each bucket can hold about 300 lb. of coal, and when running at a speed of 40 ft. per min., the conveyer has a capacity of approximately 120 tons of coal per hour.

On the vertical runs, the rails and guides are omitted, as the conveyer hangs in a plumb line. At the corners or turns are two revolving wheels, Fig. 4, mounted on the same axle, and suitably supported by brackets. These wheels engage the 6-in. rollers on the conveyer chain and are revolved by them, thus reducing the friction to a minimum. The buckets always hang in a vertical position between the revolving wheels.

An interesting feature of this installation is the fact that on the vertical run

of the buckets the chain is twisted at an angle of nearly 90 degrees. Thus, the buckets shown in Fig. 4, which is a view at the bottom turnwheel, are, at the top, turned at right angles to the position shown. This is one of the important features of the Hunt conveyer which is here used.

The driving mechanism located over the pockets, Fig. 7, consists of a pawl driver, run by a belt from a 25-h.p. electric motor. Intermediate between the pawl driver and the pulley, are accurately cut gears, which are entirely incased in an oil-tight compartment and run in a bath of oil. Pawls on the driver engage studs between the links on each side of the conveyer in such a manner that a continuous and smooth motion is given to the chain. Variation in the length of the links, due to wear, does not affect the smoothness of running.

Referring to Fig. 5, which well illustrates the driver, it will be noticed that just in front of the driver a bucket is being discharged. This is accomplished by a dumper, several of which are placed along the upper run of the conveyer. The dumper consists of two cams which are mounted on a shaft and engage cams on both sides of the buckets. The conveyer, moving along the track, causes each bucket to successively engage a dumper, thereby emptying the bucket. A dumper can be attached anywhere along the line and can be easily disengaged by throwing back the lever, which remains in this position without further attention until required again. This coal-handling machinery was built and installed by the **C. W. Hunt Co.**, West New Brighton, N. Y.

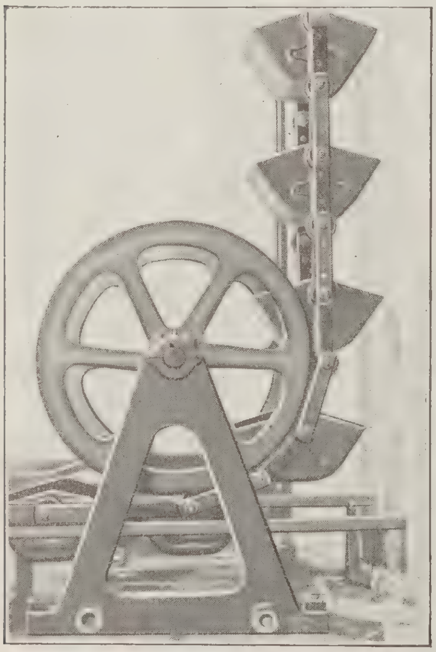


Fig. 4. Hunt Bucket Conveyers, Bush Terminal, Brooklyn

Long Island City Power Station

The station located at Long Island City, on the East river, which furnishes the electric energy for the Pennsylvania tunnels, is one of the largest in the country, having an equipment of 32 Babcock & Wilcox boilers. It is of the double-decked type, the boilers being set in batteries of two, eight batteries on the first floor and eight on the second directly over those below. Over the second tier of boilers is the coal bunker.

To design a coal-handling plant for a station of this size, required careful study on the part of the engineers. Since the station was located on the East river, advantage was taken of this fact, to bring in the coal by barges. From these it is hoisted and run into the bunkers by means of a cable railway.

A steel tower (shown on front cover of this issue of Coal Age) was built on the dock. In the lower closed portion, is an engine for hoisting a two-ton clam-shell bucket from the barge to the boom on the tower, an engine for opening and closing the bucket, and another for running it, after it has been hoisted, to the discharge hopper in the tower. The top of the tower is 190 ft. above the dock, and the boom 170 ft. above the water. The machinery for hoisting and trolleying was designed and installed by the Robins Conveying Belt Company. The

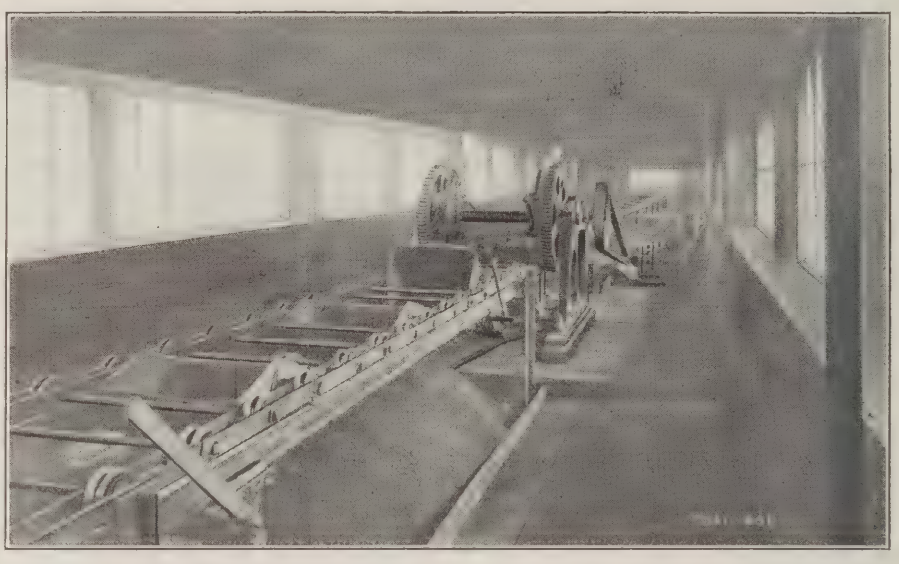


Fig. 5. Showing a Driver and Conveyer Buckets Operated by an Electric Motor

Fig. 6. Coal Is Conveyed from Tower to Power House on Two Inclined Robins Belt Conveyers

bucket can make a round trip in 45 sec., that is, it can be filled, hoisted, emptied and dropped in that length of time. The tower is operated by one man.

On the upper part of the tower is another inclosure, in which is a hopper, and below it a crusher. Chutes from the crusher take the coal to a weighing machine, and then to the delivery hopper.

A Steel Bridge Is Used

From the tower to the power station, a distance of about 500 ft., is a steel bridge over which cars are drawn by a cable, as shown in Fig. 1. The cars, after being filled at the tower, travel over the bridge, enter the top of the power house, pass down one side over the bunkers, make a half turn at the far end, pass along the other side and then cut onto the bridge again, which at the tower has another half turn. A car travels about 2500 ft. in making a complete trip.

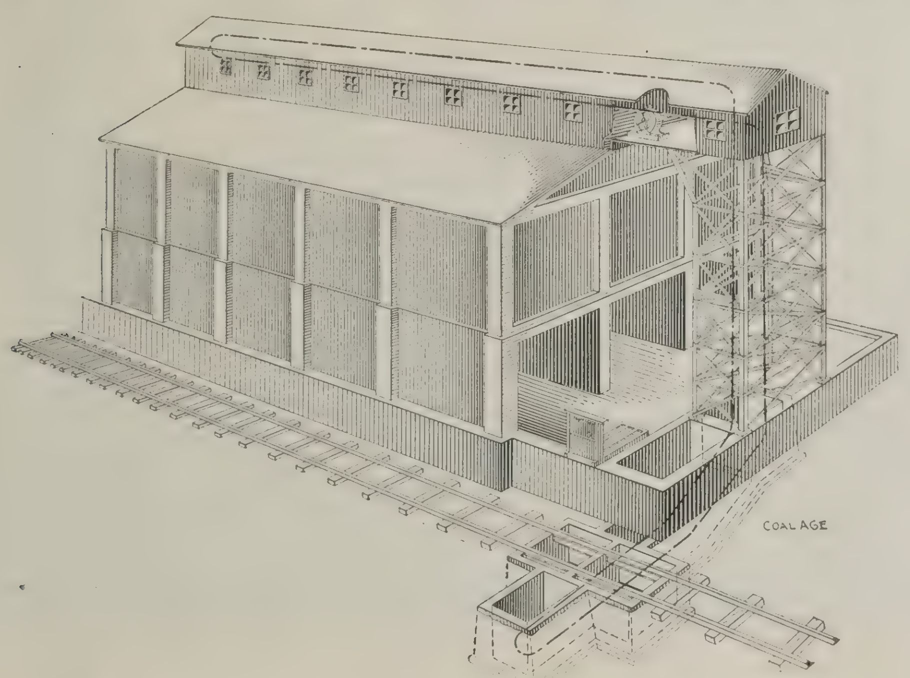


Fig. 7. Reinforced-concrete Coal Pocket at Bush Terminal, Brooklyn

When a car is to be filled at the tower, its clutch is temporarily released from the cable and the car stopped under the feed hopper, the doors of which are opened by the operator. As soon as the car has been filled, the clutch is thrown in, and it travels along with the cable, to the bunkers. At various places over the bunkers are trippers which catch projections on the cars and open the doors on both sides, the coal dropping in two streams into the bins below. As soon as the car passes over the tripper, the doors are automatically closed and the car continues around the track to the tower on the dock. In discharging, the car is not stopped but travels on as if still loaded. The trippers can be placed anywhere, so that any desired bin can be filled.

The cable railroad, when operating 29 cars at a speed of 180 ft. per minute, has a capacity of about 150 tons of coal an hour.

Kingsbridge Power Station

Still another type of coal-handling equipment is in use at the Kingsbridge power station of the Metropolitan Street Railway Company. This station, like the one at Long Island City, has its boilers arranged in two tiers, the bunkers being over the upper tier, and is located near the water so that coal is brought to it by barges.

From a tower, Fig. 6, extends a boom, about 100 ft. above the water. This supports a bucket that is raised and lowered by a steam engine, and drawn by another engine to and from the tower. In raising the bucket a speed of 1500 ft. per min. has been obtained, but under normal conditions three trips per min. are generally made. The tower has a capacity of 200 tons of coal per hour.

The coal after being raised and brought into the tower is discharged into a crusher, and thence into a hopper that in turn discharges onto two Robins belt conveyers which enter the station at an incline, and are housed as shown in Fig. 6. It will be noticed that the housing is at the center of the building. One of the inclined conveyers discharges onto two conveyers extending to the right over the bunkers, and the other onto two running to the left over bunkers, the coal in each being piled up into two separate piles. By means of trippers, the coal can be discharged at any desired point.

Electric Lamps in Mines

R. A. S. Redmayne, the British chief inspector of mines, as a result of the Whitehaven explosion, became convinced of the adaptability of electric safety lamps for use under certain conditions. At his request Robert Nelson, the electrical inspector of mines, was commissioned to investigate this subject. It is believed this is a matter of general interest to coal men and a brief summary of Mr. Nelson's report is given here.

The main disadvantages of electric lamps, apart from some constructional defects, is that they will not, without a cumbrous and delicate attachment, detect the presence of explosive gas. Then there is the switching difficulty, some of the lamps having an external switch which may spark in making and breaking. Several ways of overcoming this are possible:

1. To use a lamp with a liquid battery, so designed that the light is switched on or off by simply turning the lamp over. Such a lamp may be made cylindrical in shape so that if held, or placed with one end uppermost it lights, but if held with the other end uppermost it is dark.

2. The battery may be of the ordinary dry "primary" type. It would be easy to arrange a pair of contacts, fixed inside on the bottom of the lamp, with a corresponding pair of contacts on a loose dry cell. Then, again, when the lamp is upright it will light, placed bottom uppermost it will be dark.

With either of the above lamps, Mr. Nelson explains, the possibility of igniting gas would only occur if a lamp bulb should be broken in an explosive mixture. With the battery cracking or breaking the outer glass *alone* is not immediately dangerous.

A further constructional defect it is desirable to remove is that most electric safety lamps give a sort of search-light effect and a rather worse general lighting effect than an ordinary oil safety lamp.

In conclusion Mr. Nelson says the disadvantage of electric safety lamps named above, as far as he is aware, can only be minimized at present, not removed. An apparatus on the same principle as the Holmes Alderson electrical firedamp detector* (which is automatic in its action) might be utilized in each district worked by electric safety lamps. A few of the electric safety lamps in use, those in the hands of deputies, might as a means of occasionally testing for gas be fitted with firedamp detectors.

The total capacity of the anthracite storage plants of the United States is a little over 5,500,000 tons, or nearly 8 per cent. of the anual production.

*The Holmes Alderson automatic firedamp cut out was described in *The Engineering and Mining Journal* under date of March 4, 1911.

The Adrian Mine Explosion

By R. Dawson Hall

This explosion resulted in the death of eight men. Six succumbed to afterdamp and two were killed by the violence of the blast. The cause of the explosion is mysterious, but it may have resulted from a short-circuit following a roof fall.

The Adrain mine is situated about two miles north of Punxsutawney in Jefferson county, Penn. The explosion, which occurred there on the morning of Thursday, Nov. 9, as the men were entering the mine to go to work, was of a mild order, but resulted in the death of eight men. Two of these were killed by the violence of the explosion and six others, working about ¾ of a mile away, and located in another split, were overcome by the noxious gases contained in the afterdamp and died before they could be reached.

Description of the Mine

The mine was opened in 1886. Adrian was one of the best equipped mines in the section at that early date. But today it lacks that outward pretense and exhibit of permanence which characterizes

Power Houses and Fan at Adrian Mine

modern mine developments. It is needless to add that since the time of its opening, a quarter of a century ago, there has been extended development until today the workings cover roughly some 8000 acres. The mine is operated by the Rochester & Pittsburg Coal and Iron Company.

The coal bed mined is the Lower Freeport. In this mine the average thickness of the bed is 6 ft., though there are occasional places where the coal runs as low as 3 ft. 2 in. and as thick as 7 ft. For those who are not well acquainted with central Pennsylvania, it may be added that the coal is a bituminous bed of good quality and excellent for coking. It lies near water level at Adrian and is reached by a slope of which the portal can be seen in an accompanying illustration. The mine is situated 8 miles west southwest from Sykesville, where an explosion occurred on July 15 of this year, causing the death of 21 men. An account of this disaster appeared in the Prospectus number of Coal Age.

Adrian had an explosion about 15 years ago and two men belonging to an exploring party were killed. Edward W. Robinson, who was then superintendent, nearly lost his life on that occasion. Many years ago there was some trouble with gas in the 9th Left and in the 8th Right. In the latter heading, operations were suspended till the men were supplied with safety lamps. An erosive fault appeared and to its occurrence the presence of gas was, with good reason, attributed.

The Last Mine Inspection

The recently appointed inspector, T. A. Furniss, soon after his appointment, knowing that there was gas in mines nearby, determined to make a complete examination of Adrian mines. He was especially anxious to determine the condition on the tops of falls and in abandoned sections of the mine. He noted and recorded all his observations, which covered from 50 to 60 separate places. In all he was unable to find gas. He spent four days at Adrian, Sept. 1, 5, 6 and 7, and some weeks in nearby mines. In Adrian he found no gas and reported that the ventilation was good in all sections.

The fan is a Capell, 16 ft. in diameter with blades 8 ft. wide. When the inspector made his report the fan was making 130 r.p.m. and producing a water gage of 1.8 inches.

The air at the fan measured 102,375 cu.ft. per min., and was divided into six splits as in the following table:

AIR COURSING ADRIAN SPLITS

Split No.	Cubic Feet per Minute at Last Cross-cut	Men in Split	Cubic Feet per Man at Last Cross-cut
1	12,864	49	262
2	19,384	55	333
3	12,296	60	204
4	15,696	54	290
5	10,080	41	354
6	21,600	70	308

The Origin of the Explosion

For a long time after the explosion there was an expectation that its origin would be discovered. It was confidently reported that Mike Dehannis, cutter, and Paul Sinoski, his scraper, were the innocent causes of the disaster, but now that they have been found, the tendency is toward placing the source of the ex-

plosion elsewhere, perhaps at a point a quarter of a mile from where their dead bodies were discovered.

It is customary to find a cause for all explosions, that cause being often determined by the personal predilections and needs of the investigator. Here, however, if neither Sinoski nor Dehannis set fire to the gas the explosion must have been due to short-circuiting of a haulage wire or possibly to the leaving of dynamite or caps within the mine, despite the fact that the use of dynamite is forbidden except for the shooting of rock headings. The cause is in any event not obvious. There was no fire in the mine before the explosion. There was probably none immediately afterward and none has been discovered. The explosion is a mystery, not alone in that the cause is not known, but because a cause is hard even to imagine.

The mine inspectors failed to find gas after the explosion though they made diligent search for it. Every effort will be made to ferret out the cause. The officials of the company desire to know it so as to safeguard the mines against a possible repetition of the disaster. The miners of Adrian are mostly foreigners, but many have grown up with the mine and it is a mystery to them how the explosion occurred. The men are all of a high type of citizenship; cleanly, hard-working, self-respecting, gradually absorbing the favorable surroundings of their environment.

Dehannis and Sinoski

It is a rule at Adrian mines that the entrance to the mine be protected by adequate locked gates till 6 a.m. These gates are guarded by a watchman. Meantime the mines are examined by the firebosses. This rule was followed on Nov. 9, the firebosses being William Haddick and William Maloney. Among the first to enter were Dehannis and Sinoski. They were working in the 13th Left which is reached by way of the 12th Left through a cross haulway known as the 6th East.

They did not, however, follow the regular haulway to their places, but went by way of the 12th Left and 10th East.. One man reached a point 50 ft. beyond the intersection of these headings. The other was found about 500 ft. further and was probably considerably in the lead. When they were at these points, the explosion must have occurred. Neither man was burned or even scorched. In fact, had they been five minutes later they would not have been killed by the force of the blast, for they were on the very edge of the territory where the severity of the explosion died out. But the gust threw one man flat on his face, where he lay till he was found with his face in the mud. The forward man was possibly thrown some distance and fell with his arm over his face, his skull being broken, his arm fractured and the heel of his rubber shoe cut off. Both men showed by their blackened appearance that much coaldust was being driven through the headings by the expelling current.

The Other Victims

Other men, whose work lay in the 2d East, off the old 9th Left, entered the mine about the same time as the two men mentioned. It appears that some arrived at their working places, stripped off their coats and started to work. About that time the explosion probably occurred. One man, Angelo Fornio, who escaped, declared that no noise was heard, but states that he was thrown against the timbers with sufficient force to raise a lump on his head. It appears that pails and coats in hand, the miners hastened down the heading. They were all foreigners.

How to Act in Afterdamp

From the survivers, who represented themselves as at first passed by others, it appears that those who ran the fastest were more speedily overcome. Those who left with moderate speed did not increase their pulse rate or enlarge the capacity of their inspirations or the number of their lung movements per minute. They therefore inhaled and absorbed less carbon monoxide and were enabled to travel further, passing seven of their companions lying prostrate along the heading. It has been said that due care not to hurry or in any way overwork in the presence of afterdamp is to be counselled, because hurry stimulates the lungs and the heart, and moreover draws heavily on the vitality of the impetuous runner or overworker.

Two men had presence of mind enough to stop, dip their handkerchiefs in the tea contained in the tanks of their dinner pails and carefully wrap their mouths with the damp rags. They are living to recommend such precautions to others.

The Motormen

The motormen arrived later. By that time, there was an appearance of smoke near the foot of the slope. This was accompanied by the smell of burning from the explosion. Some said it was merely fog and that the smell arose from the smoldering of a short-circuited, rubber-

Showing Head of Slope, Storage Bin for Ovens, and Abandoned Power Houses

covered cable. The boss motorman turned off the power, believing that such a broken circuit had actually occurred. But the men were not disposed to go in, the fog becoming denser, the smell stronger and the smell not resembling in any way the odor of burning rubber. Those who did go in soon concluded that safety lay in leaving the mine.

It must be explained that the ventilation is being provided by a blowing fan and the air consequently passes around the workings, using, as has been said, six splits, and leaves the mine by the main haulway. Thus the men entering the mine passed into the return airway. This must have contained much afterdamp, although the explosion having short-circuited the air in the affected districts, the afterdamp was being but slowly removed. In fact, it may be fair to assume that the air circulated mainly where the impurities were least in percentage. The brattices, which were all constructed of wood, were blown down over an area conservatively estimated as being a half mile square. Two doors perfecting a single stopping were down and the air of the explosion area was circulating its foul products through another split. The return, where all or part of the other four splits were discharging was not dangerously befouled by the afterdamp, and was used freely by the rescuers.

Improvised Rescue Corps

Anthony Goodlick and Mike Zuby and another foreigner induced Fred Hall to take them in on his motor, and together the four made a dash to save the seven men that Goodlick and Zuby had passed in leaving the 2d East. They gathered up an Italian, Fornio, and hauled him to the main slope, where he was transferred to a car and drawn up to the surface. Later he was successfully resuscitated. Three plucky men returned and started to bring out two others. Zuby and Goodlick caught hold of the prostrate forms and started to drag them to the motor. But the afterdamp, hard physical labor and increased heart action from excitement had already combined to weaken them. Leaving their friends for whom they had risked so much, they returned to the slope mouth in order to save their own lives and none too soon, for on reaching the main entry they fell down, Goodlick first and Zuby shortly afterward.

Official Rescue Work

Robert Maloney, the mine foreman, started to lead a rescuing party as soon as the news reached the surface. But every moment the return air was getting more foul, and he could not reach the places where the men were known to be.

The rescuing parties were soon augmented by the arrival of A. W. Calloway, general superintendent, R. B. Dick who superintends Adrian mine, and T. A. Furniss, the inspector of the 12th Bituminous District of Pennsylvania, of which Adrian forms a part. They built many canvas stoppings and, succeeding in driving the air up to the crosscut nearest to Room 22 in the 13th Left out of the 6th East, T. A. Furniss entered the above room. Returning, he found the others sitting silently along the side of the heading. There had been a fall somewhere, a large cave, which Mr. Furniss did not think boded them any good, and he spoke to the rest of the party about it, but no one answered, all being seemingly under a spell. Shouting to them, he roused them from their stupor, so that one and all followed his advice and example and proceeded to leave the vitiated heading as soon as possible, but thoughtfully keeping tally of each other.

Some think the air-current was reversed, but if so it was only temporarily. Probability favors the idea that the cave dislodged the afterdamp from the faces of rooms, which the newly established current of air in the heading had by no means, so far, swept clean. Fortunately Maloney managed to reach a door which, once opened, permitted a cleansing draft to sweep directly down the heading or otherwise it is to be feared that as too often happens, a rescue party would have contributed to the death roll. The party succeeded in making its way to the intake and were attended by the physicians at the mine mouth. Firebosses Haddick and Maloney, and D. Fleming, superintendent of the Eleanora shaft and John Metro nearly succumbed to the toxic action of the gas, but the opening of the door with its clean gust of purer air gave them strength enough to get out.

On returning to the surface, Furniss discovered that the Government Mine Rescue Car had not been wired for; all those present having such an earnest desire to see what *they* could do, that they overlooked the equipment at their disposal. At four o'clock the car was sent for. At that hour another corps entered the mine but at five o'clock all were withdrawn exhausted, the tally being taken to see that all, totaling 59, came out.

Inspectors Furniss and Lowther with a few men entered the mine at 8 p.m., exploring the 2d East out of 9th Left. They found the bodies of six men. These bodies were hauled to the surface later with the aid of the corps from the U. S. mine rescue car. Search was resumed for Dehannis and Sinoski, but without result.

Government Rescue Car

The rescue car of the Bureau of Mines arrived shortly after 11 p.m. The 4:15 p.m. train on the Buffalo, Rochester & Pittsburg Railway was held for it for half an hour, but being late it lost time all along the road and arrived two hours behind schedule. J. T. Ryan, the engineer in charge, had a crew of four men. At 11:30 they entered the mine, having four oxygen helmets and a pulmotor. They also had canary birds with them. When the canary bird with the foremost observer gave unmistakable signs of the presence of afterdamp, that section of the party retreated to better air. Four donned their helmets and explored the face of the 13th entry and the last two rooms. It was anticipated that the men would be in these rooms and their machine was found at that point, but no trace was found of their bodies. The party then returned to the limit of circulation. Under Inspector Lowther's supervision the circulation was carried up to the face and thereupon the remaining seventeen rooms were in-

View of Slope Portal at the Adrian Mines

spected without helmets, advance being made with canary birds as indicators.

For two nights and a day, with crews of men turning over rock falls the company endeavored to find Dehannis and Sinoski, but without success. Men do not always remain in their places and the most unlikely places were searched, with almost as much diligence as the more probable. They were supposed to be the igniters of the gas or coaldust and the center of violence concentrated around the rooms it was their duty to cut. So 13th Left was searched with closest scrutiny.

At last, questioning their agency in the explosion, inquiry was made as to their habitual way of going to work and they were soon found, uncovered and easy to be observed, close by roads which had been much traveled by searching parties.

COMPANY STORE AND POST OFFICE AT DELANCEY, PENN.

The Mildness of the Explosion

One fact shows conspicuously in the annals of mine disasters in Clearfield and Jefferson counties. All explosions are comparatively mild. The DuBois, Sykesville, Eleanora, Ernest and two Adrian explosions were all of light character. This explosion lifted two cars partly off the track, blew down rock and demolished wood brattices; but partly because of its unlimited chance for expansion and partly because the coaldust did not materially aid its operations it did not manifest any force at the fan, which continued its revolutions without cessation. The relief door was off, and light slats were nailed over the opening. These were not blown away.

The Rochester & Pittsburg Coal and Iron Company are extremely anxious to avoid explosions. Inspector Furniss on his appointment suggested the introduction of clay-stemming and permissible powders. The company readily agreed to install the first at once and the second as conditions warranted. Many men were using permissible powders at Adrian at the time of the explosion. But as has been seen, the explosion arose from other causes than blasting.

Illinois Coal Mining Statistics

The following is a summary of the Illinois coal statistics for the fiscal year ending June 30, 1911, prepared by the Bureau of Labor Statistics.

During this period the Illinois mines have produced 50,165,099 short tons, which is an increase of nearly 1,500,000 tons over that of the previous year. Of this amount 13,025,663 tons were mine-run coal, and 19,588,409 tons were lump coal, the remainder being egg, nut, pea and slack.

The average value per ton of all grades at the mines was \$1.101, which is an increase of about 10c. above that for last year. The aggregate home value of the total product was \$56,034,494, which is an increase of about six million dollars above that for the previous year.

There are 845 mines and openings of all kinds; of this total, 184 were opened during the fiscal year, and 217 were abandoned. The average number of days in active operation for shipping mines was 169, which is 10 less than for the year previous.

The number of mining machines in use during this period was 1430 and the number of motors in use underground was 316. These figures both show appreciable increases over that of the year previous. The number of tons undercut by machines was 20,191,865, while the number of tons mined by hand was 29,973,234 tons.

The total number of employees at the mines doing this period was 77,410, which is an increase of nearly three thousand over that for the same period last year. Of this number 70,973 were employed underground, and 39,912 were miners.

The average price paid per ton for hand-mining was 62.7c. which is an increase of exactly 3c. above that for the same period last year. The average price per gross ton for machine mining was 49.4c., which is also an increase of nearly 3 cents.

The number of men accidentally killed at the mines was 157, of which 149 were killed inside the mine. Eliminating the large loss of life at the Cherry disaster, these figures both show appreciable increases over that for the same period of last year. The number of men so badly injured as to lose a month or more work was 709, which is a reduction over that for the same period last year.

The number of tons mined per life lost was 319,523, and the number of employees for each life lost was 493. The number of deaths per thousand employed was 2.03, and the number of men killed for each million tons produced was 3.1, which is identically the same as for last year, eliminating the victims of the Cherry disaster.

Nation's Coal Production

The United States Geological Survey has issued its annual coal chart, showing the production of coal by States from the year 1814 to 1910. The figures relate a wonderful history of growth. In 1814 a total of 22 tons of coal was produced in Pennsylvania. In 1815 the percentage of increase was good, but still only 50 tons were taken out. By 1825 over 100,000 tons were mined in the two States producing. In 1850 the figure had reached 7,018,181 tons. In 1876 it was 53,280,000 tons. At the end of the century it was 269,684,027 tons. In 1905 it was 392,722,635 tons. In 1907, which it was supposed would remain the record year for some time, the production was 480,363,424 tons, but in 1910 the enormous total was reached of 501,596,378 short tons, a production larger by far than that of any other country in the world. So steady has been the increase in American coal production that most of the years have been record breakers. The total production since 1814 has been approximately eight and a quarter billion tons.

The greatest difficulty in the manufacture of briquets is to secure a cheap binder. When the difference between the price of slack and first-class coal averages \$1, the cost per ton of briquetting must not exceed this amount, which means approximately 40c. for manufacture and 60c. for binder.

Breathing Apparatus

The following table gives the conclusions of the British Royal Commission on the efficiency of breathing apparatus. English specialists are inclined to look upon breathing apparatus rather as an assistance to recovery work than as an actual life saving agency. The commission considered the Draeger apparatus heavy and uncomfortable to wear, hot and liable to catch on rough surfaces or timbering. Experience has shown the ½-hour Draeger to be more practical for use under mine conditions than the two-hour form as it weighs less, about 14 pounds as compared with 42 pounds, is cooler, does not interfere so much with the eyesight, has no chin valve to close, is quicker to adjust and there is no trouble from adjusting a helmet to the face. It is also better adapted to such work as renewing stoppings, etc.

CONCLUSIONS AS TO EFFICIENCY OF BREATHING APPARATUS

Apparatus	Weight in Pounds	Oxygen Capacity in Liters and Cubic Feet Lt.	Cu.Ft.	Removal of Carbonic Acid Gas	Supply of Oxygen	Air Tightness	Comfort and Convenience
Pneumatogen type III	14½	163	(5.8)	good	poor	good	Very good
Draeger	36–39	251	(8.9)	good	good	good	bad
Westfalia	36	274	(9.7)	bad	good	good	good
Fleuss	31	228	(8.0)	good	good	good	good
Weg	about 30	150	(5.3)	good	good	good	good
Aerolith	22			fair	good	good	very good

A Barometer for Mines

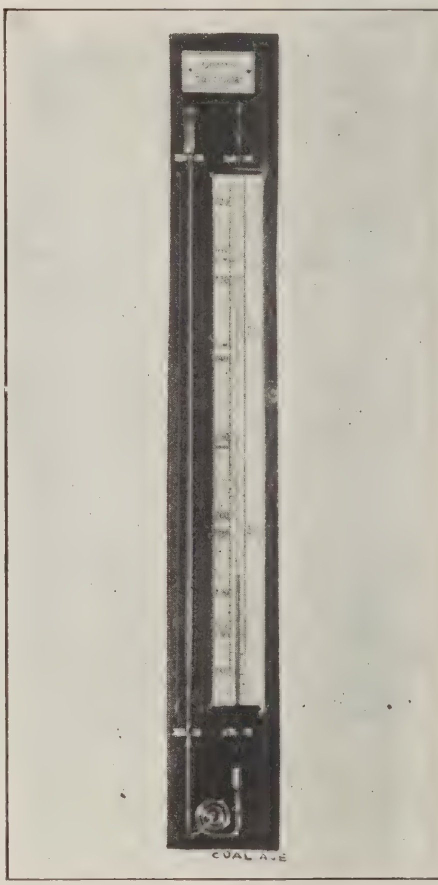
The important influence which the state of the atmosphere has upon the conditions of safety in coal mines, particularly where these mines are of a dry or gassy nature, is well known to every practical colliery man. It is the custom, in the coalfields of Great Britain, to issue colliery warnings by means of the public press, when the barometric conditions are such as to render an increase of danger probable, and every colliery manager recognizes that a careful study of the barometer is one essential of safe working.

For this reason it is of interest to refer to a barometer of increased sensibility which has been developed by the mining faculty of the University of Manchester, England, under the direction of Prof. G. H. Winstanley, whose work in mining research is so well known. This, as made by Otto Baumbach, is shown in the illustration. The feature of this barometer, known as the "Contra," is that the movements of the mercury siphon barometer are magnified through a light liquid. This liquid rests on the lower mercury column, which terminates in the narrow capillary tube, seen to the right of the figure, and which is provided with a suitable scale. The spiral, which is the only difference in shape from the ordinary siphon barometer, is only inserted to act as a safety trap, in order to prevent the light liquid from diffusing into the vacuum of the upper mercury chamber.

It is, of course, evident that the readings of the liquid in the narrow capillary tube are caused by the mercury in the lower siphon, and hence these readings are in reverse order to the readings of an ordinary mercury barometer. The graduation, which is from ten to twelve times as long as that of an ordinary barometer, is calibrated so that the readings in all parts of the scale coincide with those of the standard barometer. They can be observed easily at a distance. Each interval (10 to 12 mm. long) corresponds therefore with one millimeter on the mercury barometer.

The chief advantage of the "Contra" barometer is the readiness with which the smallest change in atmosphere pressure can be observed during unsettled weather. The ease with which it can be read renders it eminently suitable for use in connection with mines, while for most purposes it is well adapted to the requirements of laboratories.

In installing the barometer, it is placed vertically on the wall and a stopper, which in transit is placed on the top of the capillary tube, is replaced by a dust protector. A tap, which is provided to secure the liquids during transit, is then opened and the light liquid, which for convenience in reading is colored red, is allowed to come to a standstill. The barometer is then brought very slowly to a slanting position in order to allow all the small portions of mercury and red liquid to combine, after which it is brought back to the vertical position.



The Contra Mine Barometer

It is very important that while the barometer is in operation it should not be taken from its position on the wall. If, however, from any cause, the barometer has to be moved, it is brought very slowly to a slanting position until all of the mercury has filled the left-hand tube, after which the tap, which is used in transit, is closed. It is most important to bring the barometer slowly and gradually from the vertical to the horizontal position, in order to allow the mercury to fill the top of the left-hand tube. With these precautions in moving the instrument, the apparatus works in a perfectly satisfactory manner, giving greatly magnified scale readings which are a distinct asset to the mine manager.

Resistance of Iron to Rust in Concrete

According to the *Review Scientifique*, xlix, 1, 23, an old building in Hamburg was recently demolished, from which the behavior of iron inclosed in cement could be judged. This was an old gasometer, the foundations of which rested on several pillars. The iron anchors were immersed in cement grouted to a good thickness. The 60 bars, each 2½ m. long, which formed the anchors, were examined. and were found to be perfectly well preserved. They still showed their outer bluish skin and no trace of rust. This gasometer was built between 1852 and 1855, so the iron bars had been fully 50 years in the concrete. This protection from rust can be explained by the fact that the dampening of the concrete had produced a strongly alkaline reaction, and that iron, when surrounded by alkali, is inoxidizable.

Experience has shown that it is unwise to put trust in even a good system of vaporizing to lay mine dust and prevent the extension of explosions, where extensive gobbing is practised, as wide gobs mean the accumulation of much dust which cannot be effectively dampened by any known system of wetting.

The Appointment of Firebosses

Special Correspondence

Great Britain is contemplating the passage of stringent laws regulating the appointing of firebosses. Particular attention is to be given the physical qualifications of the applicant, especially as regards eyesight and hearing. The matter is being actively debated, not only by the labor organizations, but the owners' and managers' associations as well.

There is abundant evidence that the mining people in Great Britain are taking a real and deep interest in the Coal Mines Bill. The terms of this bill, as amended by the select committee, will be discussed generally and in detail by the House of Commons ere this bill is passed on to the House of Lords for formal and final ratification—if, indeed, such stage is reached by the present Parliament.

The Proposed Law

As an example of the interest and excitement aroused, it may be mentioned that many educational authorities have been arranging special courses of instruction on mine gases and gas testing, the growing importance of which is emphasized by the conditions imposed by clause 15 of the bill, which now reads:

(1) A person shall not, after Jan. 1, 1913, be qualified to be appointed, or to be a fireman, examiner or deputy[1] unless he

(a) is twenty-five years of age or upward, or is the holder of a first- or second-class certificate of competency, and

(b) has had at least five years' practical experience underground in a mine, of which not less than two years shall be at the face of the workings of a mine, and

(c) has obtained a certificate from a mining school, or other institution or authority approved by the Secretary of State, as to his ability to make accurate tests, so far as practicable, with a safety lamp, for inflammable gas, and to measure the quantity of air in an air current, and that his hearing is such as to enable him to carry out his duties efficiently, and

(d) has within the preceding five years obtained from such approved school, institution or authority as aforesaid, or from a duly qualified medical practitioner, a certificate in the prescribed form to the effect that his eyesight and hearing are such as to enable him to carry out his duties efficiently, the expense of obtaining which shall, in the case of a person employed at the time as fireman, examiner or deputy, be borne by the owner of the mine;

Provided that:

(i) the requirements of paragraphs (a) and (b) shall not apply to any person employed as a fireman, examiner or deputy at the date of the passing of this act; and

(ii) a person shall not be required to obtain a certificate as to ability to make tests for inflammable gas, or as to eyesight, if he is employed in a mine in which inflammable gas is unknown.

(2) The certificate as to eyesight and hearing of a fireman, examiner or deputy employed in a mine shall, while he is so employed, be deposited with the manager, who shall, whenever required to do so by the inspector, produce the certificate for his inspection.

[1]In various centers this underground official is designated fireman, examiner or deputy.

As Viewed By the Miners

As compared with the requirements of the existing act of 1887, the qualifications required by this new clause are looked upon as revolutionary. Many of the present-day firemen anticipate that their positions as officials will be lost under the "eyesight" and "hearing" tests, which they accordingly condemn. This will mean the appointment of new men to fill the vacancies, necessitating so far as they are concerned, a course of instruction in mine gases, etc. This is the cause of the extensive preparations now being made, and in certain quarters it is being whispered that even if the new coal-mine bill fails to pass the House of Commons, the Home Secretary may put through an order covering the points contained in clause 15, and thus insure the raising of the qualifications of the firemen. If it should happen that such a procedure is followed, the order made will be as binding as though it were embodied in the principal act, as is exemplified by the explosives in the coal-mines order.

It is not surprising, therefore, that the matter is attracting considerable attention, not only among the educational authorities, but the Association of Colliery Firemen, who are also actively discussing it. In various parts of the country there are colliery firemen's associations in existence, which are combined in one national federation some twelve thousand strong, having as one of their main objects the raising of the standard of education among colliery firemen. The Lancashire Association, in September, engaged instructors to give the needful tuition at three different centers in the county, and therefore, the members should have no difficulty in retaining their posts should clause 15 become a law.

A Mine Inspector's Views

In Yorkshire, classes for colliery firemen have been held for some time, and J. Mellors, H. M. Inspector of Mines, attended a gathering at Wakefield when the certificates were presented. He found that all the men had risen from the ranks, and he told them he felt proud to be able to hand certificates to men like that, because, with the certificates they would be better miners and citizens. It was matter for regret to find, in the course of his calling as a mine inspector, that every man was not able to detect gas in the safety lamp. Miners, when aware of the presence of gas in the mine, should have a wholesome appreciation of their danger and go out, or to a place of safety. Further, he hoped they would go on and fix a high standard, as there were men who had risen from the ranks to the position of general manager, and that ought to be encouragement to them.

Mr. Mellors told how he had been obliged to walk a distance of 10 miles to attend a technical class. Now there are classes for miners everywhere, education being literally thrown at them, and there is no reason why any man with energy, should not rise to be a colliery manager if he will put his shoulder to the wheel and take advantage of the educational facilities now offered.

The Royal Road to Success

"Therefore," Mr. Mellors said, "persevere, and let your guiding star be safety of life and limb." He remarked that they are practical men, and should qualify to be scientific as well. One of the brightest stars they had, not only a Bachelor, but a Master of Science, was, only a few years ago, working at the coal face. It was a proud thing to be able to rise from the ranks. There was no difficulty about it other than self-denial. It could not be done, however, if they had three or four things all proceeding at once; to succeed they must have but one object in view. The one royal road to success was downright hard work. If miners all worked with that object in view, there would be fewer of the lamentable accidents which they read about today. If men would only qualify themselves to distinguish the safe places from the unsafe, they would be able to look after themselves without having to trust to deputies.

VIEWS OF THE MANAGERS

When the members of the South Staffordshire branch of the Colliery Managers' Association met on Sept. 25, President J. W. Liddell referred sympathetically to the objects sought to be attained under the new coal-mines bill. A distinct change has taken place since the time of Lord Shaftesbury's agitation on behalf of the miners, and since the time when Mr. Tremenheere was appointed by the home office to inquire into the conditions of mining life. Female and child labor have been abolished and restrictions upon mine working have been enacted by the legislature.

Nevertheless it is alarming to know that the death rate has gone up in recent years. The authorities are anxious to arrest the upward tendency, and with that idea they all concur. The new bill is an attempt to create conditions in regard to mining work, which will tend to enhance the safety of the miners. It seeks to place the miner in a position which will make his dangerous calling less hazardous. A law of this kind is a benefit upon the whole community, and Mr. Liddell sincerely believed the bill in its final form would, in a far greater measure than its predecessors, fulfil its grand objective.

W. G. Phillips, in discussion, acknowledged the fact that modern practice in mining, especially the large increase in the areas worked, sometimes covering as much as 10,000 acres, renders new legislation necessary, the introduction of electricity alone making such a change almost imperative. Clearly, wherever the gaseous condition of the air renders safety lamps necessary, there should be no exposure to electricity. Mr. Phillips believing that no motor has been invented which can be so used with safety.

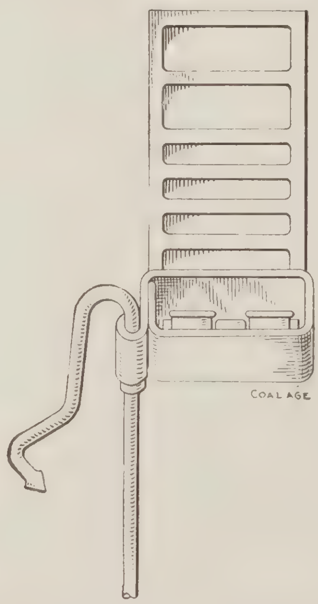
The general committee of the Colliery Managers' Association, according to the message of D. E. Parry to the members, are cordially approving everything which they believe will promote safety, and they propose communicating with the home secretary to secure redress in any matter which they consider will operate unfairly on managers as a class. In particular they propose to take steps to insure that a manager whose certificate is suspended for any reason should have the right to appeal, and they have also considered whether he should not have the right to continue to act as manager while that appeal is pending.

The divisional inspector of mines, Hugh Johnstone, although unable to discuss there any of the details of the Mines Bill, heartily congratulated the managers on the action they are taking. In an earlier bill, while the coal owners and workmen were strongly represented, when the bill was before the House of Commons, there was no such representative of the managers, because it was supposed their interests and those of the colliery owners were identical. Mr. Johnstone felt then that a great deal of responsibility was thrown upon the colliery manager, which would not have been placed upon him if he had been as ably represented in Parliament as the other interests.

A Simple Firedamp Detector

SPECIAL CORRESPONDENCE.

A very ingenious and novel firedamp detector which has been provisionally protected in Great Britain, is the invention of J. G. Guy, the resident manager of Wardley colliery in the county of Durham, and we are able to show its construction in the accompanying figure. The device consists of a sleeve with a combined divided screen, made from one piece of material, attached to the wick pricker of the safety lamp. The sleeve embraces the wick tube, and when moved upward the flame of the safety lamp is reduced to a mere speck without the slightest risk of losing the light, which usually happened by the ordinary method of drawing down the wick; the normal flame being quickly regained by drawing down the sleeve.



SHOWING DEVICE THAT MEASURES THE PERCENTAGE OF GAS

The divided screen well behind the flame, enables the "blue gas cap" to be easily measured, and the percentage of the gas present can therefore be estimated with facility. Reference to the illustration will give a clear idea of the invention without further description.

This ingenious contrivance has been seen and used by many of the leading mining engineers in Great Britain who speak highly of its simplicity, utility, and adaptability, and has been used by the inventor and his officials with the most satisfactory results. It is easily applied to any flat wick burner and is quite inexpensive. This simple and effective method of detecting firedamp must, in all cases where it is introduced, greatly increase the safety of working and tend to prevent disastrous explosions in coal mines.

Results of Experiments in France

Taffanel, the French expert, urges that the practice, frequently recommended, of watering in front of shot holes in dusty mine galleries, may be classed among the measures for preventing the initial ignition of the dust. Experiments have shown that the risks accruing from blownout shots are considerably lessened by this precaution.

As a general conclusion, Mr. Taffanel says: "Other conditions being equal, dry coal dust will be more dangerous in proportion as it is finer in grain. In galleries or working places where the dimensions of the finest particles are 1 to 2 mm., no coal-dust explosion can be produced by the more ordinary initiating causes, though an explosion can be propagated there as the result of a violent initial explosion occurring in a more favorable environment as regards dust, or started by firedamp or by the detonation of a store of explosives.

"Then again: Other conditions being equal, coal dust rich in volatile matters is more dangerous than if the content of the latter be small. No explosion can be produced by the ordinary initial causes in a dust deposit where the content of volatile matters does not exceed 18 per cent., though it may be propagated there as the result of a violent initial explosion occurring over a portion of dust deposit richer in volatile matters, or started by firedamp or by the detonation of a store of explosives. Coal-dust explosions developing, as the sequel of a powerful initial explosion, in a dust deposit unfavorable to propagation, are naturally less violent and more easy to arrest than those propagated in a favorable deposit."

Coal Production in Ohio

Ohio has produced more coal than any other State except Pennsylvania, Illinois and West Virginia. Since coal mining began in Ohio, in 1838, according to the United States Geological Survey, the State has produced 581,189,306 short tons, the figures showing an almost steady increase. In 1850 the production was 640,000 tons; in 1870 it was 2,527,285 tons; in 1890 it was 11,494,506 tons; in 1900 it was 18,988,150 tons; in 1905 it was 25,552,950 tons, and in 1910 it was 34,209,668 short tons.

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This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

Testing the Fireboss

Attention is invited to the article on "The Appointment of Firebosses" appearing in this issue. Among the qualifications required are clearness of vision and good hearing.

As an instance of the vital importance of this subject, the disaster at the Globe colliery in England may be cited. This appears to have been directly due to the inability of a fireboss to detect 3 or 3½ per cent. of gas; at a subsequent test made by a government inspector, it was found that 31 out of 41 firebosses were incapable of detecting a like percentage.

The fireboss may be compared with the locomotive engineer, being directly responsible for such a large number of lives. As is well known, the engineers on our larger railroads are required to pass rigid eyesight tests, to insure their ability to distinguish the colors of lamps and brightly painted boards. On the other hand, the fireboss, often working under the most adverse conditions, and required to distinguish minute fluctuations of a hardly perceptible flame, is seldom subjected to any such test.

To the compilers of our State mine laws, is recommended the method of testing adopted by the government in British Columbia, whereby the exact percentage of gas the applicant is capable of detecting is accurately determined.

Safety in Mines

So much has been written on the subject of safety in mining that were it not for the grave importance of the question and the frequent misapplication of the term to some improved form of appliance or device, an apology would be due our readers. In some of its uses the word safety has become a misnomer, and has a tendency to deceive the unwary and confiding worker who must use the device.

Safety in coal mining means immunity from danger, accident, hurt or loss of any kind. A *safety* appliance is any device the proper use of which will lessen the danger of accident to man or machinery. Such are the safety lamps, safety gates, safety catches, safety blocks and a thousand other so called safeties.

To the general mind the word as here applied has a far greater significance than its use in this connection warrants. A safety lamp is only safe, in the presence of gas, when it is in perfect condition and properly handled by a competent person and not subjected to conditions beyond its power of resistance. Under other conditions than these a safety lamp is not only *unsafe* but positively dangerous.

Likewise, safety gates that are too frail or insecure in their attachments, or safety catches on cages that would fail to operate in time of need are a menace to safety, because they inspire a false feeling of security. A full knowledge of a present danger is the surest safeguard, because such knowledge suggests at once the remedy or at least admonishes caution. Automatic devices that tend to diminish the vigilance, the care or the caution of the person or persons in charge of life and property, invite danger and increase the risks of operation instead of diminishing them.

Many mine managers and superintendents have rejected and refused to install overwinding devices at the mines in their charge, because of their firm conviction that such a device installed at a hoisting shaft tends to make, and in most cases does make, the hoisting engineer less watchful, cautious and on his guard. The apparatus appears to work so perfectly that the engineer comes at length to rely wholly upon its operation, and himself becomes an automaton; till suddenly some sad day the spell is broken by the failure of a single part of the mechanism, and the inevitable happens. It is all done in a twinkling, but the results of that moment's unguardedness on the part of that engineer are fatal to the lifetime happiness and comfort of the widows and fatherless, made such by the accident.

Some years ago, a mine-signaling system was suggested by an engineer of standing, by which it was hoped to be able to indicate in the mine office on the surface, the gaseous condition of the mine workings whenever such condition became dangerous. The impracticability of the scheme was discussed by mining men everywhere and the effort to install the system in mines was defeated and finally abandoned. Recently, another attempt has been made to patent a somewhat similar system for the detection of dangerous quantities of explosive gas in the mine chambers, and giving the alarm at the surface. Such systems have for their ultimate tendency the elimination, in whole or in part, of the work of the fireboss or mine examiner.

All like attempts to eliminate the human factor by replacing human consciousness with an automatic mechanical device, however ingenious, jeopardize the safety of the mine just to the degree that official care and watchfulness are decreased. There is no question but that there are many helpful and desirable automatic devices adopted and in use at many mines. Our remarks refer only to such devices as are designed to transfer the responsibility for the safe operation of mines from the certified officials to the uncertain operation of a machine, which might result in finding no one responsible for loss of lives when, in truth, the responsibility should rest on the mismanagement shown in the adoption of such device.

The adoption of different forms of automatic mine doors, in order to cut out the expense of trappers, has resulted in the accidental death of many drivers and the loss of many valuable mules. The failure of the device to work, in such a case, leaves but a meager chance for the escape of either the driver or the mule, especially if the door is located on a slight grade or at the foot of a grade, which should never be done.

Our desire in this brief article is to draw the attention of mine managers and superintendents to the importance of so regulating every operation, in and about the mine, as to fix, beyond doubt or question, the responsibility for accidents that may be foreseen as possible and liable to occur through lack of faithful and thorough inspection. The duties of each official should be clearly defined and his instructions so given that the responsibility for any ordinary accident cannot be shifted.

We would further impress upon miners the fact that any so called *safety* appliance to be *safe* must be properly used. The term safety does not mean exempt from danger. The fact that a safety appliance is necessary at all should warn all persons of the danger to be avoided, and should urge upon every mine employee the need of caution.

Corrosion by Mine Water

Acid mine waters eat freely into bodies of concrete exposed to them, especially if the concrete is mixed stiff. When mixed with an excess of water, the necessary reactions in the cement appear to take place, resulting in a concrete which has more power to resist sulphuric acid. This acid combines with the earthy elements, such as calcium, setting the silicic acid free. The severity of action on stiff mixed concrete seems to be diminished with time. The portal of the Hoffman tunnel near Frostburg, Md., through which much mine water passes, was eaten into below the water line, nearly two inches in the first two years. After that time no further ill resulted. And in the Georges Creek field, it has been found that concrete mixed with excess of water, always shows considerable resistance to corrosion.

In the anthracite field, marked instances are to be found of the corrosion of concrete, which was mixed so wet that the water rose to the tamped surface. It must be remembered that the waters of the anthracite field are often unneutralized by the action of natural limestones, and though harmless in appearance, are nevertheless incredibly active. A concrete breaker, erected in 1905, shows much corrosion, as does also a concrete tank in which sulphur water is stored.

The most harmful effect is to be found in the uncovering of reinforcement. The tension face of a beam should always be carefully protected, where corrosive action is feared. It has been shown in a large number of experiments that no reliance can be placed in the tensile strength of the concrete alone and that as soon as strained to its point of endurance it cracks, in fine hair-like crevices, invisible to the eye, except where aided by the presence of water, in which case the cracks are clearly lined out. When a beam is loaded therefore, so that the tensile deformation exceeds that which the concrete can endure, cracking must take place, even though the reinforcement may carry loads many times as great as those imposed. Thus a safe beam may be so creviced that corrosive waters have a good chance to work on the strengthening rods and that chance is enhanced when the covering they receive is but slight. This leads to the suggestion that the iron in ferro-concrete should be placed further within the whole mass, additional concrete being used to secure this result, wherever corrosive waters are to be encountered, as, for instance, in the washing department of a breaker.

It might be argued that concrete being porous, corrosive waters will penetrate whether the integrity of the concrete is or is not destroyed by strain. But it is more than probable that the virulence of the waters is neutralized by the outer layers of concrete and that glassy impervious silica is deposited on the outside, preventing further decomposition. The whole question of corrosion due to the action of mine water is one that the U. S. Bureau of Mines might well subject to experiment.

Government Appropriations

During the last 20 years, the Government has appropriated amounts varying from 20 to 40 million dollars per annum for the Department of Agriculture. While we do not begrudge this department its generous appropriation, and appreciate that it has been the means of accomplishing enormous results, we do feel the amount, as compared with that alloted the mining industry, is entirely out of proportion.

The appropriations to the Department of Agriculture are for commercial purposes, while an appropriation to the Bureau of Mines means increased efficiency not only in the conservation of natural (and exhaustible) resources, but to *human life*. We do not believe that commercial problems are due a greater consideration than is given to the protection of our workmen.

COLLIERY NOTES and COMMENTS

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

Slabbing or "taking up a skip" should be strictly forbidden as it often results in a loss of coal as high as 50 per cent., besides calling for an excessive use of timber. It also results in dirty coal and is dangerous and expensive.

Tests have shown that some weathered lignites make excellent briquets. The future may see lignite slack take its place beside bituminous slack and anthracite screenings as a material for the manufacture of briquets on a commercial scale.

In tests made at the mining-experiment station at Pittsburg, bituminous-coal dust through a 200-mesh sieve floated on a strong current of air, and caused an explosion when there was only 0.032 oz. of it per cubic foot of air, or one pound per 500 cu.ft. of air.

When robbing pillars see that each fall is of sufficient size, the cars removed and the timbers drawn before the strata loosen, as this lightens the weight on the next pillar. This method prevents excessive weight on pillars, increases the safety of the workmen and tends to give a high percentage of recovery.

The successful robbing of pillars depends to a large extent upon the mine boss. He should make a careful daily inspection of all pillars and should be present himself or send an assistant when falls are made, so as to be able to decide upon the amount of coal that can be taken out without danger from the overlying strata.

The yield per foot acre of anthracite coal was recently determined by Judge Newcomb, of Lackawanna county, Pennsylvania, in a case of the Delaware, Lackawanna & Western Railroad Company versus the County Commissioners. The subject was in dispute for some time, but it was finally decided that the yield per foot acre is 1225 tons.

Ventilation has much to do with determining the life of mine timbers. Poorly ventilated, moist, air passages and gangways are always productive of decaying timbering. In such cases preservation treatment gives good results, though it in no way benefits timber subjected to wear, such as drum lagging, wooden rollers, etc.

When a new hoisting rope is purchased the maker should be required to furnish a certificate of test, both of the wire used and a sample length of the finished rope. The tests should be of as comprehensive character as possible, embracing tensile, torsional bending and fatigue tests. All the details should be freely set forth in the certificate.

Uniform mining laws, as far as local conditions permit, throughout the coal-mining States of the union, would do much to add to the safety of the occupation. The miners are constantly moving from one camp to another, and from State to State, and the wrong methods of one State are easily and quickly introduced into another State. Uniform laws would do much to overcome this spread of unsafe practices.

When crushing coal for briquetting purposes be careful not to get it too fine or additional binder will be necessary. It will also be harder to fire although making a better appearance in the market because it will have a smoother surface and will not weather easily. See that the coal is not crushed to a uniform size or much more binder will have to be used. About 56 per cent. of the material used should consist of grains ¼ in. in diameter.

When possible all mine employees should be instructed as to the danger, prevention, cause and the most effective method of fighting mine fires. Mine managers should see that all possible means are adopted to control the strong drafts often found in shafts, entries and haulage roads as they are a source of great danger in case of fire. Foremen should be drilled in withdrawing the men from the mines, and the individual miner should receive instruction on the subject.

The disadvantages of dump storage for anthracite coal are; excessive breakage; the impracticability of rescreening, and high cost of operation, which amounts to 20 to 25c. per ton. Such storage should be considered as suitable for steam sizes only. Trestle storage should never be used if it possibly can be avoided, as it gives a high percentage of breakage, is costly to maintain, has a relatively small capacity, and rescreening is difficult. It should never be found outside of yards doing a small retail business.

A good storage plant should be capable of screening all coal before shipment, preparing all screenings for sale or briquetting, handling frozen coal by means of hot water and have an ample drainage system; storing all sizes in bins or spaces by themselves; and rapidly handling any and all the sizes. Such plants should also be so located that enlargement can be made as necessity demands. The first cost per ton of capacity should be low. The trackage through the plant should be more than sufficient to handle the expected tonnage and minimum breakage in stocking and reloading should be the motto of all such plants.

A single-stroke style of signal bell is preferable to the trembler style as it is more easily heard. Distinctness is the first and greatest requirement of a signal system. Much of the efficiency of a signal depends upon the quality of the equipment and the perfection of installation. All wires should be incased in wooden casings if the mine is dry or in iron piping in the case of wet mines. In deep shafts a junction box should be located near the middle of the shaft to facilitate the localizing of defects in the wire and help in its support. Wire used in a shaft should be insulated with lead covering and incased in smooth piping to protect it from injury. Only dust, gas and damp proof bells should be used in gaseous mines, for an ordinary bell is exceedingly dangerous in a gaseous atmosphere.

The burning qualities of briquets, the flame produced, the smoke given off and the completeness of combustion depend largely upon the shape of the briquet and the nature of the binder used. Briquets should be of such shape as to insure a good circulation of air. The binder should not contain too high a percentage of constituents having a low boiling point or it will distil away before the briquet is heated to ignition and give off the smoke and odor which should be absent from the burning of the perfect briquet. Inorganic binders and also starch, molasses and sulphite liquor are smokeless. Tar pitch and petroleum residues, if not carefully regulated, will produce smoke and odor, but if the shape of the briquet is such as to allow a good circulation of air through the bed of fuel, thus enabling a more nearly complete combustion to take place, the smoke given off will be less than that produced by the coal from which the screenings were derived.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

Effect of Regulators in Splitting

A total of 8000 cu.ft. of air is passing through three airways *A*, *B* and *C*, with a water gage of 1.7 in. All areas are the same; but the lengths of the airways are: *A*, 6000 ft.; *B*, 10,000 ft., and *C*, 21,000 ft. It is desired to increase the quantities in *B* and *C* so as to make each of the three airways pass an equal quantity of air. (a) What effect will it have on the water gage? (b) In what proportion will the resistance be increased in *A* and *B* when the change is made? (c) If *B* and *C* each get as much air as *A* gets now, what will be the total increased circulation?

Puritan, Penn. H. M. M.

Power on air before change is made

$$Q\,p = 8000\,(1.7 \times 5.2) = 70{,}720 \textit{ ft.-lb. per min.}$$

Natural division of air, before change: Assuming that each split has the same cross-section, the perimeter (o) and area (a) are constant for all the splits, and, since the pressure is the same in each case, the quantity of air passing in each airway is inversely proportional to the square root of the length of the airway. The relative lengths 6, 10, 21 can be used in this calculation; thus,

$$\left.\begin{array}{ll} \text{Split } A,\ 6{,}000 \text{ ft.}, & \dfrac{1}{\sqrt{6}} = 0.4082 \\ \text{Split } B,\ 10{,}000 \text{ ft.}, & \dfrac{1}{\sqrt{10}} = 0.3162 \\ \text{Split } C,\ 21{,}000 \text{ ft.}, & \dfrac{1}{\sqrt{21}} = 0.2182 \end{array}\right\} \text{relative potentials}$$

$$\text{Sum of potentials } 0.9426$$

$$\left.\begin{array}{ll} A, & \dfrac{0.4082}{0.9426} \times 8000 = 3464 \\ B, & \dfrac{0.3162}{0.9426} \times 8000 = 2684 \\ C, & \dfrac{0.2182}{0.9426} \times 8000 = 1852 \end{array}\right\} \text{cu.ft. per min.}$$

$$\text{Total quantity } 8000$$

Assuming the power on the air remains constant, it is proposed to place regulators in splits *A* and *B* so as to equalize the air in all the splits; and the question asks what effect this will have on the water gage. It is necessary, first, to find the total quantity of air that the same power will pass in these three splits after the regulators are placed in *A* and *B*.

Since the quantity and the pressure are to be the same in each split after the regulators are in place, the power ($Q\,p$) will be equal in each split; or $70{,}720 \div 3 = 23{,}573$ ft.-lb. per min. Now, as there is no regulator in the open split (split *C*), the quantity of air passing in this split is proportional to the cube root of the power on the air. In other words, the quantity ratio is equal to the cube root of the power ratio; thus, calling x the new quantity passing in split *C*,

$$\frac{x}{1852} = \sqrt[3]{\frac{23{,}573}{1852\,(1.7 \times 5.2)}} = 1.129 +$$

$$x = 1852 \times 1.129 = 2090 + \textit{ cu.ft. per min.}$$

(a) Since for any open split the pressure or water gage varies as the square of the quantity of air passing, the water-gage ratio is equal to the square of the quantity ratio. Then calling the required water gage after the change x,

$$\frac{x}{1.7} = 1.129^2 = 1.275 +$$

$$x = 1.7 \times 1.275 = 2.16 + \textit{ inches.}$$

(b) Since the sectional area (a) is not changed, the resistance ($p\,a$) in *A* and *B*, and in fact throughout the mine, will be increased in the same ratio as the pressure or water gage, or as

$$\frac{2.16}{1.7} = 1.27 \textit{ times.}$$

(c) The total quantity of air circulating in the mine would be, in this case, $3 \times 3464 = 10{,}392$ cu.ft. per minute.

Timber Framing for Side Pressures

We are having a lot of trouble with our timbering because of the softness of the coal, which throws all the weight against the sides of the posts. The roof is a

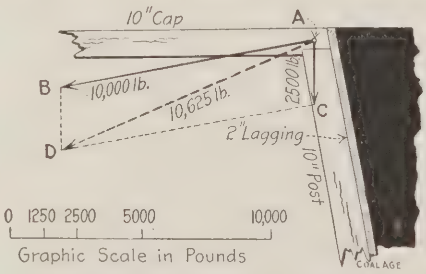


DIAGRAM OF FORCES IN A TIMER SET

hard, sandy shale which seldom breaks, but settles hard on the pillars, squeezing them out against the posts. We use 2-in. lagging on the sides and 10-in. caps and posts.

We do not know what the pressures are, but think the side pressure is about four times that on the caps. In order to make the joint of the cap and post right, we would like to know the resulting direction of two pressures acting this way.

TIMBER FOREMAN.

The condition is not an unusual one in coal mines and the problem may be readily solved graphically. To fulfil the prescribed conditions a side pressure of 10,000 lb. on the posts and a vertical load of 2500 lb. on the cap will be taken, and it will be assumed that these loads act at the joint of the cap and post.

Draw the center lines of the post and cap, and at their intersection *A*, Fig. 1, draw *A B* perpendicular to the center line of the post. Make this equal to 10,000 lb. according to the graphic scale. Draw *A C* perpendicular to the center line of the cap, making it equal to 2500 lb. Now complete the parallelogram by drawing *C D* parallel to *A B*, and *B D* parallel to *A C*, and to the intersection *D*, draw *A D*, the resultant. *A D* shows the direction of the resultant of the two forces acting on the cap and post, and by scaling the length we find it equal to 10,695 pounds.

As will be noted, this resultant lies close to the roof and it would be interesting to hear from our correspondent, and others, as to the best method of framing timbers under these conditions.

Which Is Better, Fuse or Squibs

I have long been accustomed to use a good quality of double-tape fuse, in blasting coal, but am told that it is much safer to use a squib. Kindly give me your opinion, as I think a good coal paper should explain this matter thoroughly.

A MINE FOREMAN.

Our correspondent will find the use of fuse and squibs in blasting coal quite fully explained on page 131 of COAL AGE, Nov. 4, under the headings, "Safety in Blasting in Mines," and "Hangfires in Blasting with Fuse." We would simply add here, *never* use fuse when a good safety squib can be procured. The reasons why the use of squibs is safer than that of fuse are the following:

Squibs are less liable to injury, or to contain imperfections that would cause the shot to misfire, or at least to hang fire for an indefinite period of time. A good squib, properly used, is more positive and reliable in its action, less subject, in its use, to the dampness of the mine, and permits the hole to be tamped quicker and better than fuse. Squibs are cheaper than fuse. They do not permit an unscrupulous miner to overcharge his hole and escape the possible chances of trouble, which he can often do, to the jeopardy of his fellows, when fuse is allowed.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Handling Mine Cars in Pitching Seams

In anthracite mining, owing to the nature of the formation, the seams or "veins" of coal, as they are commonly called in Pennsylvania, are more or less highly inclined. The steep inclination of the haulage slopes or the roads in the chambers, makes the handling of the mine cars dangerous and calls for special and careful consideration in order to avoid, as far as possible, the accidents that occur so frequently, in this regard.

The mine foreman in a pitching seam is constantly confronted with the question of what will be a safe grade in an entry where mule haulage is employed; or, in what direction should the chambers be driven with respect to the pitch of the seam in order that the cars may be safely handled by the miner in his room. As the pitch of the seam increases, the chambers are often driven at a greater or less angle with the strike of the seam or the gangway, so as to reduce the grade of the roads in the chambers. When, however, it is impossible by this means to obtain a safe grade for handling cars in the chambers, the mine foreman must decide what means can be adopted to lower the cars more safely from the face of the chamber to the gangway. These are interesting questions, that are more easily solved when we understand a few of the principles involved. Some of these principles will be briefly explained in the following:

First Principle—Cars Moved by Gravity—Gravity Pull

The force of gravity acts vertically downward. This force acting on the car gives it weight. When the car stands on a level track, see Fig. 1, the weight of the car acts in a direction perpendicular to the track, and is wholly balanced by the resistance of the rails. There is, in this case, evidently, no force acting to move the car along the rails.

When the car is on an incline, see Fig. 2, the weight of the car OW still acts vertically downward, but is not now perpendicular to the track. In this case, the weight OW is resolved into two forces; one OP parallel to the track, and the other ON perpendicular to the same. The force OP acts to move the car along the rails and is the *gravity pull;* ON is the *normal pressure* of the car on the rails, and is wholly balanced by the resistance of the rails.

From the construction of the figure, angle $PWO =$ angle $WON =$ angle of inclination of road CAB;

$$OP = OW \sin PWO;$$

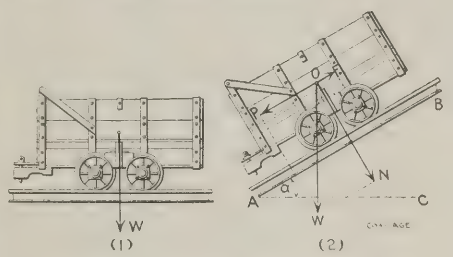
$$ON = OW \cos WON.$$

Rule—On any inclined plane or road the gravity pull equals the weight of the car multiplied by the sine of the angle of inclination of the road. Normal pressure on rails equals the weight of the car multiplied by the cosine of the angle of inclination of the road.

Example—What is the gravity pull of a loaded car weighing 3 tons, on an incline when the angle of inclination is 30 degrees; and what is the normal pressure of the car on the track?

Solution—The weight of the car is $3 \times 2000 = 6000$ pounds.

Gravity pull, $6000 \times \sin 30 \text{ deg.} = 6000 \times 0.5 = 3000$ pounds.



Showing Forces Acting on Car

Normal pressure on rails, $6000 \times \cos 30 \text{ deg.} = 6000 \times 0.866 = 5196$ pounds.

Second Principle—Movement of Car Resisted by Friction—Friction Pull

When starting a car there is always a certain resistance due to the inertia of the car and adhesiveness of the moving parts that may be considerable. This starting friction cannot be estimated accurately, as it varies greatly. It may be several times the actual rolling friction when the car is in motion.

What may be called, for our purpose, the *rolling friction*, however, is more uniform. It may be estimated closely as a fraction of the normal pressure of the car on the rails. If the track or road is level, or has only a slight inclination, the frictional resistance or *friction pull* is a fraction of the weight of the car. On an incline, however, to be accurate, this must be multiplied by the cosine of the angle of inclination of the road.

The friction pull always acts parallel to the track and in a direction opposite to that in which the car is moving; it is represented by OF in Fig. 2. The ratio of the friction pull to the weight of the car or the normal pressure on the rails, as the case may be, is called the coefficient of friction. In mining practice, the coefficient of friction may vary according to the condition of the rails and wheels from $\frac{1}{50}$ to $\frac{1}{25}$; or, expressed decimally, 0.02 to 0.04. Calling this coefficient c, we may assume for an average value, under ordinary conditions of mine-haulage roads, c equals 0.025, making the friction pull $\frac{1}{40}$ of the weight of the moving load or the normal pressure on the rails, as the case may be.

Friction pull, level road,

$$OF = c \times OW.$$

Friction pull, inclined road,

$$OF = c \times ON = c \times OW \cos a,$$

in which a is the angle of inclination of the road.

Example—What would be the friction pull, in ordinary mining practice, of the 3-ton loaded car mentioned in the previous example, (a) on a level haulage road, (b) on a haulage slope having an inclination of 30 degrees?

Solution—Assuming the coefficient of friction as $c = 0.025$,

(a) Friction pull, level road,

$F = 0.025 \times 3\ (2000) = 150$ *pounds.*

(b) Friction pull, 30-deg. slope road,

$F = 0.025 \times 6000 \times \sin 30$ *degrees.*

$F = 0.025 \times 6000 \times 0.5 = 75$ *pounds.*

Note—(1) On an incline, the friction pull is always less than on a level road, for the same load. For the same load, the friction pull decreases as the angle of inclination increases, but not in the same proportion. In a vertical shaft, the friction pull is practically zero. (2) On a level road, the friction pull is equal to the drawbar pull; but on an incline, the drawbar pull of an ascending car or trip is equal to the sum of the gravity pull and the friction pull.

Example—Assuming the same value for the coefficient of friction as before, what is the drawbar pull of the 3-ton loaded car mentioned in the two previous examples, (a) on a level road, (b) on a slope of 30 degrees?

Solution—(a) Drawbar pull, level road,

$P = F = 150$ *pounds.*

(b) Drawbar pull (30-deg. slope),

$P = 3000 + 75 = 3075$ *pounds.*

Note—On a level road, or a slope road, the drawbar pull is always the pull on the haulage rope. It should be carefully noted, however, that when cars are being lowered on an incline, engine plane or gravity road, the load on the rope is

equal to the gravity pull less the friction pull; because, in this case, the cars are moving down the incline, while, in the example given above, the car was being hauled up the slope. When hoisting the friction pull acts in the same direction as the gravity pull, but when lowering the cars, the friction pull acts in the opposite direction to the gravity pull.

MINE ENGINEER.

Birmingham, Ala.

From the Ranks

A Fireboss' Suggestion

As I have had a good deal of experience in firebossing in mines in the Pittsburg district, I want to write a few lines and hope you will publish them in your paper as I am a subscriber and reader of COAL AGE.

A fireboss is a man who must get out of his bed, in the dead hour of night, whatever the weather may be, and proceed to examine the mine or district in his charge. It is dangerous work, and must be done and the mine reported safe before the men are allowed to enter for the day's work.

When an explosion occurs, as it will at times, and the fireboss is killed, many say it was because he did not do his duty properly. Those who are so quick to lay the blame on the poor fireboss do not understand the peculiar conditions under which he is obliged to work. He must obey the law or he is liable to be arrested and prosecuted by the mine inspector. Also, he must do what the company wants or he will be discharged. In many cases the company wants to get along without doing all the law requires.

There are many firebosses who are afraid they will lose their jobs, and are willing to do anything that the mine foreman or superintendent asks, and run the risk of accident and the consequences of the mine law. Some of these men are personal friends of the officials, and work to suit them without regard to the law, or their own individual responsibility under the law.

The mine law (bituminous, 1911), Article 5, Section 6, makes the fireboss responsible for a "false report" of the condition of any place or portion of a mine allotted to him for examination; and for such "misdemeanor," makes it the duty of the mine foreman to suspend him and report his name to the mine inspector for prosecution. This act virtually shifts the responsibility for the security of the mine and the safety of the men from the fireboss to the mine foreman; for what mine foreman, having gotten his firebosses to disregard the condition of any section of the mine and admit the men for work, will report the matter to the inspector, *unless an accident results; and then the whole blame rests with the fireboss who sold himself to make "a false report."* Can a worse condition be imagined than to be obliged to work thus, when any day the fear of the loss of his place will induce an honest fireboss to do violence to his conscience and run the risk of bringing disgrace upon himself and his family?

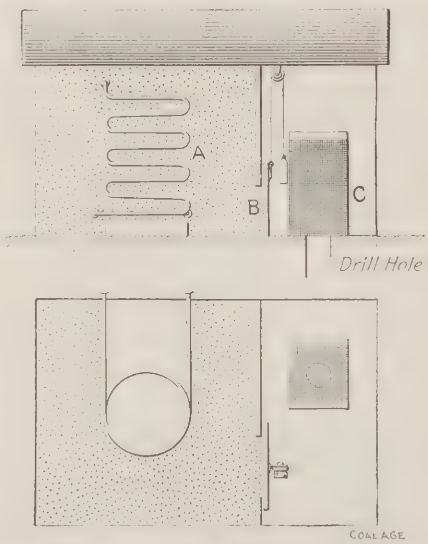
I never wrote to a magazine before, but do so now to make one suggestion. It is this: For the safety of the men and property concerned, the fireboss should be a government officer, appointed under the government and commissioned by the same for the daily examination of the mine, under the supervision and control of the district mine inspector. The fireboss would then be able to perform his duties, in the inspection of the mine, without fear or favor, and the three-cornered condition that now exists between the mine inspector, mine management and the fireboss would be at an end.

FIREBOSS.

Western Pennsylvania.

Sand House to Supply Mine Motors

The accompanying cut shows the arrangement of a sand house, or sand box, for supplying sand direct to the mine for the use of the mine motors. It consists



SAND HOUSE TO SUPPLY SAND TO MINE MOTORS

of a wooden box, or a small frame building or shed can be built, if desired, on the surface, immediately over a 4- or 6-in. drill hole that is sunk from the surface to a point in the mine most convenient for supplying sand to the motors.

The sand is delivered by cars or wagons, and unloaded into the box at *A*. In this portion of the box there is a steam coil arranged to dry the sand. As sand is required in the mine it is shoveled from the trap-door marked *B* onto the sieve *C* which screens out all coarse stones, gravel and sticks, and thus prepares the sand for use in the motors. The screen *C* stands immediately over the drill hole through which the sand falls into the mine. This arrangement has proved a considerable benefit in the saving it has effected in the cost of handling sand. The cost of handling the sand before this arrangement was instituted was $1 per day. By the present arrangement it takes just 30 minutes to get the sand down into the mine, at a cost of 15 cents per day.

J. B. F.

Drakesboro, Ky.

Inclined Plane Haulage

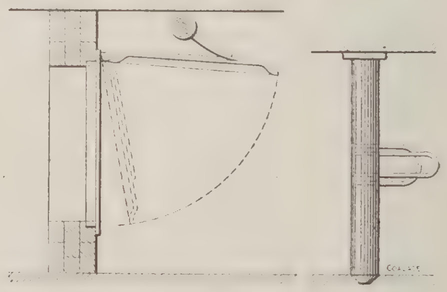
In reading your issue of Oct. 21, I notice in the description of the Castle Valley Coal Company's plant, at Price, Utah, the writer gives the manufacturers of the different classes of machinery installed, but has inadvertently omitted to state that the inclined-plane haulage at this plant, which is one of the largest planes installed under the most severe conditions, is equipped with our machinery. I know you will gladly give me space in your valuable paper to make this statement.

S. B. STINE.

Osceola Mills, Penn.

A Simple Device for Closing Air Doors

The device shown in the accompanying sketch, is successfully used in some German mines. Two short lengths of wire rope are bent, each in the form of the letter U and fastened, one outside the other, into holes drilled for the purpose



ROPE LOOPS FOR CLOSING AIR DOORS

in a mine prop. The rope is secured in these holes by means of wooden wedges. When the door opens against the loops, the elasticity of the rope is sufficient to act as a spring and close the door. With wooden doors the loops are best fastened to the frame of the door itself.

W. HARTMAN.

New York City.

Experience has shown that whenever practicable, triangulation gives the best results in surveys for the development of large coal properties.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Glen Jean, W. Va., Examination

Selected Fireboss Questions

Ques.—What would you do in the event of an explosion that had destroyed your ventilation, in order to rescue the living and recover the bodies of the dead? Explain fully and in detail.

Ans.—Much will depend on conditions not stated in the question. If both shafts are belching smoke, dust and gas, and there is no other entrance to the mine available, it would not be wise to attempt to enter, for a time at least, even with breathing or rescue apparatus. Start at once to repair the fan or to install a temporary ventilator. After a time one or the other of the two openings will show signs of downcasting. Advantage should be taken of this, and as soon as possible the ventilator should be connected and run as an exhaust or blower so as to assist the natural tendency of the circulation as shown by the discharge from the shafts.

In the meantime every effort has been made to organize and equip two rescue parties under the leadership of experienced men acquainted with the mine. Descent into the shaft with the rescue apparatus is made at the first opportunity that promises a reasonable degree of safety, in order to ascertain the condition below and if possible assist the air-current by the removal of any obstruction blown into the airway; or extinguish smouldering fires that only need fresh air to burst into flame. The work is extremely dangerous and requires the cool, experienced action of brave men, whose judgment will be their greatest safeguard. As soon as practicable, the air-current having been started, the other rescuers follow; the men equipped with breathing apparatus and electric lamps going ahead, and the others following with safety lamps as fast as the air-current can be established. No advance must be made by these men ahead of the current.

Ques.—What instruments are used to properly determine the condition, volume and temperature of the air-current in a mine? State fully the principle and application of each.

Ans.—The safety lamp, hygrometer, anemometer, watch and measuring tape, and the thermometer. The safety lamp depends on the cooling effect of the wire gauze surrounding the flame or protecting the openings of the lamp. The cool metal of the gauze extinguishes any flame that would otherwise pass through the mesh. The mixture of gas and air enters through openings and burns freely in the lamp; but the flame of the burning gas cannot pass out to ignite the gas outside the lamp, unless the gauze is defective or becomes heated, or the lamp is improperly handled.

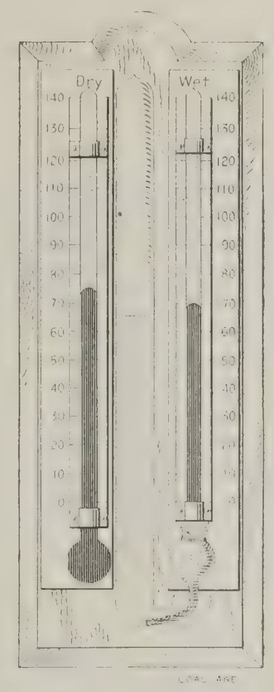


Fig. 1. The Hygrometer

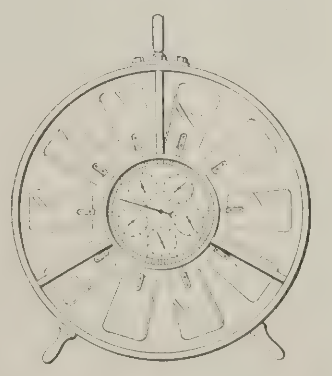


Fig. 2. The Anemometer

The hygrometer, sometimes called the psychrometer, consists of two standard thermometers mounted on a frame, as shown in Fig. 1. The bulb of one of these thermometers is kept wet by a sack of muslin, which is tied over it and which terminates in a wick that dips into a water bath below. The evaporation of water from the sack covering the bulb lowers its temperature; so that the reading of the wet-bulb thermometer is lower than that of the dry-bulb thermometer. The difference of the two readings indicates the degree of saturation of the air. When the air is fully saturated no evaporation takes place and the readings of the two thermometers are the same.

The anemometer (Fig. 2) is a vane set in a metal frame and connected by a series of gears with the hands on a registering dial. The blades of the vane are inclined at such an angle that one revolution of the vane corresponds to one lineal foot of air-travel. The dial registers the number of revolutions of the vane and therefore the distance the air travels in the time the instrument is exposed to the current. This time is noted by the watch. The velocity of the air-current, in feet per minute, is thus determined. The sectional area of the airway where the observation is taken is measured with the tape and this area, in square feet, multiplied by the velocity of the air, gives the air volume, in cubic feet per minute.

The temperature of the mine air is made known by the reading of the dry-bulb thermometer.

Safety and Efficiency of Boilers.

Ques.—What are the principal boiler fittings designed to increase the safety and efficiency of the operation of boilers? Explain briefly the purpose of each.

Ans.—The safety valve, water-gage, gage-cocks or try-cocks, steam gage, fusible plugs, mud-drum, blowoff valves and feed-water heater. The safety valve is a valve generally attached to the steam dome of the boiler to automatically relieve the steam pressure in case the latter rises above a certain point; the steam gage is to indicate the pressure of the steam in the boiler. The water-gage and gage-cock or try-cock are to indicate the level of the water in the boiler, while the fusible plugs, by melting when the water level falls below a certain fixed point, give warning by the escape of the steam into the firebox. The mud-drum is for the purpose of collecting the sediment that accumulates in the boiler, while the blowoff valve is used in cleaning the boiler by blowing out a portion of the water, under pressure. The feed-water heater is used to heat the water before it enters the boiler, which results in a large saving of fuel and in many cases, also, helps to purify the water.

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

Liquor Problem in Mining Communities

By C. L. Fay*

While considering the fact of a liquor problem in mining communities it is instructive and interesting to note the sentiments of captains of the coal-mining industry.

A general manager of one of the largest anthracite companies said recently, "We know there are entirely too many saloons and that the use of liquor seriously affects not only the operation of the mines but also the welfare of the men and their families. If I had my way, there would not be a place to sell liquor or any way of getting it within 100 miles of any of our operations. I can see no good whatever in the saloon.

"It is said that the men need a place to visit for recreation and for social purposes. The base-ball field, Y. M. C. A. rooms, pool and billiard rooms without the liquor attachment, and the garden, will give a man all the recreation he requires. If he wants to meet good people, he can go to church and Sunday school or a lodge of one of the many reputable organizations."

Another Personal View

The president of one of the largest bituminous coal operations in Pennsylvania and West Virginia says: "I think the best thing would be to eliminate or prevent the manufacture of liquors.

"As long as liquors are made and permitted to be shipped into a community, I think that a licensed saloon properly conducted is the best regulator of the traffic.

"I find that when no saloons are near our mines, the employees bring in whisky by jug and beer by the keg or barrel, and often have orgies that last for a week at a time, but I find that where saloons are properly conducted, the miners go in and get a glass of whiskey or beer and then go about their business, thus preventing these orgies that occur where the men buy by the barrel, keg and jug."

Very good. There is truth and logic in both views, but let us place the average mining-town situation alongside the statements.

In the first place, the average mining town does not possess a Y. M. C. A. building and equipment. Too often the gardens are backyards of mud and rocks and too small to be converted into plots that will "produce."

The fields are side hills strewn with boulders or covered with scrub oak or other bushes, while the "flats" are masses of culm. Pool and billiard rooms without liquor "available" are somewhat of a myth and at best are permeated by an immoral influence that is as vicious as liquor is detrimental.

The Saloon Fails to Regulate Liquor Traffic

Experience has demonstrated that the saloon is a failure as a regulator of the liquor traffic, at least under the operation of existing laws.

In the best equipped mines, there will be a maximum of loss in operation, unless back of that equipment, the human factor is ever vigilant and persevering.

The same thing applies to the liquor and social-welfare problems in the mining community. No matter how excellent the methods, or how suitable the equipment to attract men and divert their thought and energies from dissipating habits, the endeavors will fail unless the coal-company officials constantly exert the same efforts to get maximum efficiency from the social-welfare equipment, that they employ to get the highest efficiency from mine equipment. An industrial corporation will secure the best results, when utilizing or coöperating with various welfare movements, by insisting upon a definite working relationship.

The liquor problem is an economic one in the matter of operating mines, and until the coal companies fully recognize the fact that it must be dealt with in a business way as any other business problem, the average mine will continue to operate at a loss in tonnage of 5, 10 and 15 per cent. every month.

I will conclude this series of articles next week with a description of the Greenwald Welfare Committee as promoted by the Donahoe Coke Company at Crabtree, Pennsylvania.

*Secretary, Coal Mining Institute of America, Wilkes-Barre, Penn.

Note—This is the fourth article discussing the above subject.

The Pancoast Relief Fund

The beneficiaries of the Pancoast disaster relief fund received their first payment Wednesday, Nov. 9, at the Anthracite Trust Company's banking rooms in the Mears building, Scranton, Penn.

The relief committee furnished to the trust company the amounts each beneficiary was to receive, and the trust company adopted the following plan of identification and disbursement:

A photographer went the rounds taking a picture of each one entitled to payment. The beneficiary had to be properly identified before the picture was taken.

Each beneficiary's picture was pasted upon the ledger page of his or her account, and when he or she came for the money, the picture spoke for itself.

The relief committee does not issue checks or warrants. It simply supplied the trust company with an official list of the payments to be made, and the trust company drew its check for each individual payment.

Scranton Mining Institute Banquet

The third anual banquet of the Scranton District Mining Institute, held in Scranton, Penn., on Oct. 21, was attended by over 1600 men, representing every phase of the coal-mining industry from driver boys to general superintendents and presidents of companies.

Addresses were made by Judge H. M. Edwards, toastmaster; C. E. Tobey, president of the Institute; Major Everett Warren; William H. Truesdale, president of the Delaware, Lackawanna & Western railroad, and others. Mr. Truesdale congratulated the association on its growth and on this remarkable meeting which he found interesting, instructive and inspiring, and went on to point out that from operators and managers down to the humblest mine worker, all were comrades in prosecuting a great industry.

Mr. Tobey gave a short history of the Institute from its organization in 1908, to the present time, dwelling particularly on its wonderful growth in the past year from a membership of 142 to a total of 1756.

The Raleigh Mining Institute

On Wednesday night, Oct. 25, a banquet was given by the Raleigh Mining Institute in the new R. M. I. building, at Raleigh, W. Va. This institute was organized in October, 1908, for the purpose of studying practical and scientific methods of operating coal mines, in order to better fit the officers and employees of the Raleigh Coal and Coke Company, to perform their duties and assume the responsibilities thrust upon them, for the betterment of conditions, more efficient mine management and the preservation of life and property.

The institute began with a membership of 12 persons. Today the Raleigh Mining Institute has a membership of 38, composed of the managing officials and the foremen of the Raleigh Coal and Coke Company, and Lance B. Holliday, inspector of the 9th district, West Virginia Bureau of Mines.

On the night of the banquet, this organization met in regular session and was called to order by President James P. White, general superintendent of the Raleigh Coal and Coke Company. The institute proceeded to elect Ernest Chilson, general manager of the Raleigh Coal and Coke Company, toastmaster, to preside over the banquet. The applications for membership of J. W. Heron, chairman Chesapeake & Ohio railway allotment commission; James Clark and D. R. Phillips, his associate commissioners; Prof. E. W. McDairmaid, of Beckley Institute; George W. Stevens, Jr., youngest son of President George W. Stevens, of the Chesapeake & Ohio Railway Company; A. F. Beck, general manager of the Charleston Electrical Supply Company, and Professor J. A. Thompson, of Glenleigh Schools, were read and approved and the applicants were duly elected and enrolled as honorary members of the Raleigh Mining Institute. Upon motion, the meeting was adjourned and the members entered the banquet hall, where the address of welcome was delivered by the toastmaster. Tables were set for 150 persons. After the dinner, interesting addresses on diverse mining subjects were delivered by various menbers of the institute.

A New First Aid Packet

By Geo. B. Parker and B. T. Pollard

A new type of first-aid packet is about to be adopted by the Colorado Fuel and Iron Company for use in its mines. This packet (the invention of Dr. Gates) consists of two pieces of hard tin with smooth edges. Each piece of tin measures about 3x8 in., and is adapted for use as a splint. These two splints have lugs soldered thereon with attached strips of webbing suited for securing the tin plates to either side of a fractured limb. The lugs are turned inward and are arranged to be at reverse ends of the packet. In this manner they act as spreaders. An aseptic bandage is placed between the tin plates and an air-tight strip of soft solder is run around the edges so as to make an airtight packet.

Uniontown Section of H. C. Frick Coke Company's First Aid Corps, Taught by Dr. M. J. Shields, American Red Cross Society

In the side of the tank of a dinner pail a round hole is made and the packet is soldered to the pail through this hole. If the splints are torn from the pail, the tank is rendered useless and this fact is expected to make the miner or laborer apply for another. It is considered unlikely that any miner or laborer would be overcome by an accident without a first-aid packet being available as it is customary always for the workmen to take their pails with them when they are transferred from place to place.

The soft solder can be easily removed, leaving a splint without ragged edges. One important feature of this appliance is that it can be put into water and washed with the dinner pail without injury to the aseptic bandage.

First Aid Hints

By all means give your patient air. It is the safest and cheapest drug in the *Materia Medica.* Stand back if you are not needed and let nature do its work.

Roller bandages for the fingers should be $\frac{3}{4}$ in. wide and 3 to $4\frac{1}{2}$ ft. long; for the arm and head $2\frac{1}{2}$ in. wide, 3 to 6 yd. long; for the body and legs 3 in. wide, 6 to 8 yd. long.

If your patient, overcome by gas, is breathing, but can't walk around, don't drag him. Lay him out with his back on a flat surface. Roll a coat and place it under his shoulders and neck, so that his windpipe is straight. That will give him a chance to breathe without labor.

If you have been exploring after an explosion and come out with your lungs full of gas, nauseated and with a headache, you will want to sit down on a step and hold your head as people with sick headaches, and feeling weak at the stomach naturally do. Resist the impulse, get up and call a friend or two and let them walk you around. Get air into your lungs, hold up your head, take in deep breaths; don't constrict your lungs. No good will come of doubling yourself up. It is not rest or quiet you need so much as fresh air and a gentle stimulus.

Erratum—In our issue of last week, there appeared in this department a photograph captioned, "Banquet of Wilkes-Barre Mining Institute." The view in question was a photograph of the "Scranton Mining Institute Banquet," the word Wilkes-Barre having been printed by mistake.—Editor.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

Alaskan Coal and the Administration

Secretary Fisher has had a consultation with President Taft for the purpose of discussing the policy of the Government in regard to the treatment of coal deposits in Alaska. Mr. Fisher has prepared and submitted to the President the details of his plan, which provides in substance that the coal shall be owned in perpetuity by the Government and that the leasing system shall be adopted for the control of the coal properties. The Secretary has discussed with Mr. Taft the form in which the recommendation should be made and has indicated the extent of the concessions to private interests which he believes may be made with advantage in order to induce them to undertake the exploitation of the coal.

It is probable that progressive members of Congress will lend their support to the leasing system and will not attempt to antagonize the main feature of the program of the Administration. They will, however, it is believed urge great modifications in the details with a view to what they consider the more effectual protection of the interest of the public in the lands.

War Department Coal Purchases

The Quartermaster General of the Army has just completed a report to the Secretary of War on the subject of coal purchases for the army in which he reviews the experience during the past year or two with the present system of purchasing and recommends new legislation to govern the purchases henceforward. It is not certain whether this legislation can be obtained but it is expected that Secretary Stimson will have the proposed change incorporated in the new army appropriation bill.

The report says in part: "In view of the excess prices frequently submitted by bidders for fuel over that at which fuel may be purchased in the open market, especially upon the Pacific coast, for that required in Alaska, and for use of transports, it is suggested that recommendations be made to the Secretary of War for enactment of legislation giving the Secretary of War authority to purchase, as in his discretion may be deemed for the best interests of the service, and in view of this suggestion the following draft is submitted: 'The Secretary of War, in making contracts and purchases, shall give the preference, all other things, including price and quality, being equal, to articles of the growth, production, and manufacture of the United States. In purchasing fuel and forage for the Army, particularly with reference to Alaska and island stations, the Secretary of War shall have power to discriminate and purchase, in such manner as he may deem proper, that kind and quantity of fuel and forage, not to exceed the supply necessary for a single fiscal year, as shall be best adapted to the purpose for which required.' "

The report further on, reads: "Attention is invited to the fact that the price for delivery of anthracite coal advances from April to August approximately 50c. per ton, and if authority of law and appropriation could be obtained for the purchase of anthracite coal in April for the succeeding fiscal year it would, based upon the consumption for fiscal year 1911, effect an annual saving of approximately $60,000, being about 8 per cent. saving on purchases of anthracite coal; this on the presumption that storage space for a year's supply is available at all posts using anthracite coal."

Upon the suggestion of the Geological Survey, in May, 1910, the Quartermaster's office took under consideration the question of purchasing coal for use of the Army based upon its heating value as expressed in British thermal units. The method then pursued was to purchase coal on its fuel equivalent, in which case the actual test of each coal was necessary before contractors could bid on same. After a careful consideration of the matter, the proposed method was approved by the Secretary of War in December, 1910, and all coal for the Army for the fiscal year 1912 has been purchased under this system. The question of extending this B.t.u. system to the Philippine islands is now under consideration.

Alabama

Birmingham—The Woodward Iron Company, of Birmingham, has purchased the properties of the Birmingham Coal and Iron Company, including 40,000 acres of coal lands, 2400 acres of high-grade ore lands, two blast furnaces, the mining town of Mulga and other properties. It is said that the deal represents $7,500,000, and that developments on a large scale are anticipated.

The Jefferson Coal Company, of Jefferson county, has filed in the United States court a petition in voluntary bankruptcy.

In the absence of a quorum of the reorganization committee, formal ratification of the merger of the Southern Iron and Steel Company and the Alabama Consolidated Coal and Iron Company, which was to have taken place Nov. 10, was indefinitely postponed. That the merger will soon become operative, however, is evident from the fact that the committee has received deposits of from 60 to 70 per cent. of the various securities of the two companies.

The new stockade of the Pratt Consolidated Coal and Iron Company at Flat Creek will not be ready for occupancy until the first of the year, and the State of Alabama will probably not be able to take charge of the Banner mine of that company under the lease entered into a short time ago until Jan. 1. The State was to begin the lease about Nov. 15, and work the mine with State convicts.

California

San Francisco—The Clear Lake Coal Company has been incorporated to develop a coal prospect in Lake county. The property consists of 1920 acres of Government land, on which a force of men, with an engine and pump, are sinking a shaft; the work is reported to be progressing satisfactorily.

The mine of the Stone Cañon Coal Company, in Monterey county, has been closed for more than a year. The company now is sinking the slope, previously worked at the 300-ft. level, to a depth of 1000 ft. and expects to mine coal from this level and market it about Jan. 1. The vein is alleged to be 14 ft. thick and to contain several million tons of good merchantable coal. The work of rebuilding the railroad, washed out in the spring floods of 1910, is progressing satisfactorily.

Illinois

Springfield—The Livingston mine of the New Staunton Coal Company, claims the tonnage record for the State. There were hoisted during the last half of October, 34,649½ tons, working 13$\frac{9}{16}$ days, making an average of 4029 tons per day. The record hoist, of Sept. 29, is 4265 tons, making 4192 trips and loading 105 railroad cars in eight hours. It is generally understood that Mr. Ross, of the Superior Coal Company's mine No. 3, at Gillespie, expects very shortly to beat these records for both day and week.

Chicago—The O'Gara Colliery Company, of Chicago, has been incorporated with a paid-up capital stock of $100,000.

The company has a large tract of coal rights north of Harrisburg, in Saline county, and development has already been started. This concern is not to be confused with the O'Gara Coal Company, although it is understood that the two are closely allied.

DuQuoin—Official announcement has been made of an extension of the Burlington's Southern Illinois coal line to West Frankfort, in the heart of the Franklin county field. The extension will branch off from the main line, south of Christopher, and continue in a southwesterly direction for a distance of about six miles to West Frankfort. Practically all the right of way has been secured and the work of construction will be well under way by the first of December.

Chicago—Consolidation of the City Fuel Company and the Lill-Robinson Coal Company, forming the largest corporation for the retailing coal business in existence, was perfected recently at a meeting of officers of the two concerns.

The concern, which will be called the City Fuel Company of Illinois, will have a total capital stock of $4,000,000. "The consolidation was effected solely for the purpose of economizing deliveries," said Fred W. Upham, the president.

Indiana

Indianapolis—The miners employed by the Domestic Coal Company of Kokomo, which recently was placed in the hands of a receiver, have been paid in full. The mine, which is in excellent condition, will be kept in operation.

Kentucky

Louisville—The organization of the Cambria Coal and Lumber Company, at Lexington, is said to mean that Pennsylvania capital is preparing to acquire immense areas of coal and timber lands in the mountain section of the State. Four companies, in all, have been organized. The capitalists back of the project have acquired 140,000 acres, and as individuals they hold 35,000 acres additional. The approximate value of the lands which they control is said to be about $1,500,000. These lands are in Perry, Floyd, Magoffin and Knott counties.

The several companies are as follows: Kentucky Land and Improvement Company, which controls 40,000 acres; Cambria Coal and Lumber Company, 67,000 acres; Knott County Coal and Lumber Company, 23,000 acres; B. F. Price Coal and Lumber Company, 10,000 acres.

The town of Jenkins, Letcher county, which has sprung up since the Consolidation Coal Company opened its mines there, now has a population of 1200, an average of 200 persons a month. It is estimated that it will have a population of 5000 in a short time if the percentage of increase keeps up, which seems probable.

Madisonville—The biggest coal deal in the history of this county was made Oct. 30, when President Ross, of the Kentucky Bank and Trust Company, bought the I. Bailey tract of coal lands at the edge of Muhlenberg county, for $23,000. The tract contains 4600 acres.

Montana

Roundup—Recently a new record was established by the Roundup Coal Mining Company's mine No. 3 at Roundup in the amount of coal hoisted in a single day. The mine is being worked at full capacity with a crew of 304 men and in one day of eight hours 1504 tons of coal were mined and loaded. Also a new record was established by mine No. 2 of the Republic Coal company, employing a force of 410 men, when 2020 tons of coal were mined and loaded in one day of eight hours at this property.

Ohio

Columbus—The bonded indebtedness of the Sunday Creek company is no longer backed by the Hocking Valley Railroad Company, as is disclosed by the last fiscal report of the latter. This is in conformity with a decision of the courts on ouster suits compelling divorcement between the railroad and coal properties.

The Meister Coal Company of Fushing, Belmont county, has been incorporated with a capital of $75,000 to mine and sell coal.

Bridgeport—The movement toward the consolidation of practically all the big coal companies in eastern Ohio has taken on definite shape. The proposition is up to the syndicate which will furnish the money and a favorable reply in anticipated. The consolidation would embrace 11 or 12 of the largest companies in the eastern half of the State and about $25,000,000 would be involved. It is said the proposed organization would virtually control the output from the district and would be able, in a measure, to fix prices.

Pennsylvania

Bituminous

Punxsutawney—Eight men perished in an explosion in the Adrian mine of the Rochester and Pittsburg Coal and Iron Company shortly after 6 o'clock in the morning of Nov. 9.

With the aid of the rescue crew from the United States Bureau of Mines of Pittsburg, the rescue crew at the mine later took out six bodies, but was unable to penetrate to the seat of the explosion on account of the afterdamp and débris. Two other miners are believed to have perished under a crushing weight of fallen rock. The cause of the explosion and fire is as yet not definitely known. The damage to the mine proper was slight.

Altoona—Bondholders of the Pennsylvania Coal and Coke Company met Nov. 10 at Philadelphia to ratify the plan for the reorganization of the company proposed some months ago. The plan provides for a foreclosure of the consolidated mortgage and a sale of the properties held by the receiver, which are not subject to the lien of the mortgage. The new company will be capitalized at $7,500,000, and will be authorized to buy, lease and operate coal and other lands and sell their products.

Boswell—The Merchants' Coal Company is spending about $100,000 in improvements, which will increase the output from 2000 to 3500 tons daily and give employment to 300 more men. The improvements include an enlarged tipple, two dumps for loading coal, new crusher, new fanhouse, new haulage engine, and an addition to the power plant to house a new generator and boilers.

Cassandra—According to authoritive information, work will soon be started on the opening of a new mine by the Shumaker & Hughes Company to tap a large coalfield lying north of this place.

Anthracite

Scranton—Shipments of anthracite in October amounted to 6,269,179 tons. This establishes a record for October, being an increase of 161,114 tons over the previous record for that month, made in 1907. Last month's shipments were 647,084 tons in excess of October, 1910.

The shipments from Jan. 1 to Oct. 31 amounted to 57,645,558 tons, as compared with 52,602,462 in the corresponding ten months of 1910, an increase of 5,043,096.

Incorporation papers were filed Nov. 8 by the Connell Anthracite Coal Company, capitalized at $10,000. William J. Connell and James S. McAnulty, both of Scranton, are directors.

Testimony in the equity suit of the Delaware, Lackawanna & Western Coal Company to recover $90,000 from the North End Coal Company for coal alleged to have been illegally mined, was heard recently by Judge H. M. Edwards. It is alleged by the plaintiff that the North End company has violated the terms of lease by going beyond the boundary lines and taking 60,000 tons from the Lackawanna's property. It is asking 50c. a ton and treble damages amounting to $90,000. The North End company will attempt to prove that it followed the lines laid down in the lease as closely as possible, and that if its operations did extend beyond the lines it was done inadvertently and that the coal mined did not amount to any substantial quantity.

Shamokin—The Pennsylvania railroad is storing a great quantity of coal at its new yards near Northumberland.

Wilkes-Barre—A mine cave recently occurred in a crowded street at Plains. The subsidence left a hole about 15 ft. wide, 20 ft. long and 20 ft. deep, and wrecked several houses.

Pottsville—The Alliance Coal Company, a subsidiary branch of the Lehigh Coal and Navigation Company, in the Panther Creek valley, has purchased the Maryd colliery from J. S. Wentz & Co.

Hazleton—It is understood that the proposed new Spring Brook washery of the Lehigh Valley Coal Company at Audenreid will be electrically operated throughout.

Rhode Island

Providence—Operations at the Rhode Island Coal Company's plant have been started after a 10-days' suspension to permit double tracking of the slope and other improvements. The company expects to produce daily 500 tons of coal.

Tennessee

Nashville—The Bon Air Coal and Iron Company plans to organize a new company with $3,000,000 capital stock to take over and develop its properties, which include 38,000 acres of coal and timber land in two counties and 80,000 acres of iron and timber land in five counties of Tennessee.

Memphis—Special Examiner Anderson, for the interstate commerce commission, recently began hearing testimony affecting complaints against a 10 per cent. increase in the freight rate on coal shipped to Memphis from Illinois, Kentucky and Alabama by the Illinois Central, Louisville & Nashville and St. Louis & San Francisco railroads. The increase became effective April 1 last. Local coal consumers complained. A decision by the commission is expected in 90 days.

Washington

Palouse—At a meeting of prominent business men of Palouse, a syndicate was formed to develop a coal find on the Ellsworth Bishop ranch, on Cedar creek, four miles north of here. It is announced that work will commence on the property at once, a contract having been already completed with an Idaho coal miner for sinking a 200-ft. shaft.

Centralia—Franklin A. Umstead, of Chicago, has purchased the Great Western coal mine, located a few miles south of Tenino. It is hoped that the sale will mean a big boost for lignite coal in this vicinity.

Seattle—The Mendota mine of the Mendota Coal and Coke Company is now producing 600 tons of coal daily. The property is located ten miles from Centralia and comprises 9000 acres which are underlaid by six workable veins. The seam being worked at present is 10 ft. thick.

West Virginia

Fairmont—The Consolidation Coal Company recently established an office in London, and all foreign business will be handled from the European branch.

Charleston—The New River Collieries Company, operating the Sewell and Beckley seams in Raleigh county, is now shipping from four shafts, and has an output of 25,000 tons which it hopes to increase to at least 40,000 tons within the next two months. This company has 8500 acres under lease.

The incorporation of the Southern Collieries Company, of this city, for the purpose of mining coal and cutting timber in the Cabin Creek district of Kanawha county, means another large development along the Cabin Creek branch of the Chesapeake & Ohio railroad. The development of properties along that line during the past year has necessitated the practical reconstruction of the branch railroad in order to handle the coal and timber, but especially the coal. The Southern Collieries Company has an authorized capital of $100,000.

Canada

Nova Scotia—A renewal for two years of the agreement between the Dominion Coal Company and the Provincial Workmen's Association has been concluded. This renewal will hold good until the close of 1913, and is on exactly the same terms as the present agreement.

Personals

Edward Cameron has been appointed manager of the Natchez, Miss., office of the Pittsburg Coal Company.

O. D. Hogue has been appointed vice-president and treasurer of the Goulds Manufacturing Company, of Illinois.

E. P. Merrill, formerly at Pachuca, Mexico, is now in charge of the western business of the Island Creek Coal Company, with headquarters at Minneapolis.

P. C. Thomas, formerly a mining engineer with the Temple Iron Company and later with the H. C. Frick Coke Company, has been appointed chief engineer of the New River Company, with offices at MacDonald, West Virginia.

Waldemar Lindgren has been appointed chief geologist of the United States Geological Survey to succeed C. Willard Hayes, who recently resigned. Mr. Lindgren has been a member of the Federal Survey since 1884 and has been in charge of its investigations in metalliferous deposits since 1907. He is the author of some 50 reports published by the Survey, and in addition has contributed between 50 and 60 articles to technical and scientific journals. Mr. Lindgren is a trained mining engineer and has a world-wide reputation as an authority on the geology of ore deposits.

Obituary

The death of J. K. F. Steele, of Keystone, W. Va., removed one of the pioneer coal operators of the southern section of the State. Mr. Steele came to West Virginia from Stewartstown Furnace, Penn., about 22 years ago, to enter the employment of the Indian Ridge Coal Company, and later became interested in the Keystone Coal and Coke Company, at Keystone, of which company he was general manager at the time of his death.

New Publications

Bureau of Mines

Bulletin 13. Résumé of producer-gas investigations, by R. H. Fernald and C. D. Smith. 1911. 378 pp., 12 plates.

Miners' Circular 5. Electrical accidents in mines; their prevention and treatment, by H. H. Clark. 1911.

Bulletin 24. Binders for coal briquets, by J. E. Mills. 56 pp. Reprint of Bulletin 343.

Bulletin 28. Experimental work conconducted in the chemical laboratory of the United States fuel-testing plant, St. Louis, Mo., January 1, 1905, to July 31, 1906. Reprint of Bulletin 323.

Bulletin 27. Tests of coal and briquets as fuel for house-heating boilers, by D. T. Randall. 45 pp., 3 plates. Reprint of Bulletin 366.

Bulletin 35. The utilization of fuel in locomotive practice, by W. F. M. Goss, 28 pp. Reprint of Bulletin 402.

The Bureau of Mines has copies of these publications for free distribution, but cannot give more than one copy of the same bulletin to one person. Requests for all papers cannot be granted without satisfactory reason. Bulletins, 24, 27, 28 and 35 will not be sent to persons who received the original bulletins. In asking for publications please order them by number and title. Applications should be addressed to the Director of the Bureau of Mines, Washington, D. C.

West Virginia Geological Survey

Detailed County Report, on Wirt, Roane and Calhoun counties, 573 pages + XX, with case of 3 maps—topographic, geologic and soil—published under date of July 1, 1911, and now ready for delivery. Besides the detailed study and description of all the rocks, minerals, soils, streams, industries, etc., found within the area, the geologic map gives also the true location of all the oil and gas pools developed up to July 1, 1911, and shows by structural contours the several anticlinal and synclinal arches, including the southern extension of the famous Burning Springs or Volcano anticlinal. Price, with case of maps, postage paid by the Survey, $2. Extra copies of geologic or topographic map, 50c. each. Order from the West Virginia Geological Survey, Morgantown, W. Va., Lock Box No. 448.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The past week has witnessed a sharp flurry in the coal market, due to the first general break in the weather this season. The spot market has tightened in all sections, with prices firm, and a shortage in transportation facilities becoming acutely evident in some districts.

In the extreme East the market is normal generally, with a fair demand for spot coal of the better grades. A shortage in some sizes is appearing and the recent storms will, no doubt, stimulate the market all along the line.

The cessation of Lake shipments in the East has left the market unsettled, but the unprecedented fall in temperature will result in a heavy demand for domestic. Shortages in some sizes are reported, and dealers are beginning to consider the possibility of a strike next fall.

Ohio mines are estimated to be working 80 per cent. capacity, one of the strong features being the Lake trade. Transportation troubles are developing here and down through West Virginia, but not in serious proportions yet. It is believed 60 to 75 per cent. of present production is contract coal.

Through the Middle West conditions are variously reported as quiet or improving with an occasional instance of overstocking and weak prices. The Rocky Mountain States still continue with a heavy consumption, which is taxing the capacity of the mines and railroads. Pacific Coast operators are working full time with trade normal.

Boston, Mass.

Bituminous seems to be marking time this week; there cannot yet be said to be a seasonable demand for spot coal, and contract requirements are steady enough to keep the situation generally firm. At the Virginia terminals $2.60 f.o.b. remains the base price for Pocahontas and New River, with but few sales reported. There is not quite the rushing anxiety to get fuel forward that was evident ten days ago.

Arrivals have been better, and a supply of tonnage is in prospect, but freights continue firm at high figures, 90c. to $1 being the rate to Boston, depending on size and draft.

Prices at Mystic Wharf on cars are from $3.63 to $3.68 on the better Southern coals. The cold wave reported to be on the way should cause a decided change in the market here and we are likely soon to see higher prices along with higher freights. The textile mills are enjoying fair business, and general prospects are somewhat brighter.

In anthracite trade continues active. The better movement of boats is helping out, but barges are still short and the companies slow on delivery. Retail trade is brisk, and the demand for chestnut is still an important feature. Surprisingly little interest is shown in possible labor troubles next April and the dealers, outside of the points soon to be closed to navigation, seem only to be looking out for present needs. It is true that the companies seem to have their hands full looking out for those.

New York

Market conditions here this week show but little change from those prevailing during the past two or three weeks. Railroad movement to New York tidewater, with few exceptions, is prompt and the supply at the piers is fully adequate to the demand, which on contract is good, although the movement from the piers is reduced to some extent by reason of the unfavorable weather for transportation on the sound. This has held back the boats considerably and delayed somewhat the movement from the piers.

The market for inferior coals shows no improvement whatever and some of these grades on demurrage are offered at sacrifice prices.

On new business the market is very dull. Consumers are getting all the coal required from contract sources so that the amount of new business coming into the market is about at a minimum. The possibility of labor trouble in the spring has as yet caused no decided increase in the demand for soft coal. This contingency will undoubtedly have a strengthening influence on the coal business in general as the first of April draws near. The excellent demand that has prevailed on contract this fall, may in some measure be traceable to this possibility. Rail business in this territory is in good condition and a large tonnage is reported as moving.

Prices obtaining in this market for steam coal, with the exception of the prices made to get rid of demurrage are unchanged from those previously reported, ranging f.o.b., New York, about as follows: $2.35 for West Virginias (80c. at the mines); $2.35@2.45 for ordinary Pennsylvanias; $2.55@2.65 for good Pennsylvanias, and better grade Pennsylvanias, $2.65@2.75.

Buffalo, N. Y.

The feature of the coal trade just now is the scarcity of both anthracite and bituminous. Anthracite dealers have complained of a lack, especially in stove, for some weeks, but bituminous has been plenty enough and it would be now, but for two features of the trade, only one of which will last. The miners have been badly demoralized of late, the hunting season, the Pittsburg convention and the election conspiring to keep them idle. The other difficulty is the growing shortage of cars.

The improvement in soft coal is still small. It will need to be much larger than it has been yet to affect prices, beyond preventing the offering of slack at all sorts of prices, as has been done through the summer. Slack is stronger now and if the Lake trade takes as much of it as it should there will be but a small surplus at the close of the Lake season and prices will continue to strengthen, though they are not likely to advance right away. It is believed that under normal conditions the natural supply is too large for that.

Some report is made of a prospective coal famine in the Northwest, especially Canada, the coming winter, but anthracite shippers say that they, at least, have enough on docks at the head of the Lakes, even though they do expect to have a call for it further west than usual, on account of the strikes in Rocky Mountain mines. So this condition will keep soft coal moving by Lake as long as the vessels can go. The condition of the closing Lake trade has much to do with the soft-coal situation during the early winter.

Bituminous prices remain fairly steady, except for slack, on the basis of $2.50 for Pittsburg three-quarter, $2.40 for mine-run and $2 for slack, with Allegheny Valley about 25c. less. No stir is evident in coke, which is weak at $4.25 for Connellsville foundry, to $3.50 for stock.

The smithing situation is steady, a fair amount moving at $4 for Georges Creek Cumberland and $3.65 for Cambria county. The practice of using a large percentage of slack for smithing purposes keeps prices down.

Pittsburg

Bituminous—The coal market is rather unsettled since the practical cessation of lake shipments, prices being somewhat more irregular, while production is restricted. Shipments to retail coal yards and to manufacturing consumers increased slightly this week. Genuine winter weather appeared with a suddenness that has rarely been paralleled, the temperature dropping over 30 degrees in a few hours and the movement in the domestic trade this week will undoubtedly be very heavy. We repeat former quotations, which represent approximately the average level of the market: Nut, $1@1.05; mine-run, $1.05@1.10; ¾-in., $1.15@1.20; 1¼-in., $1.25@1.30; slack 40@50c. per ton at mine, Pittsburg district.

Connellsville Coke—Sales of between 60 and 75 cars of furnace coke have been made in the past week, about 3000 tons, all at $1.50. Several consumers have been buying an odd lot each week for several weeks past, which accounts for the steadiness in the sale of spot furnace. Otherwise the market is very dull. One furnace in the East goes out this week, but another goes in, while in the Central West the furnace operations are practically unchanged. Some negotiations have been on for furnace coke for next year. As a rule, buyer and seller are far apart, but one or two contracts may be closed within a few days. The majority of buyers seem to be inclined to wait for at least 30 days before going deeply into the matter of contracts. Many contracts, of course, run into or through next year. Foundry coke continues quiet, with fair shipments on contract. We quote: Prompt furnace, $1.50@1.55; contract furnace (nominal), $1.65@1.75; prompt foundry, $1.80@1.90; contract foundry, $2@2.25, per net ton at ovens.

The *Courier* reports production in the week ended Nov. 4 at 322,745 tons, an increase of 2000 tons, and shipments at 4058 cars to Pittsburg, 4933 cars to points west and 1043 cars to points east, a total of 10,034 cars, an increase of 907.

Philadelphia

The week opened with a splendid effort on the part of the weather man to make matters easy for the retail trade. Temperature here dropped anywhere from 25 to 35 degrees, and, as a result, the dealers were swamped with new business, and urgent telephone calls for orders to be filled that were in hand. Shortage of coal is reported, particularly stove and chestnut, presenting an opportunity that the individual operators will hardly fail to take advantage of, by asking a premium for their product. All sizes are in good demand, and weather such as inaugurated the present week, is likely to cause a shortage all along the line. While it is understood that the large companies have some stocks of the small sizes, yet they are entirely inadequate to stand any unusual drain upon them, and it is believed that the first of the year will see these stocks pretty well depleted.

The conditions in the wholesale market are good, and the outlook is more than promising. Shortage of coal is also reported in this branch of the business—following the whole list, with stove and chestnut as leaders. The heavy storm early in the week, has interfered very materially with the movement of coal at Tidewater, barges and vessels being very seriously delayed, which has upset calculations very much, but this will give the companies an opportunity to throw more coal into the local market, where it is urgently required. Compared with last year, it is reported that the companies show a very appreciable increase, and all are looking forward to another record-breaking month.

The bituminous trade took a little flurry in the way of better business, and it is also reported that Pennsylvania coals are advancing a trifle in price

Baltimore, Md.

Although by no means active, market conditions in Baltimore during the past week have shown a slight improvement over previous weeks, and coal operators were more optimistic than they have been for months.

The demand for Pennsylvania and West Virginia coals was somewhat better, due to the fact that many buyers entered the market for winter coal. Others who were not in particular need of an oversupply, did some purchasing for storage purposes, believing that the coal operators will face trouble with the miners next April when their wage contracts expire.

What coal is being moved under contract, and otherwise, is delivered without delay. The railroads, including the Baltimore & Ohio and the Western Maryland Railroads, the two principal roads which supply this market, have kept traffic moving freely. There is no more talk of car shortages, which prevailed to such a large extent during the first six months of last year. The roads are well supplied with equipment, and can handle all business given them.

The coke market has shown but little life here for months, and at the present time, is exceedingly inactive. Most of the steel companies are entirely out of the market for the product, and orders are rare. Many coke ovens are idle on account of a lack of business.

Cleveland, Ohio

There is nothing to relate in regard to the lake-trade coal business, excepting there is a demand at the present time for medium-sized coal boats for cargoes to Michigan points. There has not been any improvement in the steam or domestic business in the past week. The cause in the domestic demand is owing to the very mild weather, which has continued during the past week and up to the present writing.

Slack is the only commodity that has increased in demand and also in price. This has increased in the past 10 days from 15c. to 25c. per ton, and will still increase as the closing of navigation progresses.

The general impression among coal dealers is that conditions look very much better than they have for some time past. Prices range as follows, per ton:

Ohio No. 8:	
Mine-run	$0.95@1.00
¾-in.	1.05@1.10
1¼-in.	1.15@1.25
Slack	0.55@0.65
Middle District:	
Mine-run	$1.00@1.10
¾-in.	1.20@1.30
1¼-in.	1.45@1.60
Slack	0.80@0.85
Youghiogheny:	
Mine-run	$1.10@1.20
¾-in.	1.30@1.35
1¼-in.	1.40@1.50
Pocahontas:	
Mine-run	$1.00@1.10
Lump	2.10@2.25

Columbus, Ohio

Conditions in the coal trade in all parts of the Buckeye State improved materially during the past week, the demand for the domestic grades has increased and prices are firmer all along the line. The chief cause for the betterment is the lower temperatures which have prevailed, as well as the approach of the time usually taken for stocking up. On the whole the market is in good shape and operators, jobbers and retailers are looking forward to a better trade during the fall and winter.

Dealers in cities and towns also report a better demand for all grades of domestic coals. The larger consumers are laying in their supply and the retail trade has been active in the extreme. Better weather has enabled the dealer to deliver promptly. Retail prices are firm but have not yet reached the usual winter level.

One of the best features is the continued activity in the Lake trade. Operators are rushing their mines in order to get as large a tonnage as possible to the Northwest before the close of navigation. The tonnage moved to date is larger than usual and it is believed the amount shipped to the Northwest from Ohio will surpass that of last year by many tons. There is little or no congestion on the docks at the upper Lake ports and the movement to the interior is good. Dock prices rule firm.

Production in the various Ohio fields has been rather active during the past week. It is estimated that the output has been about 85 per cent. of normal in the

strictly domestic fields and about 75 per cent. of normal in the other mining districts.

Prices prevailing per ton in Ohio are: Domestic lump in the Hocking Valley, \$1.50; domestic lump in Pomeroy Bend, \$1.60@1.70; ¾-in., \$1.35; nut, \$1.15; mine-run in the Hocking Valley, \$1.05@1.15; mine-run in eastern Ohio, 95c.@\$1.05; coarse slack, 35@45c.; nut, pea and slack, 40@50 cents.

Cincinnati, Ohio

The unexpected warm weather is responsible for the domestic stagnation which is now in evidence as well as the weak steam demand. This, however, can be only temporary. The big bulk of the business cannot be seriously affected by temporary and minor conditions which are only incident to the business. The amount of "free" coal—that is, that not contracted for—is estimated variously at 25 to 40 per cent. of the total output. The remaining 60 to 75 per cent. will continue to move right along under contracts signed months ago.

There is an increasing amount of speculation as to what the effect of the threatened labor difficulties will have upon the fuel market. It is generally believed that the difficulties of two years ago will be repeated and probably intensified. The anthracite miners have made known their demands for a 20 per cent. increase in wages.

Just now the stocks of coal are sufficient to keep the demand down to a minimum but in the event of any trouble, whether from labor or other causes which would hinder operations or tie up deliveries, present stocks would soon disappear and the demand would jump at once. It is not believed that demand uninfluenced by some such outside agency will be materially increased before the first of the year. But the determination of men in the local trade seems to be to maintain a neutral position until after the first of the year. The tone of all the offices is optimistic, and they seem to feel that having been for 10 months without material change they must soon come to the proverbial turn in the lane. In some of the offices there is met the declaration that their business has been good under all the circumstances and that they really have "no kick coming."

Thurmond, W. Va.

Conditions in the New River coalfield, along the Virginian and Chesapeake & Ohio Railways, are in a decidedly mixed-up condition. Operators along the Virginian have an ample car supply and run every day, while the operators dependent on the Chesapeake & Ohio Railway alone are only working about four days a week. Operators in the Chesapeake & Ohio Railway district, who have track connections with the Kanawha, Glen Jean & Eastern Railroad, popularly known as McKell's road (McKell Coal and Coke Company) and with the White Oak Company's road, both of which now connect with the Virginian, also have an ample car supply and run every day.

Then of the large selling agencies handling the coal from this field, some have large amounts of coal at tidewater and few vessels chartered, while others are short of coal, both at Sewalls Point and Newport News.

During the first ten months of this year, the Virginian Railway dumped over its Sewalls Point piers 1,622,534 tons. This road has just issued a little pamphlet descriptive of its Sewalls Point piers, giving some of the loading records they have made, which are quite remarkable.

As showing how far below their rated capacity the mines in the New River field along the Chesapeake & Ohio Railway are loading, the following statement is given of the four largest mines in the district and what they should have loaded, based on their actual tonnage allotment per day, with twenty-five working days allowed:

Name of Mine Shipping	Tons Actually Loaded	Tonnage-allotment Capacity	Per Cent. of Capacity Loaded
Sun	30,870	47,500	65.0
Raleigh	17,100	37,500	46.0
Klondike	10,410	32,500	50.5
Star	13,460	22,500	60.0

Nashville, Tenn.

Domestic business in this field is entirely satisfactory, with mines working full time, and so far no trouble has shown itself in the way of shortage of cars with the Louisville & Nashville Railroad.

Prices are ranging just about the same as usual at this time of the year, which are as follows per ton:

Standard lump	\$1.25
Nut coal	\$0.90@1.00
Screenings	0.25@0.30

The demand for steam coal is not as good as it might be and the mines making a specialty of furnishing steam plants their requirements, are complaining about the dullness on steam coal. The prevailing price on mine-run coal is from 80@90c. per ton, according to district from which the coal moves.

From this time on it will be strictly a weather-market proposition in this field on domestic coal. A spell of severe weather, lasting for some little time will advance the price on domestic coals; otherwise on account of the large overproduction in this field the present price on coal for the season will very likely remain unchanged.

Louisville, Ky.

A drop in temperature from 74 to 18 degrees in twelve hours in this locality precipitated a raid on the coal dealers. Different retail dealers are advertising a 2000-lb. ton, due to a lively controversy which has occurred in the general council of Louisville, as to what constitutes a ton of coal. Jellico coal is being advertised as low as \$3.60 per ton, Straight Creek, \$3.75, and Kentucky Lump, \$3.75, with Pittsburg at 14c. a bushel. The activity in coal centers in Kentucky is being duplicated in the mining districts as well.

In the western part of the State the inactivity due to the Illinois Central strike is fast disappearing. More cars are being placed at the disposal of the mines with which to handle their coal. In the Middlesborough district there is much activity; this field, while not a new one, continues to develop rapidly.

Indianapolis

The weather during the last week has been the key to the local market. The first few days of cold weather occasioned some increasing interest and strength, but when followed by warm weather the market lagged and showed weakness. It is apparent that every new touch of winter makes a draft upon the retailer, and directly through him on the wholesaler. These are indications that both consumers and retailers are depending mainly upon the day-to-day supply of coal, adopting this plan of depending on the open market with entire confidence.

Conditions relating to steam coal remain practically unchanged. Manufacturers are still confident that business will soon take an upward turn and trade generally speaking is hopeful. However, the developments of the last few weeks show a depressing effect on the coal trade in general, due, it is said, to the threatened attack by the Government against the big interests, and in particular the Steel Corporation. Because of these and other hindrances, it need not be expected that there will be any perceptible improvement in the steam-coal demand and consumption during the remainder of the year. The operators freely admit that their dependence is placed on whatever profit they may derive from consumers in general. There has been no change in the price of coal since November 1.

St. Louis, Mo.

Conditions in the St. Louis market were somewhat better the past week, because of the change in the temperature. There had been a slight increase the week previous, but during the last week prices have been practically stationary as a whole. Car supply occasioned a sharp demand on one or two days, but other than that there was nothing extraordinary about the market.

It is almost beyond understanding why the market still hovers around the cost of production price, especially on the inner belt coals. Higher-grade coals from

the outer district advanced slightly and were in fair demand, but the bulk of the tonnage moved to the country.

One extraordinary feature of the present season is the fact that the railroad companies are not buying in the volume that they have heretofore at this time of the year. As a matter of fact, right now a lower price is asked at the rate of 50 bushels of Standard lump coal than for a thousand bushels. This is retailing on track in wagon-load lots at from $1.50 to $1.62½ per ton, and the operators are asking $1 at the mines with a 52c. rate, to which must be added the shrinkage and other losses. This is the first time that anything like this has occurred in years, and there seems to be no immediate remedy for it. The cause of this is laid to one or two of the larger companies in St. Louis, who have the output of the Standard mines, and who are endeavoring to drive the retailers out of the carload business. Indications are that the higher-grade coals will continue to bring a good price, while there is very little hope for coals from the Standard field of the lower grade.

The prevailing prices per ton are as follows:

Standard:

2-in. lump	$0.95@$1.05
6-in. lump	1.00@ 1.10
No. 1 nut	0.75
No. 2 nut	0.60
2-in. slack	0.30

The Mount Olive and Staunton coals are still selling at from $1.25 to $1.35, and the higher-grade coals from the inner belt are selling at from $1.75 to $2.10.

Franklin County Coal:

6-in. lump	$1.60@$1.75
3x6-in. egg	1.60@ 1.75
No. 1 nut	1.50
No. 2 nut	1.30
No. 3 nut	1.00

Williamson County Coals (Carterville):

6-in. lump	$1.50@$1.65
3x6-in. egg	1.45@ 1.60
No. 1 nut	1.15@ 1.25
No. 2 nut	1.00@ 1.10
No. 3 nut	0.90
2-in. screenings	0.45
Mine-run	1.00

Minneapolis—St. Paul

There is a splendid tone to the retail market. The time was when the Twin Cities coal supply came altogether from the head of the Lakes docks, but for several years past, the all-rail coal from Illinois, principally Southern Illinois, has found a large place in the domestic market. All-rail coal is also used to a considerable extent in the steam trade.

There has been no change in dock coal prices, anthracite remaining at $9 for stove and egg, chestnut at $9.25, pea at $7.75, buckwheat at $6.25, delivered in consumers' bins. Hocking, $5.75, Youghiogheny, $5.75. All-rail, washed nut and stove $5.50. Smokeless $7.25.

Carload prices for domestic coal are firm on dock coal, $3.50 for Hocking and Youghiogheny at Duluth-Superior docks. All-rail coals are held very firm at mines, Franklin county lump and egg and No. 1 at $1.75, and stove and washed egg, $2; No. 2 at $1.50, sometimes called special stove.

Carterville lump and egg, about $1.75; washed egg $2; washed nut $1.75. Coals from Springfield and vicinity are held at $1.75 for egg and $1.50 for washed nut.

Portland, Ore.

Australia coal to the extent of 6000 tons was brought here this week by the British steam "Strathearn," from Newcastle, N. S. W. This is the first coal cargo to arrive here this season from Australia, and it will not be followed by more than the four or five vessels now listed. The importation of Australian coal to this port has decreased materially during the past five years, due largely to the introduction of domestic coals. About seven years ago the importation for one season amounted to approximately 70,000 tons. The fact that the railroads and steamboats are using oil fuel extensively is also responsible for the decreased shipments from Australia.

The weather of the past week has been more favorable to the fuel dealer, although by no means such as to create a sudden demand for coal.

Following are the prices asked here per ton, including cost of delivery to points within the city proper:

Japanese		$7.50	
Washington lignite	$7.00@	7.50	
Australian	10.00@	10.50	
Rock Springs, Wyo.	10.00@	10.50	nut $9.50
Diamond, Wyo.		10.00	
Carbon Hill, Wash., lump		10.50	
Carbon Hill, steam		7.50	
Newcastle, Wash.		7.00	
Beaver Hill, Ore.	9.00@	9.25	
Blacksmith coal		17.00	

San Francisco

The arrivals for the week by water are limited to one cargo from Australia of 3739 tons. Notwithstanding the light arrivals, and providing there are no mine strikes, accidents or lockouts, we see no cause for apprehension in this market. There are ample supplies of Australian to meet all existing demands.

Domestic consumers are favored with continued mild weather, no rain or cold weather having visited this section for more than a month.

The mines of the Puget Sound and British Columbia districts, from which most of our coal is received, are working full time, with increased output, and have a local demand for nearly all they produce, making them comparatively independent of this market. Prices are firm, with no immediate prospect of change, and the demand is quite satisfactory, considering weather conditions.

The car shortage referred to last week still continues and the dealer with a confirmed habit of living on the "hand-to-mouth" policy is registering his usual inconsistent "kick."

The wholesale prices, ex-bunker or at ship's side, are as follows, per short ton:

Wellington, clean	$8.00
Wellington, average	7.50
Australian, clean	8.00
Australian, average	7.50
Puget Sound, clean	6.50
Puget Sound, steam	$5.00 and 5.50
Pennsylvania anthracite	15.00
Colorado anthracite	12.50
New Mexico anthracite	13.50
Anthracite briquets	10.00
Cumberland, smithing	12.50
Utah, Wyoming and New Mexico, clean (for domestic use only)	$9.00 and 8.00

Foreign Markets

Great Britian

On the whole the coal trade of the British Isles has shown a little more activity, but delivery orders are by no means large. This has not had any tendency to reduce the prices, either those publicly advertised or the whole pit prices, and with the heavy accumulations of back orders disappearing the collieries are not averse to hold up a reserve supply in view of the demands winter will necessarily make. It seems too that the winter demand will be brisk, as the weather has certainly given many indications of a hard fall and winter. The Newcastle and Durham markets are firm, prompt and vigorous, and steam coals at Durham are in brisk demand. The house-coal trade of Lancashire is in good demand, while in the South Wales district the greatest attention is being given to the acquisition of the Welsh Navigation Coal Company's interests by Messrs. D. Davis & Sons, Ltd. This combination is one of the most important in the trade effected in recent years and the progress of the combine will be watched with interest. Some prophets have already been forecasting a huge combination of all the coal interests in South Wales. The Scottish Coal trade continues active in all branches as does the trade in South Yorkshire.

Chartered tonnage continues to arrive fairly well, and with a better demand for large coals over the remainder of the year, prices are stiffening. More attention is also being paid to contracting over next year. Quotations are approximately as follows:

Best Welsh steam coal	$4.08@$4.14
Seconds	3.84@ 3.90
Thirds	3.63
Best dry coals	3.96
Best Monmouthshire	3.66@ 3.69
Seconds	3.54@ 3.57
Best Cardiff small steam coal	1.92@ 1.98
Seconds	1.80@ 1.86

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive for wharfage and for cash in 30 days, less 2½ per cent.

Spain

Imports of coal into Spain for the eight months ended Aug. 31 were 1,398,060 metric tons, an increase of 50,031 tons over 1910; imports of coke, 206,464 tons, an increase of 16,261 tons. Substantially all these imports come from Great Britain.

Alphabetical Index to Advertisers

Classified Index to Articles Advertised

"The Dean Boiler Tube Cleaner has paid for itself. We removed over 300 pounds of scale from a boiler that we thought clean."

ALEXANDER COAL CO., *Goff, Pa.*

Have You Also Misplaced Your Confidence?

Our business is a funny one for we do our best work by breaking other people's illusions.

Many Mine Superintendents have fought the scale evil in their Boiler Plant by compounds, water purifiers, etc., and like the company quoted above have thought their boilers clean until the Dean proved otherwise.

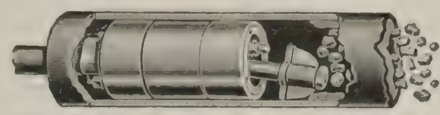
Misplaced confidence of this sort is costly, for it not only means more boiler repairs, shorter service from boilers, and greater consumption of fuel, but it also means what is more to be feared—namely, a lessening in steaming efficiency and a liability of complete shutdown.

The Dean eliminates misplaced confidence and gives a *real* confidence, for it removes all scale surely from the boiler tubes. And you can prove so yourself by sending for one on trial and seeing it remove scale, the presence of which you had never suspected.

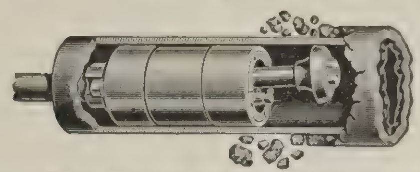
Economy is desirable in the power plant of the coal mine as elsewhere. Efficiency is essential to the power plant of the coal mine. The Dean is a valuable aid in securing both. *Try it.*

The Wm. B. Pierce Company

335 Washington Street — Buffalo, N. Y.



The Dean removing scale from the tube of a water tube boiler.



The Dean removing scale from the tube of a return tubular boiler.

Trial Offer and Guarantee

We send the Dean Boiler Tube Cleaner for free trial on one boiler. The Mine Operator, Superintendent or Manager can see how it operates and prove to his own satisfaction that it removes all scale.

We sell the Dean under a guarantee that it will pay for itself within six months or we will refund money.

Read that letter at top of this advertisement again and you'll see why we can make such a guarantee.

Accept our trial offer today.

SITUATIONS WANTED

Advertisements under this heading 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Position wanted with coal company in West Virginia as mine superintendent, engineer or mine boss; have West Virginia mine foreman's certificate; age 33; 19 years' experience in mining; can furnish good references. Address Box 2, care COAL AGE. Nov. 25.

POSITIONS VACANT

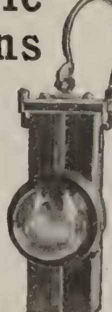
Advertisements under this heading 5 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Wanted—Experienced executive and manager of bituminous coal operation with engineering experience. Address Box 3, care COAL AGE. Nov. 25.

Hubbell Electric Safety Lanterns

Ideal for MINE Use

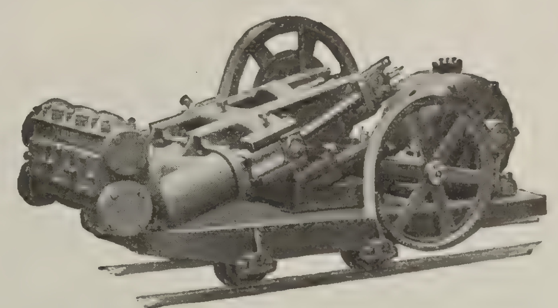
For general use about the mine, the officials' and Miners' Hand Lantern here shown is unequalled. It is excellently adapted for work in tunnel headings, for use with rescue apparatus or coal punching machines. Cost of operation is only about half that of any oil lamp. *Write for catalog.*



PORTABLE ELECTRIC SAFETY LIGHT CO.

14 Johnson Street, Newark, N. J.

Deming Electric Mine Pumps



WHEN you strike a water pocket in some part of your mine where no pumps are installed, what good is your stationary steam pump?

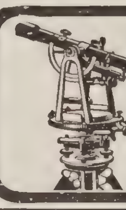
This Deming electric driven, *portable* mine pump can be taken any place your tracks lead to. *Write for particulars.*

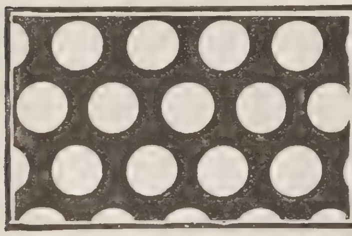
The Deming Company

Salem, Ohio

HAND AND POWER PUMPS FOR ALL USES

Henion & Hubbell, Chicago. Harris Pump & Supply Co., Pittsburg. Charleston Electrical Supply Co., Charleston, West Virginia. C. M. McClung & Co., Knoxville, Tennessee. Hendrie & Bolthoff Mfg. and Supply Co., Denver.





CA

COAL AGE

Devoted to Coal Mining and Coke Manufacture

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Issued Every Saturday.
Hill Publishing Company.

NEW YORK, NOVEMBER 25, 1911.

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CA

COAL AGE

Vol. 1 NEW YORK, NOVEMBER 25, 1911 No. 7

MR. MINE FOREMAN—You have read so many admonitions suggesting that you should have all the virtues of the Stone Figure of Justice over the county-hall clock, that you may pass this one up; however, a thought lies edgewise in my mind like a herringbone across one's gullet, and won't down.

You have arrived at an old mine, where the tonnage cost is too high, or the output too low, perhaps both—they usually hunt in couples.

What are you going to do about it? Will you laugh and say, "I'll make the old fellow dig down into his jeans and get some equipment here."

I never saw that scheme tried but it failed. And why? Because the man who thinks in that way is usually trying to get the other fellow to solve his problems for him. And when the equipment is obtained, he hasn't the men, or the mine works slow time, or somehow things are out of joint.

It's foolish to say, "Give me an appropriation and I'll give you cheap tonnage." You're promising sufficient men, a steady market, and no accidents. It's far better to go easy, and look around. Let everybody know you're boss, but don't think you have to make good the first day.

And now look for the best investment money will bring. In nearly every mine, there are opportunities (some temporary, others permanent) to employ capital so as to net 100 per cent. each week. This first investment should be one which won't show up on the semi-monthly roll, and will be totally absorbed by the quick profits. And in figuring profits, don't forget tonnage; when the mine isn't making its capacity, larger output can be cared for without extra handling cost, during the gossiping time of the men.

The shooting of a small hill in the mine—in a place where doubling is necessary; the ditching of a dip which will cut out a compressed air pump and give a "puncher" a better show; the laying of a longer pipe line through and beyond a sag so as to avoid pumping; the cleaning of a piece of dirty road, and perhaps the corduroying of it, are all chances to shave costs.

The roads you grade or clean may have been the cause of a general haulage lag. Perhaps the dip you drain was frequently flooded, and that may have washed the oil out of the axle boxes of the cars, making them run hard and thus lowering your tonnage.

Your predecessor probably met these troubles by "hollering"—a cure for low production as effective as an Indian's cure for low pulse. But you're no copper-skinned medicine man and it's better to solve your problems like a man of intelligence and practical training.

However, don't try to remedy all faults at once. Correct the glaring things first, and endeavor to select and rectify those evils which, when corrected, will return the principal in 7 to 14 days. You wouldn't loan money at 25 per cent., if you could get 50.

In the second fortnight, it's possible to tackle jobs you couldn't touch in the first two weeks, because doing them would have boosted the cost of coal. But, having made a first economy that now earns for you without further expenditure, it is expedient to make slower-paying, but no less important, investments.

One word more—don't let your cost of coal go down too low till the necessary improvements have been effected, till it is certain your mine is safe within the law, and until you are sure the low cost can be maintained.

Running a mine is a long-distance event, and the fellow who winds himself on the getaway, won't even be able to walk across the finish tape. Don't try to start by making a record, and later have to increase operating charges to keep the mine in condition. When you start breaking records in the matter of cost per-ton, be sure it is downward and not skyward.

An Illinois City Coal Mining Plant

By E. F. Mullin*

Favorably located in the heart of a large city, this mine outgrew its old equipment, and recently the owners built a new, fireproof surface plant of 3000 tons daily capacity. The design, construction and operation of this plant are described in detail.

Few of the larger cities in this country can claim, as one of their home industries, an uptodate coal-mining plant, equipped to handle a daily output of 3000 tons of prepared coal. Springfield, Illinois, however, has the distinction of having within its limits such a mining operation, the property of the Capital Coal Company, which started mining about thirty years ago and has steadilv grown until now one of the leading operators in the Illinois field.

The location of the mine from a commercial standpoint is ideal, it being practically in the heart of a large and growing city, whose citizens use a large portion of the mine's output at retail prices, while three railroads, together with an interurban traction line, carry the balance to their respective markets.

The city not only offers a ready market for the coal, but also extends to employees of the company social and educational advantages seldom found in the mining towns and districts of this country and the result is, an organization of miners, who are thrifty and industrious citizens, many owning their own homes and educating their children in lines other than that of "digging coal."

Under these favorable conditions, the demand for coal from this mine gradually grew, until the company's original surface plant became inadequate for the economical handling of its output and, early in the spring of 1910, the directors decided to replace their old wooden tipple and headframe with a steel structure, equipped with the latest type of machinery for preparing Illinois coal.

General Construction

It was the company's intention at that time to continue to use its old wooden rescreen house and wagon bin; but about the time it closed the contract for the new tipple and headframe, a fire broke out, completely destroying the rescreen house and wagon bins, as well as the power plant, headframe and tipple. This brought about an immediate decision to rebuild the entire surface equipment using a form of construction as nearly fireproof as possible, and resulted in the installation of a plant consisting of steel headframe and cages, steel tipple, steel wagon bin, steel rescreen house and bin, and brick power-

Fig. 1. View Showing Rescreen House and Wagon Bin

*Columbus, Ohio.

plant buildings designed and built by the Jeffrey Manufacturing Company, of Columbus, Ohio.

A plan of the surface layout is shown in Fig. 5, as far as the limits of the drawing will permit. The office building, shops, and connections of the tipple tracks to the main tracks of the traction and railroad lines are not shown.

Three photographic views are shown, in Figs. 1, 2 and 3. The completed headframe and tipple are seen in the foreground of Fig. 2, with the rescreen house and bin in the rear. Fig. 1 shows a photographic view of the plant taken from the side opposite to that of the view shown in Fig. 2. The rescreen bin and wagon bin are in the foreground, and the headframe and tipple are seen in the rear.

The headframe, tipple and wagon bin, all under construction, are shown in Fig. 3. The construction of the rescreen house and bin had not been started at the time this view was taken.

Fig. 2. View Showing Headframe and Tipple

A City Coal-mining Plant

A longitudinal view of the tipple and an end view of the wagon bin are given in Figs. 4 and 6, respectively.

This new equipment was put into operation early this year and will hoist, screen and handle 300 tons per hour. During the past winter, it was not an unusual thing to see 50 to 60 wagons waiting their turn to be loaded with coal for the local domestic trade, which, on some days, aggregated 700 to 900 tons, the arrangement of bins and loading facilities making it possible to easily handle this amount per day.

The shaft is 10x13 ft. and has two compartments for the use of balanced hoists. There are three loading tracks passing under the tipple, two of which also pass under the rescreen bin. The lump-coal track is provided with a track scale located below the tipple and opposite the rescreen bin.

Headframe and Cages

The headframe is of steel construction, supported on four columns, and towering about 90 ft. above the rail. The engine or back brace runs parallel to the loading tracks and is provided with a stairway leading from ground to the sheave room, together with a walkway from the latter to the weigh room in the tipple, as shown in Fig. 2. The headframe is equipped with two extra-heavy 72-in. bicycle-type head sheaves, grooved to take 1¼-in. hoisting rope. The sheaves are housed over with a steel frame covered with galvanized corrugated iron. Steel trolley beams are provided in order to facilitate the handling of the head sheaves and accompanying parts.

The cages are of the two-way self-dumping type, capable of handling cars weighing, rock loaded, 8000 lb. They are constructed of wood and steel and especially designed to dump two ways, in order to provide a means of handling the rock brought from the mine.

These cages are provided with double rocker and double dumping shafts so that by the interchanging of a pin, the cages will dump either right or left. The rock cars dump to the right of the headframe as seen in Fig. 2 into a small rock bin not shown in this view.

Steel Tipple

A longitudinal section of the tipple, showing arrangement of scales, chutes, screens, etc., is given in Fig. 4. The self-dumping cages automatically discharge the two-ton coal cars into a chute leading to the weigh hopper *B*. This hopper will hold something over two cars of coal and is suspended from a five-ton scale-beam frame. The scale is equipped with a quick-weighing dial, located in the beam box *A*. The weigh hopper is fitted with a swing gate, operated by toggles through levers from the scale-room floor.

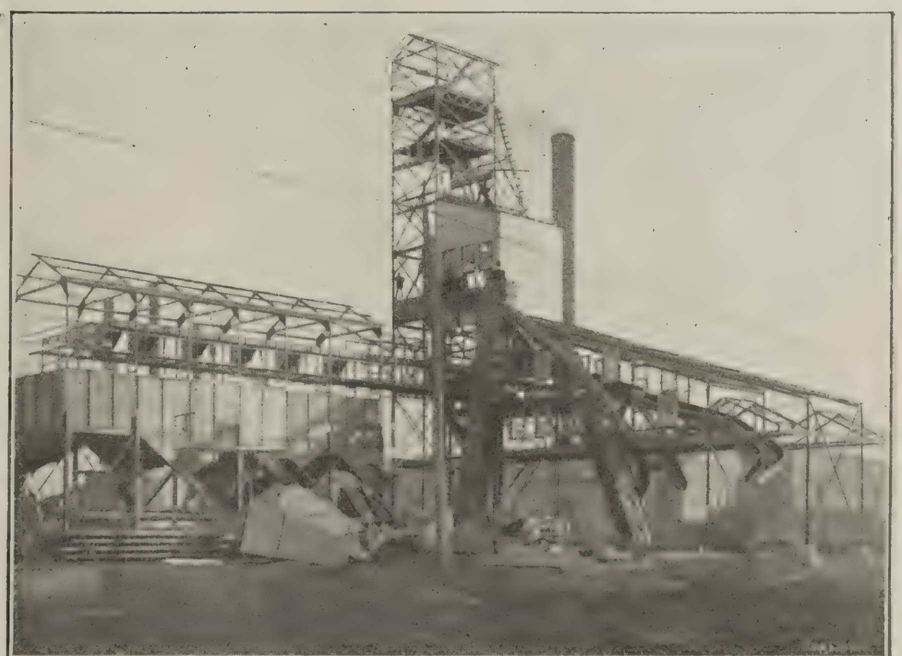


Fig. 3. View of Plant During Construction

The coal is discharged from the weigh hopper into a reciprocating feeder *C* which is of a special design, being arranged to feed the coal either of two ways by changing a valve located at

the center of the feeder plate. Coal may be fed regularly to conveyer *I* (described later) or to the upper shaking screen *D*.

This screen *D* measures 7 ft. by 22 ft. 6 in. and is provided with 16 lin. ft. of 1¼-in. round perforated plate, arranged in steps of 4 in. every 4 ft., in order to turn the coal while in transit and thus give better screening results. The lower deck of this screen is of plain steel plate, and the slack passing through the screen perforations is carried on this deck to a valve at the lower end whence it falls into chute *H*, delivering to the slack car or, if desired, is bypassed to elevator *M*.

Coal passing over the upper deck of screen *D* is delivered to screen *E*. This measures 7x26 ft. and is provided with two decks similar to those of screen *D*. The upper deck has 12 lin. ft. of plate with 3½x2½-in. oblong perforations, and the egg coal passing through these perforations is delivered into chute *G* leading to the car or, if desired, is bypassed to elevator *M*.

The lump coal passing over screen *E* is carried around the radial chute *F* to the cars. This chute is provided with loading fingers and suspended at its lower end from a hoist in order to vary the pitch for loading lump and run-of-mine product. Screens *D* and *E* are designed to deliver run-of-mine coal to the lump track without the use of veils for covering the screen plates, a feature which will appeal to many tipple "bosses" because of the simplicity of operation, it being necessary to merely close the valves in the lower decks of the screens when shipping run-of-mine.

The shaker screens are driven by a 25-h.p. motor through two belt reductions, their eccentric shaft running at 100 r.p.m. The eccentrics have a 6-in. stroke and are designed to eliminate as far as possible the heating, due to constant service and the tendency to get out of line.

Lump-coal Conveyer

Conveyer *I* is of the scraper type, with flights carried by two strands of chain. The run-of-mine coal from the reciprocating feeder is delivered to the upper strand of the conveyer, and at the loading point there is inserted in the conveyer trough a 14-ft. section of adjustable screen bars for taking out the fine coal. The screenings, passing through, are carried back on the lower strand of the conveyer and delivered into chute *N* leading to the elevator *J*. The lump coal carried beyond the screen on the upper strand of the conveyer is delivered to the wagon bin, as indicated in the photographic view, Fig. 3.

The elevator *J* handles the fine coal from the chute *N*, and also the screenings delivered by the screw conveyers from the wagon-bin chutes. This elevator has a lift of about 44 ft., is of the continuous-bucket type, runs at 150 ft. per minute, and is capable of handling 135 tons of coal per hour. It discharges into chute *L*, leading to the screen *D*, or by means of a valve, to chute *K* leading to elevator *M*. The reciprocating feeder *C*, conveyer *I* and elevator *J* are driven by a 40-h.p. motor through belt, chain and gear reductions, friction clutches being provided for all units.

The steel framework of the tipple is made independent of the headframe, in order to eliminate the transmission of vibrations from the shakers to the latter structure. The tipple's roof and siding are of galvanized corrugated iron.

Wagon Bin

The wagon bin shown in Fig. 5 measures 18x58 ft. in plan and has a capacity of 325 tons. This bin is kept full at all times to meet the demands of the local trade. The distributing conveyer *I* is carried along the top of the bin and is housed in by a steel framing covered with corrugated iron. The bin proper is supported on ten columns, its sides being of the girder type. The distributing conveyer has six delivery points in the bin, five of which are provided with rack-and-pinion valves operated from a walkway alongside of the conveyer.

The method of loading coal into retail wagons is shown plainly in Fig. 6. The bin is provided with four loading chutes on each side and these chutes are each fitted with flanged lip screens for removing the slack coal. The ends of the loading chutes are provided with manipulating devices for governing the flow of coal into the wagons. Slack passing

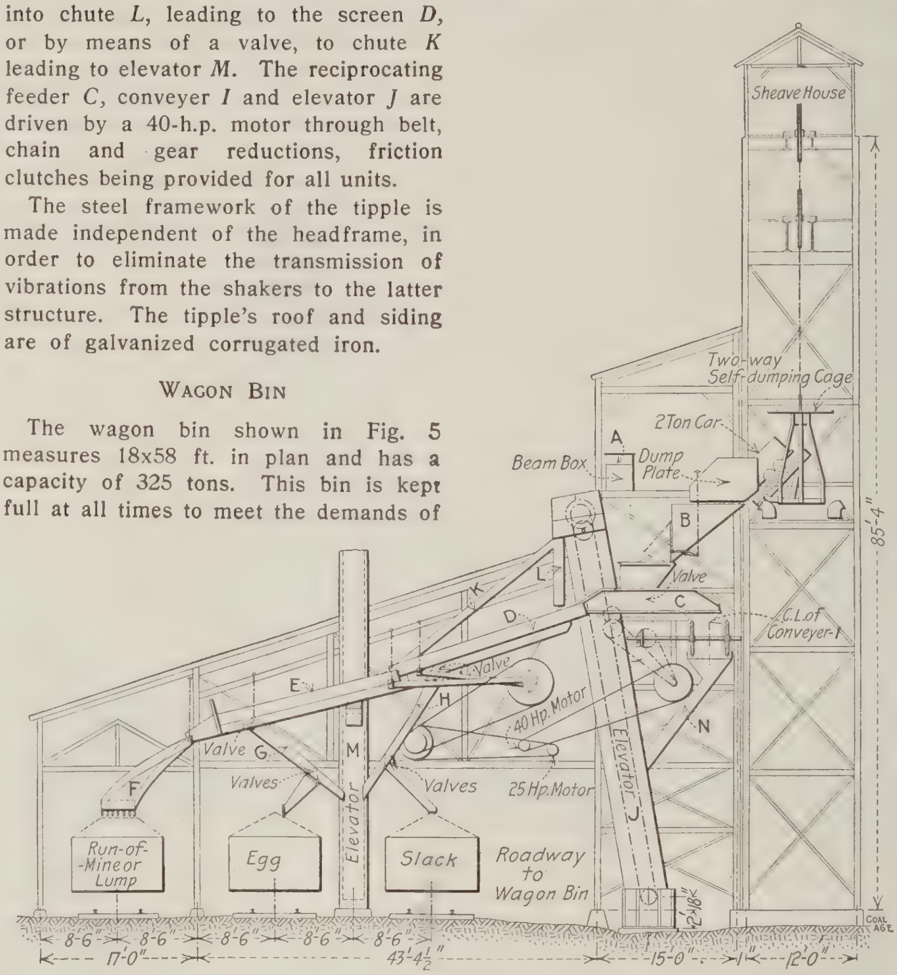


Fig. 4. Longitudinal Elevation of Tipple

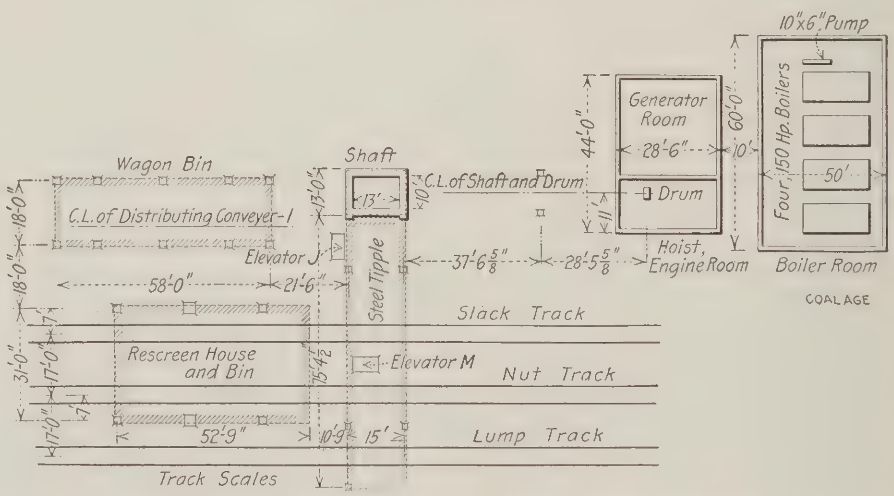


Fig. 5. Plan Showing Surface Arrangement of Plant

through the lip screens is gathered into small hoppers and discharged into a longitudinal system of screw conveyers, which deliver into elevator *J* at the tipple.

Rescreen House and Bin

A rescreen system of some kind is an essential part of a modern Illinois mining plant. The Capital Coal Company, realizing its importance, decided on a revolving-screen type of plant with a bin of sufficient size to store coal up to the capacity of at least eight railroad gondolas. The house and bin shown in Figs. 1 and 2, and also indicated in the plan, Fig. 5, is a steel structure 31 ft. wide by 40 ft. long, with a capacity of 400 tons, supported on six columns, housed over with a steel framing covered with corrugated iron, and equipped with windows and louvers.

The coal which passes through the perforations in the tipple shaker screens can be loaded into elevator *M* and ele-

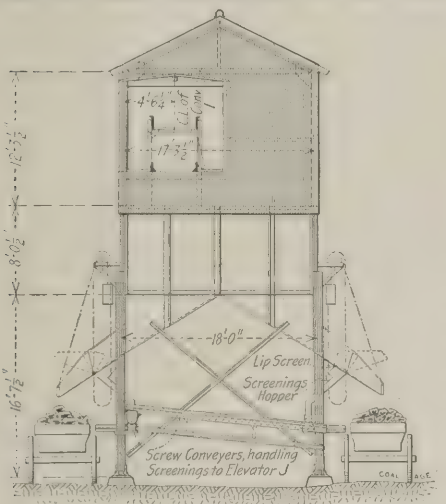


Fig. 6. End Elevation of Wagon Bin

vated to the revolving screen. Elevator *M* is of the inclined continuous-bucket type, running at 100 ft. per min. and capable of handling 135 tons per hour. The revolving screen is 6 ft. in diameter by 28 ft. long, extends longitudinally with the bin and is carried by three cast-steel friction rings running on roller shafts. The first section of the screen is covered with $\frac{7}{16}$-in. mesh wire cloth, the second section with $1\frac{1}{4}$-in. mesh and the third section with $2\frac{1}{4}$-in. mesh. This arrangement gives a grading of coal which meets the market requirements.

The bin is divided into eight compartments, giving a storage of 50 tons each. Each compartment terminates, over the center line of the loading tracks, in hinged chutes provided with chop gates for feeding to the cars. The side of the bin adjacent to the wagon bin is equipped with side-loading chutes, for serving wagons with any of the four graded sizes stored in the bin.

Elevator *M* and the revolving screen are driven by a 40-h.p. motor through belt and gear reductions. The motor is housed separately, as a safeguard against fire, just below the overhanging portion of the screen house indicated in Fig. 2. A stairway leads from the tipple floor, alongside of elevator *M*, to the motor room, and a ladder is provided from the motor floor to the screen room.

Power Plant

The power plant consists of two buildings as shown in Fig. 5. Both buildings have 12-in. brick walls with fireproof roofs. The boiler house is 49 ft. wide by 60 ft. long; it is equipped with four 150-h.p. boilers, built by the Springfield Boiler and Manufacturing Company. The engine and generator room is 28 ft. 6 in. by 44 ft.; it is equipped with an 18x36-in. Danville Hoisting Engine Company's hoist.

A 175-kw. generator, 250 volts, direct current, furnishes power for the tipple motors. The generator is direct connected to a Ridgway engine.

Organizing Rescue Work in Mines

The report of the committee appointed last October "to frame proposals for the making of an order or orders under the Mine Accidents (Rescue and Aid) Act, 1910," has been made. It is proposed that unauthorized persons shall not be allowed to enter a mine after an explosion of firedamp or coal dust, or after the occurrence of a fire, for the purpose of engaging in rescue work.

Competent rescue brigades must be organized and maintained at every mine on the following scale: one brigade where the underground workers number less than 250; two brigades where more than 250 or less than 500; three brigades where more than 500 and less than 800; four brigades where more than 800. This provision will be deemed to have been complied with where less than 100 underground employees are engaged, when the privilege is acquired of calling for a brigade from a central rescue station. Furthermore, one clause of the proposed regulations empowers the Secretary of State to exempt such a mine from this order if it is so situated that the organization of a central rescue station from which it could be served is impracticable.

Organization of Rescue Brigades

Rescue brigades must consist of not less than five persons employed at the mine, carefully selected on account of their knowledge of underground conditions, coolness and powers of endurance and certified to be medically fit.

Members of brigades must be instructed in the reading of mine plans, in the properties and detection of poisonous or inflammable gases and in the use of the various rescue appliances. Each brigade is to have a captain selected from its ranks. Members of brigades must undergo a systematic course of training, and arrangements are to be made at the mines for summoning the brigades, as soon as their services are required.

In the event of failure to organize the requisite brigades, by reason of the necessary number of underground workers declining to act in that capacity, the owner, agent, or manager of the mine shall be penalized in no way, provided he has afforded every opportunity for organization and made a bona fide attempt to arrange for the supply from a central rescue station of such rescue brigades as he is unable to provide at the mine.

Portable breathing apparatus in the proportion of two sets to each brigade are to be maintained at every mine, and the apparatus must be capable of enabling the wearer to remain for at least one hour in an irrespirable atmosphere. This provision is to be considered as complied with when the privilege is acquired of calling for such appliances from a central rescue station, if the latter is not more than 10 miles distant and connected by telephone with the mine.

It is required that there shall be provided and maintained at every mine: 1. Two or more small birds or mice for testing for carbon monoxide. 2. Two electric hand lamps for each brigade, ready for use and capable of giving light for at least four hours. 3. A safety lamp for each member of the brigade for testing for firedamp. 4. Tracings of the workings which have been brought uptodate within not more than three months, showing the ventilation courses and all doors, stoppings, etc., and distinguishing the intake air from the return air by the use of a different color of ink.

Equipment of Central Rescue Station

At each central rescue station, not less than 15 complete sets of apparatus are to be maintained, with means of supplying sufficient oxygen or liquid air to enable this apparatus to be used constantly for two days and with the necessary means of charging such apparatus. Twenty electric hand lamps, four sets of oxygen reviving apparatus, ambulance boxes, together with antiseptic solution and fresh drinking water; cages of birds and mice, and a motor car are to be in constant readiness.

Rules for the conduct and guidance of persons employed in rescue work, such as may appear best calculated for the carrying out of rescue operations, must also be formulated and kept at every mine.

Stone Dust in Mine Explosions

By R. Dawson Hall

Stone dust as an immunizing agent against explosions has many important properties which should be considered in addition to its merely nonbituminous nature and quantitative presence. Its density, chemical composition and conductivity, the size and shape of the particles, the specific heat and temperature of dessication are all factors to be taken into account.

In a letter, published on Jan. 21 of the present year in *The Engineering and Mining Journal,* I commented on the action of air-borne bodies when stopped by the interposition of a diaphragm or by the reverse action of an incipient explosive discharge or "blownout" shot. I attempted to show that these air-sustained bodies, because they were traveling with equal velocity and had greater density and consequently greater momentum than the medium in which they traveled, continued on their way after the air ceased to advance. Thus these dusts and other solids approached the diaphragm, explosive discharge or "blownout" shot closer than the air in which they were severally traveling and thus aggregated in larger percentage near the disturbing factor.

Mechanics of Immunization

Seeing that "stone dust," as all nonbituminous dust is misleadingly termed, has a density about 1.8 times greater than the dust of pure coal, it is a justifiable inference to assume that, other things being equal, the stone dust will advance toward the disturbance further than the coal dust. The word "advance" here and hereinafter is used relatively and means an advance, a slower retardation or a retarded change in direction.

But this advance may be assumed, also, to be favored or resisted by the nature of the dust, a cuboidal dust being more readily stopped than a spherical, and a spherical dust being less persistent in travel than one which is lenticular and with more spread in a horizontal plane than in a vertical. A thin scaling shale dust in this manner resembles an aëroplane, easily sustained, but freely traveling against a suddenly opposing wind by virtue of its own previously acquired momentum.

It is to be assumed, furthermore, from a consideration of the laws of nature and from observation of the action of a hurricane, that the longest dimension of any body propelled by a medium is in the direction of the flow of that medium, granted that the body be free to turn and also that the next largest dimension is so disposed horizontally as to resist most the possibilities of falling under the influence of gravity.

Immunizers in Mine and in Laboratory

Consequently, from a laboratory standpoint, the best dust for immunizing a gallery from explosion is a dust of a flat, multi-stratified, aëroplanic nature, not only well ground but well weathered into thin flakes, easy for swirling air currents to pick up, able to travel with minimum resistance, dense enough to project itself freely through the enveloping air into the very forefront of the disturbance, and free of any bituminous content which might aid an explosion. These are the primary desiderata, mostly mechanical, of a pulverized stone for use in an explosion gallery for immunization.

But a truer theory, embracing the conditions found in a working mine, would suggest that a dust, which will cement well with the coal particles on the floor of the mine to form a hard pavement, resisting disintegration and the elevation of its material by the air, will be better suited to produce immunization than a dust of so dry a nature that it has not enough cementing value to render that floor coal dust innocuous, even under continued travel.

The shape of coal particles is cuboidal, of sandstone, spherical and of shale, mostly lenticular. Consequently most forms of stone dust are of such shapes that they travel further than most forms of coal dust when projected.

Moreover, not only are stone dusts projected further by reason of their shape but they are also raised more freely than their relative densities as compared with that of coal would indicate.

Thermic and Thermochemic Considerations

There are some other considerations. A lenticular dust will be more readily heated than one which is either cuboidal or spherical, especially the latter; consequently it will have more power to lower the temperature of incipient explosion.

Most stone dusts have a large quantity of combined moisture in their composition while others contain carbon dioxide, which is driven off at and below a red heat. This makes their power to lower the temperature of an explosion far greater than a mere consideration of their specific heats would indicate. Where carbon dioxide is given off, it must tend to prevent combustion of the coal dust. Shale dust and clay dust lead among the hydrated bodies and may be looked upon almost as "tabloid" forms of water. A rich clay may easily contain as much combined moisture per pound of clay as will be found in saturated air per pound of suspended coal dust. Sandstone dust contains but little combined water; what there is, being contained in the hydrated reconstructions of its original cements. It is hardly permissible to call attention to the obvious fact that dehydration and decarbonization will proceed more rapidly, if the dust be fine or lenticular, than if in any other condition.

Sensible Heat of Stone Dust Inconsequential

But to show the inadequacy of the specific heat to explain the whole caloric absorption of a heated dust of clay or shale, the following calculations are made:

Suppose the dust chosen, to have a specific heat of 0.2 and that this value is correct between temperatures of 32 deg. and 3632 deg. F., a range of 3600 deg. A pound of such dust heated to the upper limit would absorb 720 British thermal units.

Suppose that the chemical composition of the pound of dust is represented by the formula $Al_2O_3\ 2SiO_2\ 2H_2O$, which would give 0.139095 lb. of combined moisture and 0.860905 lb. of residuum after heating and complete dehydration. Assuming that this residuum has a mean specific heat of 0.2 in the aforementioned interval of temperature, the number of British thermal units stored up in it will equal:

$$0.2 \times 0.860905 \times 3600 = 619.85 \textit{ B.t.u.}$$

Taking Mallard et Le Chatelier's figure for the average specific heat between 32 deg. and 3632 deg. F., namely, 1.22, instead of Rankine's value in the formula for the total heat of superheated steam, we have $0.139095\ (1092 + 1.22 \times 3600) = 1047.17$ B.t.u. Adding this to the units of heat absorbed by the residuum as calculated above, viz., 619.85 B.t.u., we have 1667.02 units, which result is 2.32 times higher than was obtained by assuming an even caloric adsorption of 0.2 unit per degree of rise of temperature for the undecomposed body.

The specific heat of steam I have quoted appears large and it is probable that is not truly a specific heat at all but a combination of that heat with heats of partial isomerism or dissociation. Perhaps this will account for the differences between Mallard et Le Chatelier, Berthelot et Vieılle and D. L. Chapman, the interatomic changes possibly not being equally marked in the course of their several examinations. The Berthelot value would be 1.62 and the Chapman value but 0.87 instead of 1.22 as given for the specific heat used above and based on Mallard et Le Chatelier. This conjecture relative to the cause of the discrepancy in results is perhaps unwarranted, and may well be due to methods in measurement rather than to true differences of heat adsorption.

But to Berthelot must be credited the other statement that the so called specific heat (*chaleur spécifique*) is not a simple quantity, but a compound of the true specific heat with the heat demanded by "that work of molecular loosening of the compound gas which produces no change in its composition and also the further work of dissociation, that is to say, of decomposition, properly speaking (*travail de désagregation moleculaire du gaz composé, sans changement dans sa composition chimique et le travail même de dissociation, c'est à dire de décomposition proprement dite*)".

Heat of Combination of Stone Dust

But the difference is far greater than thus set forth, for a large number of units of heat may be expended in producing a separation of the combined water from the slate or clay. I have never seen this quantity determined but any brickmaker will declare that the hold of clay and shale on the water of constitution is very strong.

It has been objected that in the length of time that an explosion lasts, there could be no such change of condition, that it would take an appreciable time for the dehydration of clay and the "burning" of limestone. Still less could such a change occur in time to prevent a blownout shot or flaring-up of methane from developing into a violent explosion.

It has been found, however, that in the spectrum of an explosion in a test tube, the lines of sodium made their appearance, showing that despite the short duration of its action, the glass was in a degree resolved into its component parts. It would be feeble in view of the uncertainty with which the rapidity of decomposition can be forecasted to say at what speed heat of great intensity will act on clay and limestone, but the fact just given is at least suggestive that the temperature of an explosion may almost instantaneously resolve some compounds into their major constituent parts.

The readiness to heat and the large amount of dehydration and decarbonization must lower the temperature of incipient explosions, while the mobility of stone dusts due to their shapes and densities must serve, it would seem, to increase considerably their percentage at the vital points.

When M. Taffanel speaks of a 50 per cent. admixture of stone dust with coal dust it is an essential point to remember what are the shapes, sizes, specific heats, conductivities, degrees of hydration and temperatures of desiccation of his stone dusts, together with the firmness of the bond with which those combined moistures are retained, and to duly consider that he does not refer to their actual distribution in the explosion zone, but to their quantitative presence on the floor and sides of his explosion gallery—quite a different matter.

That the action of dehydration in cooling flames has received some recognition is shown by the fact that alum is used, or has been used, for that purpose in the manufacture of explosives. Potash alum, it is true, has 45.52 per cent. of water of crystallization in its composition, whereas the percentage in pure clay of the water of constitution is only 14 and of gypsum 20.91 per cent.

Vancouver Island Coal

According to Consul Abraham E. Smith, a Canadian geological survey report states that the bituminous coalfields of Vancouver island are the largest on the Pacific coast. The coal area of the island is divided into five fields, viz., Nanaimo, Comox, Suquash, Cowichan and Quatsino. Of these, the Nanaimo field, with an area of 350 square miles and a content of 1,344,000,000 tons, is most important. Last year the Nanaimo field produced 1,615,160 tons of coal.

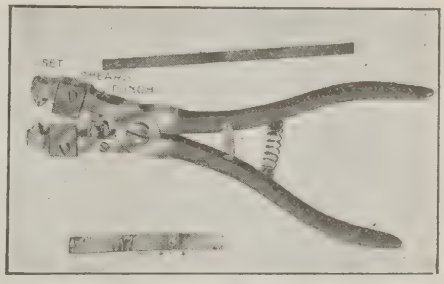
Comox is reported to have an area of 300 square miles, and the same thickness of coal as Nanaimo, making its content 1,152,000,000 tons. Suquash is given an area of 10 square miles, with an average thickness of 3 ft. of coal, or 19,000,000 tons. Recent development shows this field to have two seams of economic value, hitherto unknown, while diamond drilling shows the coal area to be probably six times greater than previous estimate, both in area and content. The Cowichan field is placed at an area of 9 square miles, averaging 4 ft. of coal, or 23,000,000 tons. The Quatsino field is placed at 5 square miles, with an average thickness of 3 ft. of coal, or 9,000,000 tons. The Cowichan and Quatsino fields are the only two lying dormant.

Alberni is likely to be added as a new field. It has long been recognized as probable that coal might be found in Alberni, outliers of the Comox formation having been recognized there. When a railway extension was under construction last fall the steam shovel uncovered a seam of coal, and the company recently started development, with the result that, so far as the slope has been run, about 170 ft., a continuous seam of coal of high quality and of a thickness of 4 ft. has been proved up. From the evidence now available it seems probable that the coal areas of Vancouver island are good for about 3,000,000,000 tons of coal, or enough to supply 10,000 tons a day for 800 years. The Vancouver island coalfields have produced to date coal to the value of $70,000,000.

The yield of the Vancouver island coal mines during the calendar year 1910 is officially reported as 1,616,030 tons, produced by four companies.

Steel Tape Repair Outfit

The accompanying halftone shows a new tape-repairing outfit, somewhat similar to others but embodying a few additional conveniences.



The tool is small, light and durable, and with an extra piece of tape and rivets, repairs are easily made. The punch will cut two thicknesses of the Lufkin or Chesterman tapes or one thickness of heavy chain type. This tool is made by the Pittsburg Instrument and Machine Company, Pittsburg, Penn.

Bath Tubs for Mules

The Philadelphia & Reading Coal and Iron Company is installing for the use of their mules, large concrete bath tanks sunk in the ground of the stable yard scaling 4 ft. deep, 6 ft. wide and 37½ ft. long. A 6-ft shower is arranged to play on the body and head of the mule so as to complete the cleansing. The approaches and floor are corrugated to protect the mule from slipping. The tanks are heated in the winter by a jet of steam. Mr. Newhard, chief veterinarian, is the originator of this improvement.

Hard Running Cars

At some mines, perforated piping is installed to spray the car wheels and tracks on insufficient grades near the tipple, so as to decrease the rolling resistance of the cars and reduce the necessary hand or animal power required to move them. This cleansing action works very well during the summer but in the winter, when cars run still more stiffly, such assistance is not available. It is at best a summer day's makeshift.

Power from Coke Oven Gases

By C. A. Tupper*

The waste gases from beehive and byproduct coke ovens are being extensively used abroad for generating power, but go largely unrecovered in this country. They may be burned under steam boilers or used directly in gas engines.

In European countries the utilization of coke-oven gases for power generation has long been common practice. The earliest method, and the only one commercially feasible with the old beehive or improved Belgian ovens, involves the use of the gases under boilers for producing steam. This is accomplished in the simplest manner by constructing a large flue parallel to the rows of ovens and providing communication from near the top of each oven, the connection being controlled by means of suitable dampers. Through this main flue the gases are conducted directly to the boiler house. In estimating the power to be obtained, the average is taken as 15 to 20 h.p. per oven, depending upon its size and the quantity of volatile matter contained in the coal.

With such an arrangement, while the ovens are in service, no coal need be used for generating the power required at a coking operation, other than that which is being treated; and the only charge for fuel is represented by the investment in the flues, their depreciation, etc. Also the expenses of handling fuel, which amount to a considerable item during the year, even when the fuel itself as mine waste can be secured at little or no purchase cost, are eliminated.

Experience with this method has been quite satisfactory, not only abroad, but also in the United States wherever it has been tried; and, if merely a small amount of power is needed, or its use is intermittent, such a plant is to be recommended, for various reasons, in preference to the more costly equipment for gas-engine operation described below. The principal difficulties arising heretofore have been due either to excessively lean gases, fit for nothing more than utilization in economizers or regenerators, or to deterioration of the flues as the result of extreme heat. The latter has also been accompanied by warping or melting of the dampers, both in the main flue and the feeders, even as far as the boiler house. All such troubles can, however, be remedied by proper design and construction and the use of suitable materials.

Use of Gases from Byproduct Ovens

Where byproduct ovens, such as the Koppers, Otto Hoffman or Semet-Solvay, are used, the installations made in the same vicinity usually include mechanical equipment for other extensive operations, such as mining, iron and steel making, etc., and the erection of a large central power plant becomes a matter of economy. Therefore, a heavy initial investment, if wisely planned, may effect a

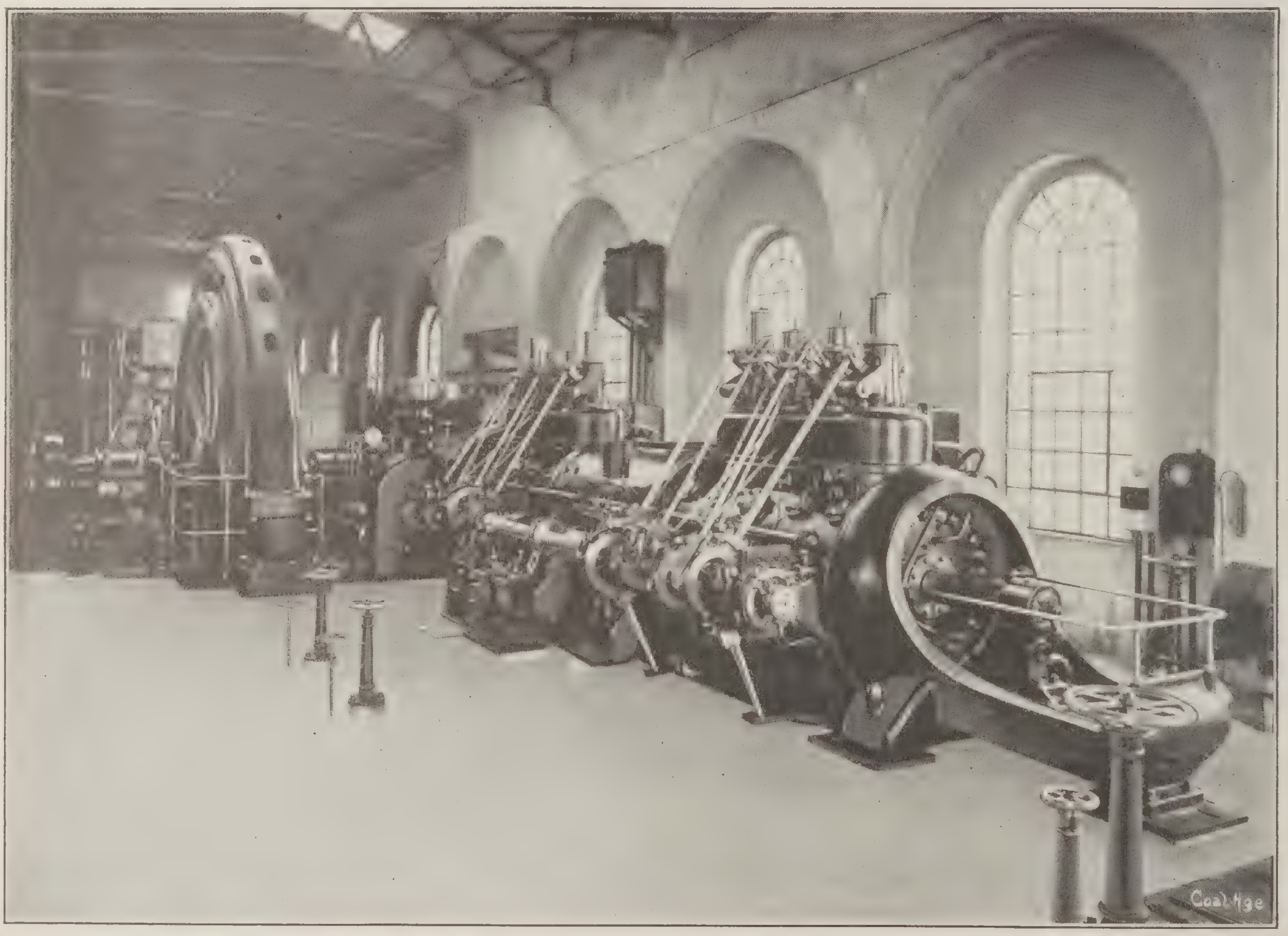


Fig. 1. Gas Engine of 1000 Horsepower, Using Coke-oven Gas, Brambauer, Germany

*Milwaukee, Wis.

material reduction in running costs, particularly as the gases from byproduct ovens can be utilized, after cleaning, directly in gas engines, thus securing a much higher thermal efficiency than is possible under boilers. The gases from a byproduct oven are, of course, much richer and more suitable for this purpose than the hot gases from one of the beehive type.

Now, assuming that a ton of coal, as charged, gives 9900 cu. ft. of gas, which is a fair average, and that from 60 to 65 per cent. is needed for heating the ovens, there will be available for power generation a minimum of 3465 cu. ft., a figure which is often exceeded in practice. Experience shows that this yields 5½ to 6 h.p. for each ton coked per day of 24 hours continuous operation.

In the cleansing of coke-oven gas it is necessary to remove both the various tar products which it carries in suspension and the more intimate mixtures of sulphur and cyanogen compounds commonly found in such gas.

Evil Effects of Tar and Sulphur in the Gases

The tar products, if not thoroughly removed, are the principal cause of fouling the induction parts and valves of a gas engine, as well as its cylinder, and frequently cause premature ignition, sticking of the regulating mechanism, etc., while all sulphur compounds that reach the cylinders turn into sulphurous acid during combustion, are converted into sulphuric acid by contact with moisture and rapidly eat away the eduction parts. Since it is necessary to use water in cooling and muffling, there is always danger of destroying vital parts of the mechanism if the sulphureted hydrogen is not prevented from entering.

The tar products which the gas carries in the form of vapor are, of course, pretty thoroughly removed in a modern byproducts plant, or may be otherwise separated by any acceleration in the cooling of the gas; but a residue remains which must be caught and retained in suitable tar washers, of which a number of satisfactory types have been evolved.

The separation of the sulphur and cyanogen compounds is considerably more difficult but, at the same time, far more important. In illustration of their destructive power, reference has been made above to sulphurous acid, which, as sulphureted hydrogen, is the commonest compound; but there is also sulphide of carbon, occurring in smaller quantities and presenting greater difficulties in its removal, and the cyanogen compounds, which form prussic acid during combustion and also act destructively on all mechanical parts subject to contact with them.

Several different methods of purification have been brought out in Germany; and in the accompanying sketch, Fig. 2, is shown one of the most successful of these plants for cleansing coke-oven gas. This was designed for use with a gas engine of 1000 h.p., supplied by Haniel and Lueg, of Düsseldorf, for the Gerkschaft Minister Achenbach (Minister Achenbach Colliery), with mines and ovens located at Brambauer, near Dortmund, in Westphalia, Prussia. A photograph of this engine is shown in Fig. 1.

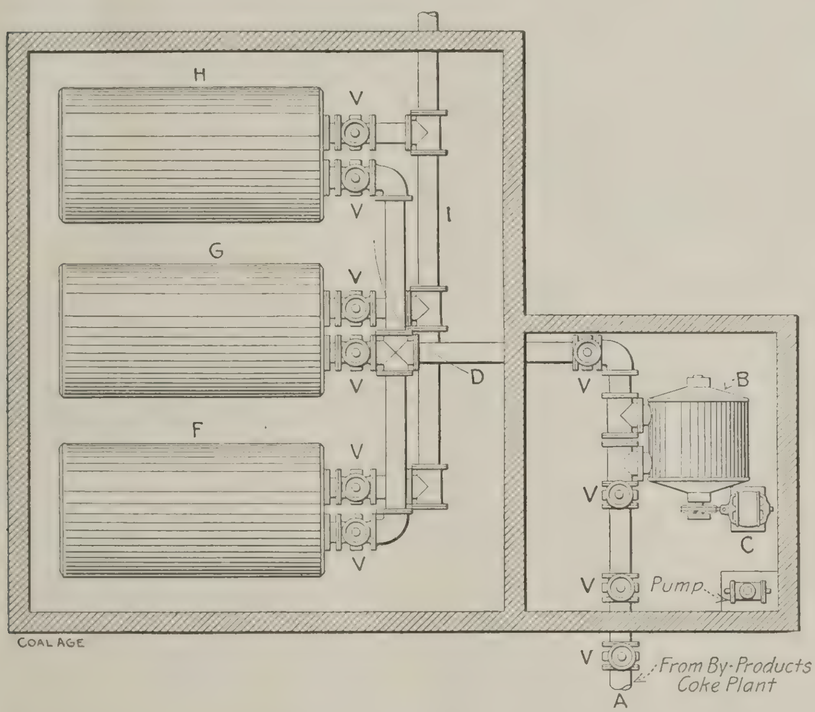


Fig. 2. Purifying Plant

From the theoretical standpoint this sounds well. In practice, however, its value has often been minimized or destroyed by failure to observe one of the fundamental conditions of utilizing waste gases for internal-combustion engines, which is the installation of an efficient cleaning plant. To insure continuous operation, the purification of the gas is a primal necessity, for, since the gas is admitted directly into the engine cylinders, all the noncombustible elements, which would remain in the cylinders and clog them or erode their surfaces, must be carefully eliminated. Such precaution becomes of especial importance when the engines are required to operate continuously and there is little or no opportunity for shutdowns to clean the cylinders.

Gas-purifying Plant

In Fig. 2, *A* represents the large gas main leading from the byproducts coke plant which the company operates, and *B* is a cylindrical rotary washer, of the Zschocke type, where the tar elements are thoroughly separated, together with the residue of ammonia not recovered in the main works. At *C* may be seen the alternating-current motor which, by means of reduction gearing, drives the washer. Through main *D* the gas, which is then charged only with compounds of sulphur and cyanogen, passes to feeders under the wrought-iron tanks *F*, *G* and *H*, where, by means of suitable vents, it is evenly diffused.

In these tanks bog iron ore is spread out on wooden hurdles, or wicker frames. In rising, the gas comes in contact with the ore, so that sulphides and ferrocyanide are formed, completely removing all noxious chemical elements. The purified gas then flows through the main *I* to the gas holder.

It is stated by the colliery officials that, after runs of two to three months or more, "no fouling worth mentioning" has been found in the cylinders or valve chambers of the engine, and there has been no clogging of the gears, thus demonstrating that the cleansing plant does the work for which it was designed. The layers of ore are automatically shifted, during operation, so as to regenerate them by exposure of their surfaces to the air; an oxidizing process then takes place, and the tanks can thus be used continuously until the mass is completely saturated. In practice it is usual to have two in service while the third is being recharged.

The matter of dust in suspension does not enter seriously into the problem of purification, as it previously settles or is removed during the recovery of the byproducts, but any which the gas may still contain is caught by the rotary washer, *B*.

High Thermal Efficiency

It has been the experience of Messrs. Haniel and Lueg, mentioned above, that, with the use of gas engines and a suitable purification plant, the waste gases from byproduct ovens will yield nearly double the thermal efficiency, for power purposes, that they would if utilized to generate steam. The idea is one that has been extensively applied in Germany and other countries of Europe but has thus far made little, if any, headway in the United States.

This is probably owing partly to the fact that the principal byproduct ovens are situated in or near large cities, where the gas can be sold for illuminating and heating, and partly to their location, more recently, adjacent to steel mills or other large works where the plan of the power equipment was decided upon previous to their erection. However, the increasing opportunities for the profitable application or sale of electric power, and the extension of coking operations to new districts, will render the subject one well worth studying for the future.

The Coal Dump

A fall of 3 per cent., is often provided on the approach road for the mine cars to the tipple. This is somewhat excessive, but 2 per cent., where the individual cars are handled, is a minimum and 1½ per cent., where large trips are dropped forward without mechanical assistance. Where long trips are to be dropped, and where there is not sufficient available fall, the tracks should be doubled or trebled, giving the motive power an opportunity to place the cars near the tipple. This is often the better arrangement as it reduces the travel of the mine car dropper.

When the coal is fragile, the grade of the mine tracks above the tipple should be reduced to the minimum at which coal cars can just drop in all seasons of the year. When the coal is to be dumped for coke use or where the markets will buy coal with a large percentage of slack, there will be a gain in the steep grade so long as the car dump and the tipple are stout enough to resist the strain.

It is well to remember that chutes are built at the angle at which coal just slides and to save it from breakage are made no steeper. If the chutes clog they can be cleaned by hand. When the chute cannot be reached for cleaning, the grade must be increased. But no storage can be obtained where chutes are set on the angle on which coal just runs, for to store a body of it, part must travel over a bed of coal and the minimum angle of travel will be greater. Arranging for such storage, chute grades are necessarily increased and if the chutes be emptied the fall of the coal will not be without excessive breakage. Even if the chutes are full, the breakage in the storage bins will be great. Any lump of coal which stops the forward flow will have to take up much of the dynamic energy of the coal above. This is why storage chutes are not more general, apart from the difficulty in obtaining tight, easily operated doors.

Installation of Power at Collieries

Special Correspondence

In the course of a paper on "Some Considerations Affecting the Installation of Power at Collieries," read before the Mining Institute of Scotland, Frank Anslow refers to the controversy now raging as to the relative advantages of the three-phase and the direct-current systems for colliery work. He says that for all practical purposes each system is equally dangerous, or perhaps it is better to say equally safe, if properly installed under conditions suitable for the system selected. Attention should be concentrated upon the question of rendering existing installations safer. Much can be accomplished in this direction, as many of the plants are at least from 10 to 15 years old, and desirable modifications may not only afford greater safety in working, but probably result in increased economy.

The possibility of electric shock is always present no matter what system is employed, and for all practical purposes the danger is independent of voltage, as the lowest practical has been shown to be fatal. The possibility of shock can be comparatively easily eliminated in all generating, motor and other plants by earthing, with the exception of coal cutters, which are more difficult to deal with. The greatest danger of shock, however, is from the cables, including main, distribution and trailing cables. In the mines of Scotland this danger is particularly prominent, owing to the wet and low seams, the latter affording the possibility of men getting into contact with the cables. The arrangement of the cabling system is necessarily a matter depending on local conditions. Armored and unarmored cables both possess advantages, but whichever type is selected great care in the installation thereof, with constant supervision, is the essential and only safe manner of dealing with cables if fatal accidents are to be avoided.

Main Objection to Direct-current Plant

One of the main objections raised to a direct-current plant is upon the score of sparking. The improvements in the design of such a plant have resulted in practically sparkless commutation, even under severe overload conditions; however, it cannot be disputed that the danger of the ignition of gas or coal dust from this cause still exists. Mr. Anslow points out, however, that this danger is also present with alternating current slipring motors, and also in a modified degree with those of the squirrel-cage or short-circuit type.

To earth, or not to earth, is at present a great question, and there are many advocates both for and against. Too frequently, however, the problem is met by a most unhappy compromise of partial earthing. If earthing is attempted, it must be carried out effectively, and generally speaking, two main earth plates should be employed, one on the surface and one below ground in the shaft sump or other suitable position.

These two plates should be connected by a main wire, which should run the full extent of the installation, and all electric or metallic work in connection therewith should be connected to it by wires of suitable section. The alternative of a number of local earth plates is sometimes preferred, but the difficulty in this system is to obtain a good earth, and the main wire will appear to offer, on the whole, the best solution.

As Concerns Large Hoisting Plants

In dealing with large hoisting plants, Mr. Anslow points out that an equalizing system is usually necessary to reduce the demands upon the generating station or supply mains, and then he recalls that fans and pumps require motors to run them, (a) at a low or medium constant speed; (b) at a high constant speed; (c) at variable speeds. In the first case, direct or alternating-current motors are equally suitable; in the second case alternating-current motors can be more easily constructed for high speeds, and no commutation troubles are involved if squirrel-cage machines are employed. Frequently, high speed is not possible with alternating current owing to the low periodicity of the power company's supply. When variable speeds are necessary, direct-current is usually preferable, as the speed variation properties of alternating-current machines cannot be compared with those of direct current.

Direct-current coal cutters, from a working standpoint, are superior to those operated by alternating current, but the latter type has proved itself reliable and satisfactory. There is another possibility with regard to coal-cutting machinery, that is, by the use of compressed air they may be operated from an electrically-driven compressor. Such a combination affords many possible advantages, especially where a number of cutters are employed in a small area, as these can all be supplied from one compressor, thus securing the advantage of compressed-air cutters and the economy of electrical transmission.

Colliery Dwelling Construction

By A. T. Shurick

This is the second of a series of articles on miners' dwellings. In this number the foundations are discussed, and the designing and carpenter work taken up in detail.

NOTE—The first article on "Colliery Dwelling Construction" appeared Oct. 21.

The kind of foundations used is dependent on the character of the building and the extent of funds available. They may be posts, piers or walls. Posts are used only on the cheapest or more temporary structures and may be the ordinary round-prop timber used in the mine or 4x4-in. or 6x6-in. timbers. They are driven in the ground and sawed off to the required hight or may rest on a flat stone or short piece of plank acting as a mud-sill.

Piers are built of either dry- or wet-rubble masonry, brick or concrete. Dry-rubble is adaptable only for short piers consisting of one stone on top of another. When using wet-rubble and with stone of average quarrying qualities, it is not consistent with good results to construct a pier less than 20 in. square. Concrete is seldom used on work of this character, but should it prove desirable a 10-in. square pier properly reinforced with ¾-

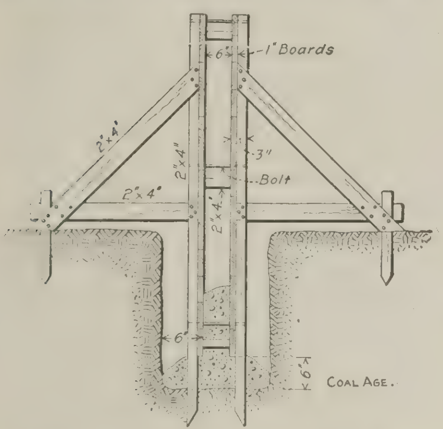


FIG. 1. FORM FOR CONCRETE WALL

in. vertical rods at each corner and resting on a spread-footing, 12-in. thick and 24-in. square, will give satisfactory results for ordinary hights. The concrete should be made soft and in the proportion of 1:2½:5, the large aggregate being sized to pass a 1-in. screen. Brick piers laid up in lime mortar give satisfactory results. On the whole piers of any kind are not good construction on work of this character as the space beneath the building will often be used as a hog-pen or made a repository for refuse, thus producing unsanitary conditions. In northern latitudes this construction leaves the bottom of the building exposed, making it cold.

A solid wall does not add materially to the cost of the building, considerably enhances its value and is one of the most common footings met with in this class of work. The wall may be of dry- or wet-rubble, brick or concrete. A dry wall when well put up would be amply sufficient were it not that they are being continually pulled down by the children or the miners themselves who sometimes wish to gain access to the interior. A rubble masonry wall, laid up in either lime or cement mortar, is probably the most satisfactory and on the whole the most common wall used on this work.

These walls are commonly made 18 in. thick, although with a stone that quarries well a competent mason can put up a satisfactory 16-in. wall. Headers 8 in. thick and 18 in. wide should be required

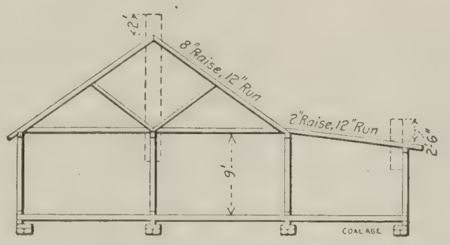


FIG. 2. METHOD OF ERECTING

every 4 ft. in length, and 3 ft. in hight, no two consecutive vertical joints should be allowed and the stone should be laid on its natural bed. The mortar used may be either lime, hydraulic lime, lime and cement or cement. A lime mortar of from 1:2 to 1:4, depending on the quality of the lime and the cleanness of the sand, will give entirely satisfactory results if the wall is allowed to season and then pointed with a 1-cement, 1-lime and 3-sand mortar. In the case of a cellar wall, hydraulic lime or cement should be used, and if the stone is soft or porous it is a good plan to give the outside a ¾-in. coat of 1:2 cement mortar.

CONCRETE FOOTINGS

Should it prove desirable to use concrete for the footing a very light wall will suffice when using a 1:2½:5 mixture of one of the standard Portland cements. When the ingredients can be placed on the ground at a moderate cost, and a portable machine mixture is available, the cost of this work will often run below that of rubble masonry.

Fig. 1 shows a method of constructing the forms for placing the concrete. They may be built of either 1-in. or 2-in. boards which should be smooth on one side and one edge, and preferably, tongued and grooved. The studs are of 2x4-in. and when using 1-in. boards they should be placed on 24-in. centers, while for 2-in. boards 5-ft. centers are sufficiently close. Forms of 2-in. boards require less labor to build, have a higher salvage value, and under average conditions are probably more economical. Struts of 2x4-in. are placed between the faces of the forms, which are then drawn up tight, either with bolts or wire; the struts are removed when the concrete reaches them, the wires left buried, and the bolts taken out after the concrete is partially set.

For the ordinary four- or five-room house, with walls not exceeding 6 ft. in hight, a thickness of 6 in. is sufficient, while for a house with an 8-ft. cellar, the

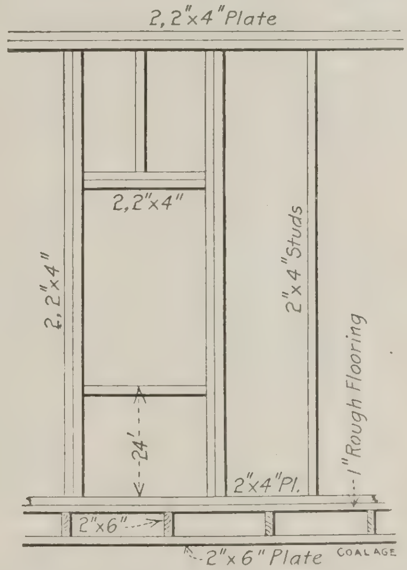


FIG. 3. WINDOW FRAMING

walls may be made 10 in. at the bottom and 8 in. at the top. To provide for freezing, the ground should be excavated 4 ft. in the Northern States, and 3 ft. in the Southern, and spread footings 18 in. wide and 6 in. thick used.

The abundance of good stones which are commonly found in the coal formations usually makes some form of stonework cheaper than brickwork, but when it may prove desirable to use the latter, a 12-in. wall, laid up in lime mortar, will suffice for the ordinary four- or five-room house.

Chimneys—The chimneys are almost entirely built of brick. The flue of the main chimney, to which two or more stoves are to be connected, should not be less than 8x8-in., while that on a lean-to addition, having usually only one stove, may be made with a 4x8-in. flue. The flue may be lined with either lime or cement mortar, preferably the latter, or the

joints may be struck with the point of a trowel; care should be taken to have the lining as smooth as possible.

Fig. 9 shows the details of an ordinary chimney for the average three- to five-room house. Since they are comparatively light they are usually supported on the partitions about 6 ft. from the floor, thus effecting an economy of this much brickwork. The walls are commonly made 4 in. thick, or the width of one brick, which provides ample stability although the efficiency of the chimney will be materially increased by having 8-in. walls. The chimney should be carried not less than 2 ft. above the building and topped off with some ornamental effect, the one shown being simple and appropriate for this type of building.

Carpenter Work

Before taking up the work of designing, the engineer should provide himself with a set of the standard rules for the grading and classification of lumber for the district in which he is located. These rules are issued by the Associated Bureau of Grades in pamphlet form and give detailed lists of defects admissible in the different grades of lumber, together with full-sized cross-sections of the various shapes and minimum dimensions. He should also have the catalog from some large factory which will give full-sized sections of different moldings, standard dimensions of doors and door frames, window sashes and frames, etc. By carefully following the catalog and specifying only stock shapes and sizes, an appreciable economy will be effected, since these details require considerable framing when of odd dimensions and can be bought much cheaper manufactured.

Frame houses may be roughly divided into two classes, braced frame and balloon construction. Braced-frame construction is a relic of former times, when mortise-and-tenon joints were cheaper than those made with nails or bolts, because of the high cost of the latter, which were all hand made. In this construction all pieces are carefully fitted into place, important joints being secured with a mortise and tenon, making a well braced and very stable structure. With balloon-frame construction, the pieces are simply nailed together and the structure depends on the sheathing for its stability. This class of construction is the one commonly used in most houses today and costs about one-half that of the braced frame.

Sills—Where masonry foundations are provided for the sills, these need not be larger than 2x6 in. They should be given a half splice at the corners and other points where necessary and set in a mortar grouting, preferably of cement; the underside is sometimes given a coat of linseed oil to prevent the absorption of moisture from the foundation. The sills should be set back 1 in. from the outside face of the foundation, which brings the sheathing even with the face, and allows the siding to extend below the sill, making a weather-tight joint.

Floor Joist—After the sills are placed the floor joist are next set, which for construction of this class, are placed even with the outside edge of the sill, as shown in Fig. 10. A better grade of construction is shown in Fig. 8, in which a boxed sill is used against which the joist butt. Since the floor joist are of rough lumber, the dimensions of which may vary one-half inch or more, they should be sized on the bottom side sufficient to bring the tops all to an even line. For the second floor joist a channel or groove should be cut in the under side to fit on the ribbon or ledger board. To eliminate the possibility of warping, the joist should be laid with the crown or convex side up, the superimposed load then tending to hold them to position.

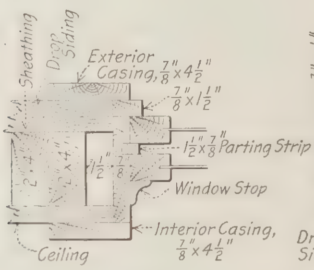
The size floor joist to be used cannot be determined from the usual tables given in the different architects' pocketbooks, since these tables are computed only for the better class of houses. Thus, for instance, in the Architects' and Builders' Pocketbook (Kidder), complete tables are given for the maximum span of floor joist for loads of from 60 to 174 lb. per sq.ft. Most of these tables are computed for a maximum deflection of 1/30 in. per foot of span, an item not usually necessary to consider on this class of work. There is, however, in the same book a series of tables for the safe quiescent loads, uniformly distributed, which may be used to advantage. In computing the permissible loads of a number of typical examples of this class of construction, it has been found the joist are designed for loads ranging from 38 to 50 lb. per sq.ft., according to the values given in these tables. Floors designed for a load of 38 lb. are commonly used and, aside from a pronounced deflection, appear to give satisfactory results.

Flooring—The use of single floors is condoned only in the very cheapest class of construction, double floors, sometimes of the poorest grade, nearly always being used. An average floor for this class of building consists of sheathing for the rough flooring and 1x4-in. or 1x6-in. Nos. 2 or 3 grade of flooring for the finished. The rough flooring should in all cases be laid at an angle of 45 deg., with the floor joist and the finish at right angles to the joist. When both floors are laid in the same direction the unequal shrinkage, due to the broader widths of the sheathing, will draw the finished floor apart. The rough flooring should be nailed at every joist with two 8-d. nails, and the finish blind nailed at each joist with a single 8-d. nail.

Because of the loss due to the tongue and groove and the difference in actual and trade dimensions, a certain percentage must be added to the amount ordered above the real superficial area to be covered. The usual practice is to add 50 per cent. for 3-in. flooring, 33 per cent. for 4-in. and 20 per cent. for 6-inch.

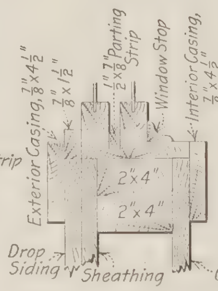
Studs—In the better grade of buildings the studs rest directly on the sills and are nailed to the floor joist, giving strong construction. The methods shown in Figs. 8 and 10, which are details of the houses described in my first article, are sufficiently strong for ordinary purposes, and more economical in materials and labor.

In this method a floor plate is laid on the rough flooring, of the same section as the studs, which provides an even bearing for the latter as well as a nailer to which the studs are spiked. The studs should be of 2x4-in. and may be placed 24 in. on centers except when the interiors are to be plastered, when they must be 16 in. on centers to provide for the accommodation of the lath. All doors and windows should have double studs



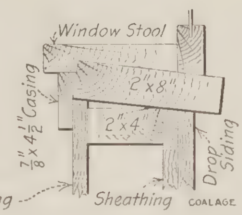
Section at Top

Fig. 4.



Section at Side

Fig. 5.



Section at Bottom

Fig. 6.

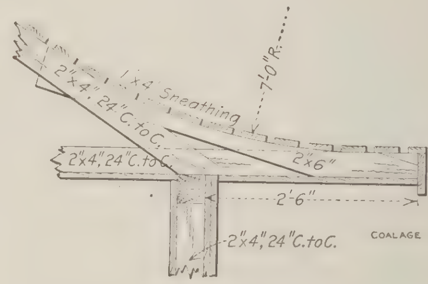


Fig. 7. Details of Shelter

on the sides, and double bridging of the same section as the studs across the top, as shown in Fig. 3.

A good average hight for the rooms is 9 ft., and to avoid waste in cutting, the studs should be ordered in 18-ft. lengths. Partitions are made the same as the walls with the exception that the sheathing is omitted, and at the intersection of the partitions in the four- and five-room houses a support for the chimney should be built, as shown in Fig. 9. On top of the studs is the wall plate, which consists of two pieces of the same section as the studs, the double plate being necessary for the purpose of splicing in order to have it practically continuous throughout.

Rafters and Ceiling Joist

The rafters and ceiling joist for the average house may be of 2x4-in., placed 24 in. on centers, except when it is necessary to provide for plastering they must be on 16-in. centers, as before mentioned. For a shingle roof the rafters should have a one-third pitch and be braced with struts, as shown in the elevation, Fig. 2, which is a cross-section of the four- and five-room houses shown in my first article on this subject. When heavy snow loads are liable to occur, the rafters on the lean-to addition should be 2x6 in., as they are often heavily loaded because of the light pitch.

On the main roof the rafters may butt at the top on a ridge board or against each other, the latter being simpler and probably as good. At the toe the rafters should be notched sufficient to get a bearing the full width of the wall plate and the remainder extended out for the cornice. When the ceiling joist are also the floor joist for the second floor, and the interior finish is to be of plaster, as shown in Fig. 8, they must be proportioned to withstand a certain maximum deflection in order to provide against cracking the plaster. Under these conditions the joist should be designed according to the tables given in one of the standard works on the subject.

Cornice—While anything elaborate for the cornice is not to be expected on work of this character, this detail should not necessarily be entirely neglected. The detail of the cornice shown in Fig. 10, which is the same as used on the three- and five-room houses shown in last week's issue, is simple, economical and very appropriate for this class of work. The projection of the rafter, cut as before described, is boxed in with a 1x4-in. facia and a 1x12-in. plancher, as shown, and an appropriate frieze and bed mold added.

A somewhat more elaborate cornice is shown in Fig. 8, which, with the exception of the gutter, is the same as used on the superintendent's house, shown in my first article. The details of construction are clearly shown, and while this would not be appropriate for the average miner's house, it is a typical example of that used on houses of a better grade. Many different designs of cornice are possible, but the two here shown are good types for use under the conditions specified.

Siding—The siding may consist of anything from common boards laid vertically with joints covered by some form of 2-in. or 3-in. battens, to a double covering, consisting of sheathing and one of the standard sidings. The former is used only on the very cheapest construction, while the latter is commonly applied to all well-built miners' houses.

The sheathing should in all cases be laid diagonally on the sides and nailed at

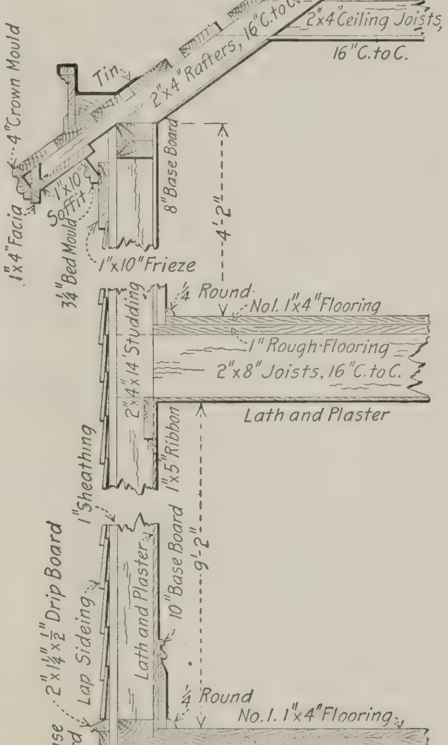


Fig. 8. Construction Details

each stud with two 10-d nails, since it forms an important, if not the only brace for the structure as a whole. In figuring the quantities necessary when laid horizontal do not deduct for the openings, and when laid diagonally allow from ⅛ extra for 10-in. widths to ¼ for 6-in. Considerable waste occurs which makes these allowances necessary. On the good grade of houses of this class one or two layers of a moderate-priced building paper should be laid on the sheathing to eliminate drafts from working through the cracks and joints.

The finished siding is furnished in a number of different shapes and by using a miscellaneous assortment of the design's available a certain individuality is given the different houses.

The sidings may be roughly divided into two classes, the lap siding and the drop siding. Lap or bevel siding is furnished in commercial lengths of about 16 ft., with widths of from 4 to 6 in. and usually ⅜ in. thick on one edge and ⅝ in. on the other. This siding is the most expensive and requires more labor to lay, but is more durable, less liable to check or crack, is usually better seasoned, and dries quicker because of its thinness. It should be nailed only at the studs and with 2½-in. cut nails, and since it can be given any lap required it is the most desirable for the better class houses. It is essential that it be gaged carefully in laying to insure its running even at the doors and window frames.

The different forms of drop siding have a uniform thickness of 1 in. except where chamfered and rabbeted on the top and bottom edges respectively, to fit the adjoining lengths. They run in widths of from 4 in. to 8 in. and the trade names of some of the more popular designs are Drop siding, Channel and Novelty Rustic and Single and Double V-Rustic. Some of the cheaper grades are made in double widths, and have an imitation joint cut through the center.

In figuring the amount of siding necessary, add 20 per cent. to the actual superficial area for drop siding, 50 per cent. for lap siding laid 4 in. to the weather and 33 per cent. for the same when laid 4½ in. to the weather.

Roofing

Shingle roofs are used almost exclusively for this class of houses because of their economy, permanency and excellent results. Shingles are usually 16 or 18 in. long and of random widths varying from 4 to 7 in.; they are also manufactured in lengths up to 24 and 27 in. and widths of 14 and sometimes 16 in. They are usually put up in bundles of 250, four bundles to the "thousand," which is the trade term for the equivalent of one thousand shingles 4 in. wide.

Shingles may be laid on sheathing or shingle lath, the latter being preferable since it permits a certain amount of ventilation underneath, allowing the material to dry quicker, thus preventing decay. Shingle laths are generally 1¼ in. thick by 2 or 3 in. wide and are placed on from 4- to 8-in. centers, according to what exposure is desired for the shingles. Common shingles are laid with from 4- to 6-in. exposure to the weather and, with the former, 1000 shingles will cover 100 sq.ft. while with the latter the same number will cover about 160 sq.ft. On a one-third pitch (8 in. rise to 12 in. run) the shingles should be laid 4 in. to the weather; on a one-half pitch, 4¼ to 4½ in., while for vertical walls they may be 5 or 6 in. to the weather.

Interior Lining—The interior lining for the average miner's house should be of some form of ceiling. While a plaster finish is given to the better-grade houses, the high first cost and the continual outlay necessary for repairing makes the use of this lining very expensive for the ordinary house.

The ceilings run in various shapes having a thickness of from ⅜ to 1 in. and widths of 4 and 6 in. A good average lining for miners' houses is ⅝x4 in. beaded ceiling or 1x6 in., the latter being probably about as economical as the former since the rules in regards to the actual area to be covered to the actual material required are the same as for the flooring. The excess required for the 1x6-in. would be about one-half that for the ⅝x4-in. and the labor would also be less.

Ceiling is also manufactured finished on both sides, Double Beaded or Double-V as the case may be, for use where very thin partitions would not be objectional This construction is sometimes used for the partitions of miners' houses of the cheaper class but is seldom applied to the better grade houses except in some minor position, such as a closet or pantry.

Doors and Windows

The doors commonly used in good construction of this class are 1⅛ to 1¾ in. thick, from 2 ft. 6 in. by 6 ft. 6 in. to 2 ft. 8 in. by 6 ft. 8 in., of No. 1 or 2 grade with a four- or five-panel design. A good average assortment of doors for the well built house would be:

Front door, of No. 1 grade, five panel, 1¾ in. thick and 2 ft. 8 in. by 6 ft. 8 inches.

Rear door, of No. 2 grade, four panel, 1⅜ in. thick and 2 ft. 8 in. by 6 ft. 8 inches.

Interior doors of No. 2 grade, four panel, 1⅛ or 1⅜ in. thick and 2 ft. 6 in. by 6 ft. 6 inches.

Closet and pantry doors, of No. 2 grade, four panel, 1⅛ in. thick and 2 ft. 4 in. by 6 ft. 4 inches.

These doors are all of standard dimensions, such as will be readily found in stock.

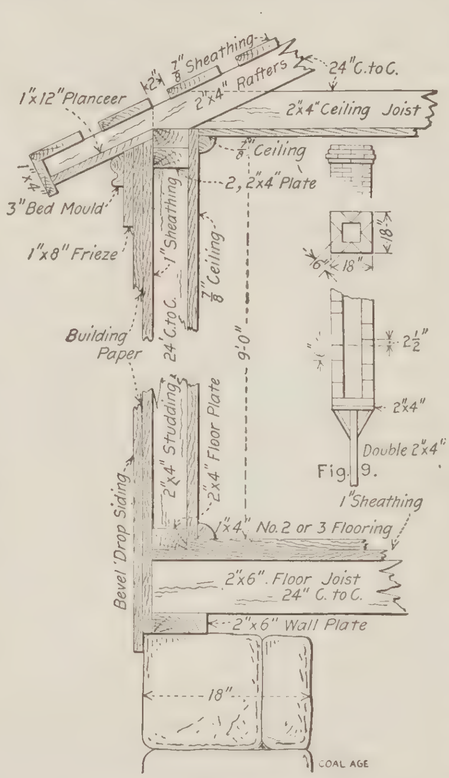
A good average window for these houses is a two-sash, spring-bolt, plain-rail, 1⅛-in. thick, with 8 lights, 12x14 in. This is a fair-sized light and yet not so large as to be very expensive in replacing. If a better class of construction is desired, a balanced window with weight and pullies may be used instead of the spring bolt, in which case the sashes should be check rail instead of plain rail.

The details of a simple window framing for a check-rail spring-bolt window are shown in Figs. 4, 5 and 6. When the windows and doors are of standard dimensions the frames for them can be bought ready made much cheaper than framed on the ground and dimensions and detailed drawings can be obtained from the manufacturers.

Miscellaneous Details

The detail for a shelter, similar to that used on the house shown in Fig. 7 of my previous article, is given in Fig. 7. The one shown in the illustration extends so low as to interfere with the screen door, which difficulty may be overcome by using the method shown in the detail drawing. This detail is one of the bungalow effects, and a certain judicious application of it in different ways will add much to the appearance of the completed town.

A detail of the method of supporting the chimney at the intersection of two partitions, as in the center of a four-room house is shown in Fig. 9. This method is



Figs. 9 and 10. Details

sufficiently strong to carry chimneys 12 to 16 ft. in hight, the maximum which these usually attain.

Some steps are usually necessary at the entrances to the houses, and in laying these out a good rule is to make the rise between 7 and 7¾ in. and the run the difference between 17 or 18 in. and the rise in inches. This rule gives the actual tread, an allowance of from 1¼ to 1¾ inches being made for the nosing, and the actual run consequently being this much less.

If it is intended to use a briquet binder such as hard pitch or asphalt, be sure to see that there is a supply of superheated steam for the mixers or the binder will not liquify enough to spread thin over the coal and will consequently be wasted.

One Man for One Job

Mining experts with experience in India tell how the "one man one job" system is adhered to in that country. The man who fills steam coal will not fill slack. If he comes to a dike he stays off work until a stonecutter has pierced the dike and got to the coal again. The stonecutter remains idle until he gets another dike to cut. The man who drives galleries for the purpose of "winning out" places quickly will not work in ordinary places. A man working at the coal face will not put up a prop; that is the timberman's job. If a stone falls, a coolie must be brought along to clear it away. A special man looks after the pump and he will neither repair it nor clean the suction pipe if it gets choked up. Robert F. Campbell tells how a fireman will fire a double-flued boiler, but not two separate boilers with single furnaces, even though it took him only one hour to do his day's work. Even at that he will only throw in the coal and draw out the ashes. The coal must be placed at his feet and the ashes taken away by a coolie. A winding engineman will not clean his engine, which is only fit work for a coolie. Every squad of men in a colliery is under a head man, who does no work, but must be paid a little for allowing his men to work. It would indeed appear that for the Indian miner the ordinary trades union would be an unecessary luxury; he is quite able to protect his own labor.

Mining Wyoming Lignite

In the vicinity of Hudson and Lander, Wyoming, is a coalfield which is rarely heard of because of the larger coalfields in the United States and Canada, but it is nevertheless an important one, despite its isolation, since it serves a territory which would otherwise have difficulty in securing coal.

The Hudson Coal Company and the Poposia Coal Company are the prominent operators in this field, and are under the management of H. O. Barber, who is president of both companies. The Poposia Coal Company is a new organization, and is just opening up a large mine which will eventually have a capacity of about 1200 tons per day.

The company is operating in a 12-ft. seam of high-grade lignite coal, all of which is consumed by the railroad, towns, and farms of that territory. As their holdings are large, the mine is being made first-class in every particular, and designed for operating through a considerable period of years. The mechanical equipment, consisting of shaking screens, supports and a special device for raising the coal to the tipple, is being installed by the Ottumwa Box Car Loader Company, of Ottumwa, Iowa.

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This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

The Adrian Mine Explosion

As was foreshadowed in last week's article by Mr. Hall, dealing with the explosion at the Adrian mine, the coroner's jury did not find it easy to come to a conclusion as to the cause of the accident. Twenty witnesses were examined, many of them being men who were at work in the mine on the morning of the disaster. Some of them had worked in Adrian for years and testified that there was no gas in the mines. The inspectors made their examination, but had not completed their report in time for submission to the coroner's jury.

A caving of one of the headings is supposed to have resulted in the fall of a trolley wire and it was thought that the short-circuit thus caused, ignited the dust naturally upraised in great volume by the violence of this same caving. On the other hand, two miners declared to the jury that there was no electricity in the wires shortly before the explosion; moreover, the falls now visible may be the result and not the cause of the disaster.

An inspection of the mine shows that the wire is down over nearly all the affected district. There are large falls of rock in both back and main headings of the 13th Left. In the main heading, several loaded cars were lifted off the track and turned at varying angles. In the back heading, the cars were empty and the force of the explosion broke several of these to pieces. Some coke was formed at the face of the 13th Left. But the examination does not favor one point of origin rather than another, and deductions are hard to make from the indications.

It seems as if the second Adrian explosion is as mysterious as was the first which occurred in 1896. To all appearances, no one was present when the earlier accident took place, and no one was discovered to be missing after the event. So also in the recent disaster; there were no miners where the explosion initiated.

If the accident was caused by exploding coaldust, the force of its action must have been considerably reduced by the presence of a large amount of sand strewn along the haulways as a result of the continuous sanding of the rails. This sand, covered with impalpable coal-dust, appeared to be in great quantity in the roadways, and conveyed the impression that the entries were dusty enough to provide a rapid detonation, but examination showed that the greater part of the dust was of an inert nature and therefore harmless.

Sand Filling

The Scranton Mine Cave Commission, in its final recommendations, advised that an engineer be appointed to direct continuously whatever plans might be adopted for the sustention of the city. This advice should not be disregarded. Granting that the engineers engaged by the commission made a practical and otherwise able report, fully justifying the reliance placed on them, yet necessarily there were some details to which they failed to give all the attention which would and should receive consideration from an engineer in continuous residence, in the long course of his observation and practice.

The engineers, Messrs. Conner and Griffith, showed among other things that concrete was inadequate and impracticable, and that culm would be unable to support the strata where the depth was excessive. They urged the use of sand—a material which is but little susceptible to compression or deformation and, therefore, one which has a great supporting power. Unfortunately sand often exhibits its other properties. Where it is dry and no binder is present, it will run freely. Should a large crack or crevice occur near a sand pillar, the sand, if loose, would certainly flow into the breach and the surface of the ground would be disturbed, especially if such a failure caused a further breach in the measure or measures above the collapsed sand pillar. Such a further break would be almost sure to occur. The experience in the Rand, where the waste sand of the cyan-

ide tailings is being used for filling, is that sand needs a great deal of constraint, and the miners are said to be afraid of death from smothering, as a result of its sudden, unpresaged outflowing.

There is another undesirable feature in loose arenaceous fillings; they are liable to be swept away by flowing waters. The heavy slag sand fillings in the neighborhood of Cleveland, Ohio, have shown this fault clearly. It is apparent, therefore, that some definite information should be sought as to the possibility of using various forms of cementing materials. Light should also be thrown on their relative values and the best methods of depositing them. Experiments should be tried on the cementing effect of the water seeping through the mine roof.

Let it not be thought that this suggestion contemplates a strengthening of the artificial pillars by cementation, an accomplishment which the report ably shows is impossible, but merely a protection of them from sliding when dry, and spreading or eroding, when in the presence of excess of water. The filler and binder should be deposited in such manner that it merely fills the interstices in the sand and does not collect in local patches, causing undue shrinkage before the weight causes it to take its appropriate interstitial location.

It is probable that eventually, the filler would be found to deform and squeeze into the spaces between the sand particles, but this change in location would not take place till the surface had been severely affected by subsidence. Interesting indeed would be experiments on the nonferruginous sands of the buried Wyoming valley, unmixed or mixed with shales of highly ferruginous type, such as the Mauch Chunk shale or with the slightly iron-impregnated shales of the coal measures, the character of the iron oxide, of course, being as important as its quantitative presence.

At the Myslowitz colliery, in Silesia, ferruginous sand, clay, rock, slag and other débris are used. They are mixed together with bricks, slate and earthy coal. To this is added hot furnace slag—run by launders to the mixing machinery. To quote William H. Storms: "It later becomes a solid mass which can only be broken by a hammer; this is quite in contrast with a sand filling that will run through a knothole at every opportunity."

The only work regarding the cementation of natural bodies of which we have any record is that of Logan W. Page, of the Federal Bureau of Roads. But his experiments were conducted with materials which were not under any pressure and these were not tested under similar conditions to those we are considering. The Federal Bureau of Mines might well make cementation a subject of its valuable research work. It is time that the United States contributed some thought and some examples in the development of a method, which was here originated, but which has received all its later perfecting and development in Germany, South Africa and Australia.

First Aid Inevitable

There have been severe strictures passed by busy critics on the dangers of incompetence in the rendering of first aid. Such critics would have us believe that aid by the layman may be more harmful than helpful.

First aid is not new. It did not originate in mining with Dr. M. J. Shields. It has not been increased in volume by the American Red Cross, but is as old as man. The only change arises from the fact that through the inestimable work of Major Lynch, Doctor Shields and the Red Cross, aided by a numberless body of corporation doctors, first-aid work has been organized, developed and improved, so that instead of being a positive detriment to the subject it is sure to be a help.

Under the old *régime*, it was customary to use for a styptic a wad of tobacco which could not fail to be infected by all the impurities contained in the mouth of the person by whom it was prepared. The hot breath of a friend mollified the smart but infected the tissues of a wound. It was usual to tear off clothing adhering to a cut. Foul coverings were put on burns and abrasions with resulting adherence and infection. Whisky was given in excess to the injured, with distressing effect. Men were gathered up without bandaging; thus simple fractures became compound.

First aid has been with us for generations, and it is here to stay, whether the corporations assist or resist, whether the Red Cross direct or desist in the good work. The only question is whether it will be effective or dangerous, whether it will injure and kill or help and save life. This is a work to which enthusiastic and self-sacrificing men have devoted their lives, with the most excellent results.

But healthy criticism by the friends of first-aid work is needed. Those who most deplore the first aid of the previous centuries will be the first to condemn the continuance of its thoughtlessness in the new first-aid men, who, with all the instruction so liberally meted out to them, occasionally drop back to the untutored practices of a past age.

The Mine Foremen

At a recent meeting of the New York section of the American Institute of Mining Engineers, during which mine safety was the principal topic of discussion, the impossibility of properly directing the non-Englsh speaking foreign element employed in the mines today was discussed, together with the dangers accruing therefrom. During the discussion it was suggested that the mine foreman, being in the minority, should be required to learn the different languages of the majority.

Should such a rule become effective we wish to extend our sympathy to the foremen. As an example of the inconsistency of such a plan we may take the engineers, men who have been subjected to a rigid mental training over a period of a number of years, part of which training was in foreign languages, and how many of these men today can use them? While we appreciate the fact that the mine foremen are undoubtedly the pick of the employees and naturally have superior attainments, on the other hand their mental training has not been such as would make the acquirement of, say, even three or four languages an easy matter.

The excellent illustration on the front cover of this issue shows shaft No. 2 of the Buffalo & Susquehanna Coal and Coke Company, located near Du Bois, Penn., between that town and Sykesville. This plant was built about 1903 and its workings extend to Du Bois No. 1, a shaft mine formerly opened and operated by the Berwind-White Coal Mining Company, but now owned by the same corporation as shaft No. 2.

COLLIERY NOTES and COMMENTS

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

After Dec. 15, 1911, all underground mine buildings in the State of Pennsylvania must be of fireproof construction. A fine of $500 for each violation is the penalty imposed for disregarding this law.

The Hillside Coal Company of Avoca, Penn., is fighting a mine fire. An opencut is being put down to the bottom of the first vein, a distance of 50 ft. or more, in order, if possible, to head off the fire. The cost of the undertaking is placed at $25,000.

When installing an electric-haulage plant for a colliery of an output of 1000 to 3000 tons per day, it is desirable, when transmitting the power over long distances to install alternating-current machines; a high potential then can be obtained and maintained, with only a slight loss.

An English authority on coal mining says: "The desirability of quickly reversible ventilation in case of need after an accident cannot be overestimated. When planning a ventilation system bear this in mind, as it may save much loss of life and time in case of fires or explosions."

As an important factor in the solution of the smoke nuisance, use a fire box large enough to allow the flames to burn out before they strike a cool surface, when burning a coal rich with volatile gases. If the volatile matter passes easily from the coal at a low temperature increase the size of the fire box or decrease the rate of firing.

When a mine car is built, the two horses on which it is constructed should be set perfectly level, otherwise the car will be in wind, and run on three wheels and show a perverse tendency to leave the rails. Such a wind eventually works out in practice, but it takes several days during which the ill-constructed car is likely to cause much trouble.

Experience has shown that connected workings, combined with large volume air currents, favor the spread of an explosion because of the large supply of oxygen and dust available. The safety of mines, whose gaseous nature demands a strong current, can be greatly enhanced by splitting the air and keeping the different splits as isolated as possible.

Experiments made in France have shown that, with coal containing from 1 to 6 per cent. of ash the dust from this same coal will contain 40 per cent. or over of ash. This increase is evidently due to the admixture of stone dust from the floors, walls, etc. With an ash percentage of over forty it is difficult for coal dust to give rise to an explosion unless it is fired by a store of explosives or a powerful explosion of firedamp.

A recent consular report from Peru states that American coal, although once popular there, no longer has any market whatever. Peru imports coal chiefly from Australia, although some briquets are brought in from Belgium and England. The limited explorations which have been made up to date would seem to indicate that Peru is undoubtedly rich in both anthracite and bituminous coal, but the amount at present mined is small due largely to a lack of transportation facilities.

A direct-connected turbine pump and motor, at present in use at a Scottish colliery, has a capacity of 24,000 gal. of water per hour against a head of 556 ft. The motor is connected to the pump by a flexible coupling, has a capacity of 110 h.p. at 500 volts, direct current, and runs at a speed of 1850 r.p.m. The pump and motor are mounted on a strong cast-iron girder bedplate, so designed that all may be carried through comparatively small roads and otherwise readily handled underground.

The Bolivian Director of Statistics reports that the coal seams in Bolivia are found embedded in a thick stratum of sand stone somewhat resembling the millstone-grit. The coal seams themselves are small, and although of fair calorific values, are associated with many impurities. The soft nature of the stratum in which they are found increases the cost of working since timbering on the Bolivian plateau is almost prohibitive in expense, and all adits have to be lined with stone. Claims have been staked out on the outcrop for some four miles in length, but none are now being worked.

An 8-h.p. "Otto" oil-burning mine locomotive for underground work has the following overall dimensions for a 2-ft. track gage. Length, 3 ft. 11 in. Width, 2 ft. 7½ in. Hight, 4 ft. 7 in. The gearing is arranged to give two speeds, namely, 4 and 8 mi. per hour. At the slower speed, the locomotive is capable of hauling a gross load of about 23 tons, and at the higher speed, a load of about 9 tons on the level. The service weight of the locomotive is about 4 tons. The oil tank is large enough for a double shift of 16 hours. The fuel and water consumption is exceptionally low. For fuel, crude or refined benzol, petrol, etc., may be used.

The British pit pony, as a rule, is a Shetland, Welsh or Moorland pony, or else a little cart horse which is too small for the surface, but can be used in mines not suited to large horses. With these ponies—the Moor and the Welsh—you practically never see a case of glanders, and F. L. Somerset informed the Mines Commission that the spread of glanders depends largely on the system of watering. If the pony is watered from a bucket and the hostler has instructions not to use a bucket to a horse that is running at the nose from any cause whatever, or to keep that horse with his own bucket, there is not much likelihood of the disease spreading.

Early in the 18th century the mine light *par excellence* was a tallow dip set in a lump of wet clay. When gas tests were to be made the experienced miner surrounded the wick of this brilliant light with more clay. The "fireman" of those days, prototype of the modern fireboss, must have been a man of much nerve and little caution, as his duty was to rid the mine of gas by firing it. Clad in damp leather or sackcloth, duty compelled him to lie prone on the floor and light the gas suspended in the air above him. If he survived the explosion he returned to the surface and reported the mine safe. Another method of disposing of gas was the use of "eternal lamps," kept burning continuously in gaseous mines to burn the gas as fast as it was generated.

Recent consular reports show that during the year 1910, the output of coal in the United Kingdom was 264,417,588 long tons, an increase of 658,216 long tons over 1909. This came from 3253 mines, where 1,049,407 persons were employed. It is interesting to note that of this number 6221 were women, and 72,094 were under 16 years of age. The total number of deaths from accidents during 1910 is the highest ever recorded, being 1775, or 169 deaths for every 100,000 people employed. The injured in accidents numbered 159,042, which amounts to 151 out of every 1000 people employed or over 15 per cent. The annual output of coal per worker has also been estimated as follows for various countries: United States, 500 to 600 tons; Great Britain, 250 to 290 tons; Germany, 250 tons; France, 200 tons; Belgium, 170 tons; Australia, 490 tons; Canada, 425 tons; Japan, 120 tons.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Opening a Colliery

In your issue of Oct. 28, p. 92, you answer a question, "Opening a Colliery." Allow me to suggest another way to open this colliery under the conditions named. I would sink the main-haulage slope in the Buck-Mountain vein instead of in the Mammoth, for the following reasons: The Buck-Mountain is an underlying vein and the upper or overlying veins could then be mined and robbed without injuring the lowest seam. Also the Buck-Mountain vein has the least pitch, and if it is found to be more advantageous the cars could be hoisted to the surface in this vein, with less danger of the coal falling off while hoisting.

A tunnel should be driven from the bottom of the slope in the Buck-Mountain to the Mammoth and this vein, the Mammoth, worked first. As these workings advance the Skidmore vein should be developed and then the Buck-Mountain. This would give a more equalized cost than to work the Mammoth vein alone. The pumping station should be located in the Buck-Mountain vein, as no coal would then have to be reserved to protect it. I would locate the fan on the Buck-Mountain vein and drive a main air-tunnel from the Buck-Mountain vein to the Mammoth and take splits off each of those veins. I would use a blowing fan and drive openings in each vein to the surface for return air courses. This arrangement would be more economical, as it would not be necessary to maintain long return airways.

There are numerous reasons in my opinion why this plan is preferable, but I would be pleased to have some other subscribers give their views on the question, or I shall be pleased to have you criticize my plan.

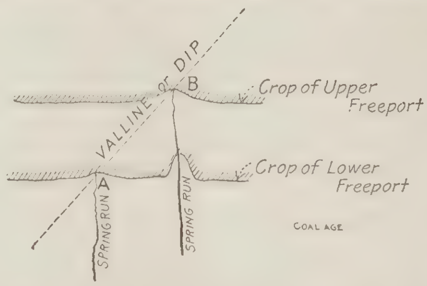
A SUBSCRIBER

Mount Carmel, Penn., Nov. 6, 1911

[We are glad to receive these valuable comments from our correspondent. There may be some difference of opinion in regard to the best method to be adopted in opening a colliery on these seams; but our correspondent's points are well taken. They are particularly applicable in case the parting between the seams is of insufficient strength to maintain a safe and economical condition of the main-haulage slope. In any case, mining should commence and advance more rapidly in the upper seams, the workings in the underlying seams following some yards behind those above. It is also necessary to provide ample protection for all slopes and air courses by leaving sufficient slope pillars in each seam. These slopes and pillars must lie vertically under each other in the several seams.—EDITOR.]

Surface Evidence of a Dip

On the development of a drift opening in central Pennsylvania, in the lower Freeport bed, I noted on the surface that two spring runs descended the hill, crossing its contours at right angles.



TWO RUNS ISSUE WHERE CROPS AND DIP CROSS

One came obviously from the crop of the lower Freeport at *A*, another from the crop of the upper at *B*. The natural assumption was, granting that both measures were similarly folded, that a dip or valline extended in the lower Freeport from *A* to *B*, and for some distance beyond. This dip was found when the drift was opened. The presumption that a dip ran from *A* to *B* was very clear, owing to the short distance between the runs, but with caution the method might be extended with advantage to greater distances, especially where the roof of the lower measure is heavily eroded and the upper measure does not crop near it.

Pittsburg, Penn. H. A. B.

Records for Mine Output

What is probably a Yorkshire record in coal mining, if not a world's record, has been achieved at the Hickleton Main Colliery. Recently the tonnage raised during six days reached a total of 26,986 tons, from a seam which is known as the Barnsley bed. Another record for the week ending Oct. 24 is 25,572 tons from the Crown Farm Pit of the Bolsover Colliery Company. This amount was mined in the time of five days and a half, each of 7 hours and 5 min. duration, only one shift per day being worked. It is said that this latter mine holds the world's record for a day's output, which is 4678 tons of coal.

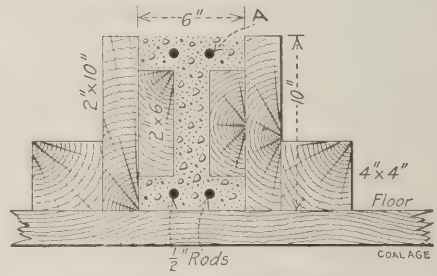
Wigan, Eng. T. J. HEILMAN.

A Homemade Concrete Timber

On an unusually broad parting, or in an exceptionally bad piece of ground, occasions frequently arise where a timber of more than ordinary strength becomes necessary. To meet such an emergency the foreman makes a special order for large-dimension stuff, uses a built-up girder (made of a number of boards nailed together) or falls back on that old standby, the T-rail, with its notoriously uneconomical section.

While no data in regards to costs are available, it is believed that the method here described will not exceed these rather expensive subterfuges in cost, and there can be no question as to its superiority.

The method of construction is clearly shown in the accompanying figure, which is a cross-section through the beam and form. The beam here described is 10 in. deep, 6 in. wide and has a 2-in. web; all dimensions can be easily changed to suit conditions, the ones here shown no doubt being smaller than would be used in practice. As will be noted in the drawing, the form is simply two 2x10 in. boards, with a 2x6 nailed on their respective inside faces. The 2x10's are spiked to the floor on edge, at the required distance apart, and for the sake of additional rigidity, backed with blocks, should this prove necessary.



SECTION CONCRETE I-BEAM

By the use of reinforcement the strength of the beam can be appreciably increased. Thus in the section shown, two ½-in. rods are used, which at the ends of the beam should be near the top of the section as shown at *A*, and gradually lower, until at the middle, they are near the bottom.

The concrete should be a good rich mixture of about 1:2:4 and not to exceed 1:3:5, and made soft to insure its running well. The large aggregate should be sized to pass a 1-in. ring and for beams smaller than this it may prove desirable to decrease this even more.

The size and shape of the beam can, of course, be varied to suit the requirements of the case, but it should be remembered that the strength varies (approximately) directly as the square of the depth. Thus the comparative strength of an 8-in. and a 10-in. beam would be 64:100, or the 8-in. only about three-fifths as strong as the 10-inch.

Better results will be obtained by rounding the corners slightly and filling in angles with small shapes. A more nearly true I-beam is thus obtained, and sharp corners, which are easily broken, thus eliminated.

New York. A. T. S.

Boiler Fuel Larry for a Mine Boiler Plant

Few coal-mine tipples are now built without making special provision for taking slack coal directly from the tipple into the mine boiler plant. The usual method is to install a small scraper conveyer, which runs while the screens are running and receives coal through a small opening in the flat screen. This makes a simple and inexpensive apparatus.

Side Dump Larry for Boiler Fuel, and Electric Motor

However, sometimes the power house is situated so far from the tipple that it is not possible to use a conveyer. At the plant of the Central Coal and Coke Company, at Sweetwater, Wyo., the boiler house is about 400 ft. from the tipple and the lay of the ground is such that a conveyer could not be installed. For many years coal was hauled by team up a 5 or 6 per cent. dirt road. Inasmuch as this plant furnishes power to several mines and is consequently of considerable size, it was necessary to employ a team and a man six days a week to supply sufficient fuel.

Having on hand some old electric-locomotive motors, the superintendent built a side-dump larry car, capable of carrying about eight tons of slack, and coupled it through a draw bar to one of these motors, still mounted on the same wheels and axle formerly used in the locomotive.

This rig, shown in the illustration, has given satisfactory service, and the coal supply is now brought by it to the boilers in an hour each day. The team and driver have been taken from this work, and the tipple boss finds time enough to handle the electric larry in addition to his other duties.

An amusing controversy arose as to why the larry developed a greater drawbar pull when running in one direction than when running in the other. Of course, it is obvious, after consideration, that since the motor is mounted on only one pair of wheels, when it is running in one direction and pushing the larry, the tendency of the downward thrust of the draw-bar is to force the motor wheels against the track, thus giving a greater tractive force, while when running in the other direction, and pulling the larry, this condition does not obtain.

Benedict Shubart.

Denver, Colo.

Fan Doors

The explosion door on a fan should not be too readily opened. There is no use in designing it so that it will open for a pressure measured by a few inches of water gage, less than five or six, for instance. A well built fan will not break, especially if run at a high speed at such a low water gage. A door which opens too easily is apt to be wrenched off its hinges, if exposed to a pressure greater than it is designed to oppose. It is better to use a door than to house the downcast with a wood or weak concrete roof without a door. The resistance of such a roof to pressure is indeterminate; besides, such a covering takes too long to replace by boards. Nevertheless it does seem well to arrange the whole covering of the downcast so that a particularly violent explosion will find nothing really solid to oppose its escape in all directions except the fan itself. There has been a disposition to design fan doors and fan-release housings with certain types of explosion in view. It is true that in some places explosions are usually made more violent by reason of the presence of coal dust. It is quite possible that with the care which is now being taken to prevent unsafe coal-dust accumulations, explosions may be, in those localities, less violent in the future, and it may be well to consider the question as to whether it would not be better to provide fan doors rather than such housings as would only open as a result of a more violent explosion.

Birmingham, Ala. F. R. B.

Byproducts of Coke

It would be impossible to estimate even approximately the waste incident to mining and using coal in its various forms. Every year, however, we are making some progress toward more economy and some dav we will perhaps be realizing greater profit from what is now going to waste than we have obtained in the past from the coal product itself.

Different phases of the industry will be worked upon and developed on a more scientific basis. One of these that has already received attention is the saving of byproducts in coke manufacture.

It is pointed out that hundreds of millions of dollars worth of what may in the future prove valuable byproducts have been wasted in the past by American people and that in this respect the United States is far behind Germany and other foreign countries in adopting the economies resulting from the coking of coal in byproduct ovens.

The first ovens of the byproduct type in the United States were built in 1893 at Syracuse, N. Y. In 1910 there were 4078 byproduct coke ovens, and all of them were in active operation. The greater part of these have been developed, during the past few years. In fact, the greatest activity seems to have been during 1909 and 1910.

Value and Amount of Byproducts

The production of coke in byproduct ovens during 1910 amounted to 7,138,734 tons, which was about 12.17 per cent. of the total production.

The total value of the byproducts obtained from the manufacture of coke in retort ovens in 1910 was $8,479,555, or a little more than one-third of the value of coke produced. This is the thing the industry needs to keep its eye on, the value of the byproduct and the possibility of making it nearly, if not equal to the original product.

It may develop in the course of a few years that we will have in the byproducts of the coal industry a somewhat parallel case with that of the cotton seed, the byproduct of the cotton fields in the South. There was a time when cotton seed was a burden to both the planter and the ginner and was an expensive product to dispose of. Today it is the basis of a large industry and really gets more attention than the cotton product itself.

Louisville, Ky. J. C. T.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

Fan Ventilation

Ques.—If a mine fan 12 ft. in diameter has an equivalent orifice of 30 sq.ft., and the orifice of the mine is 19 sq.ft.; what is the manometrical efficiency of the fan? What quantity of air will this fan deliver under the conditions given?

H. M. M.

Puritan, Penn.

Ans.—By manometrical efficiency is meant the percentage of useful effect (pressure) produced by the action of the fan; in other words, the ratio of the mine pressure in the fan-drift, to the total theoretical pressure developed in the fan. When the orifices of the mine and the fan are both given, as in this case, mine orifice = 19 sq.ft., and fan orifice = 30 sq.ft., the manometrical efficiency K is best calculated as follows:

$$K = \frac{30^2}{30^2 + 19^2} \times 100 = 71.37\%.$$

Also, from the same data, knowing the diameter (12 ft.) and the speed of the fan (90 r.p.m.), the quantity of air the fan will deliver is found thus,

$$Q = 2.916 \frac{30 \times 19}{\sqrt{30^2 + 19^2}} \times 12 \times 90;$$

$$Q = 50{,}550 \textit{ cu.ft. per min.}$$

The mine gage, in this case, is

$$i = \left(0.00038 \frac{50{,}550}{19}\right)^2 = 1.022 + \textit{inches.}$$

Storage of Bituminous Coal

Kindly give me references concerning the storage of bituminous coal. I desire to know what conditions of coal and storage may result in spontaneous combustion occurring in the coal, and how this may be avoided; also, how to handle a fire started in a large quantity of stored coal. I shall be glad to see such matters treated in your columns, giving examples of current practice and the difficulties met.

H. D. Easton.

Lexington, Ky.

The subject of the storage of coal, both anthracite and bituminous, has been growing rapidly in importance during the past few years of increasing industrial activities supplemented by labor troubles that have necessitated the maintenance of large supplies of fuel by the government, transportation companies, manufacturers and all consumers of coal.

The storage of anthracite coal is mostly a question of the economical handling of the coal, as with ordinary precaution and care there is little fear of spontaneous combustion taking place, except where the coal contains much sulphur and is stored in damp or poorly ventilated quarters.

Bituminous coal, on the other hand, gives much trouble in storage, as it fires readily from spontaneous combustion; and, not only this, but the coal slacks or breaks up and there is a large loss on this account and owing also to the evaporation of the water contained in the coal.

The best reference, to our knowledge, is to be found in Bulletin No. 46, published by the University of Illinois, December 19, 1910, entitled, "The Spontaneous Combustion Of Coal," and giving the results of the investigations made along this line by the staff of the Engineering Experiment Station of the University. The bulletin recites the experience of the Chicago & Alton Railroad Company in the storage of run-of-mine coal from mines of the Springfield district, Illinois.

The Illinois coal, in common with all the coals of the central valley, contains a high percentage of moisture which averages from 12 to 15 per cent. and a relatively large amount of oxygen combined as part of the organic matter of the coal. The evaporation of this moisture, together with the natural structure and cleavage of these coals, causes them to slack readily when exposed to air. This action constantly exposes fresh surfaces to the action of the air and increases the absorption of oxygen, which leads to oxidation, the generation of heat, and finally spontaneous combustion. The high percentage of volatile matter, which is the chief characteristic of bituminous coal, makes it susceptible to spontaneous ignition where anthracite coal, of greater density and containing less volatile matter and a high percentage of fixed carbon would not be affected.

When necessary to store bituminous coal, it should be carefully piled to avoid unnecessary breakage of the coal. The piles should not exceed 6 feet in hight and should be protected from rain and snow by an open shed. The ground should be well drained or there should be a cement floor. The piles may be of any desired length, but the width should not exceed four times the hight of the pile.

The Western Electric Company, in 1902, experimented on the storage of Illinois coal in large quantities under water, at their Polk-Street plant. The results of this trial were so satisfactory that the same company, later, built a large storage pit of concrete, at their new Hawthorne plant. This pit was in three sections, 15 feet deep, and covering an area of nearly an acre; its capacity was 10,000 tons of coal, which could be all covered with water. The sections were crossed by three tracks supported on concrete arches and a track on each side, making five tracks in all from which coal could be unloaded or loaded. The reloading of the coal from the pit was accomplished by a crane mounted on a truck and provided with a huge grab-bucket.

Coal thus stored under water does not require to undergo any drying process. The loss in calorific power or heat value, after being stored twelve months under water, has been found, in certain cases, to be less than 3 per cent.; while the same loss in the case of such coal stored in the open air would range from 10 to 15 and at times reach 20 per cent. A description of the Coal-Storage Under Water, at Hawthorne, Illinois, is found in the Engineering and Mining Journal, March 23, 1907, page 576.

The Oxidation of Coal

Does coal absorb oxygen from the air, at all temperatures, and what is the effect on the coal? In other words, does oxidation always take place in the coal, or is the oxygen simply absorbed and held in the pores of the coal in the same manner as the coal absorbs and holds moisture?

Chemical Engineer

This question has been the subject of recent investigation by the Engineering Experiment Station of the University of Illinois, at Urbana, and some interesting and important conclusions may be found in Bulletin No. 46 of the University of Illinois, page 50.

In answer to the above questions, it may be stated, on this authority, that there appear to be two classes of oxidation that may take place in bituminous coals of the Illinois type, which contain a comparatively high percentage of moisture, generally above 10 per cent.; and are likewise rich in oxygen combined as part of the organic matter of the coal. The initial oxidation, which is not destructive to the coal and produces no carbon dioxide, but rather a change in certain unsaturated compounds of the coal, takes place continuously at temperatures below, say 300 deg. F. At about this point destructive oxidation begins with the production of carbon dioxide.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Interesting Questions

Splitting the Air Current

Ques.—What method of ventilation lessens the danger of an explosion and, at the same time, reduces friction?

Ans.—Splitting the air current in a mine provides purer air at the face of each district or section of the mine. The gases generated in each district are carried at once into the main-return airway by which they are conducted out of the mine. In this method of ventilation, the chances of ignition of gas are reduced to a minimum, as far as the circulation is concerned. Moreover, should gas be ignited, causing a slight explosion, the trouble will usually be confined to the single district in which it occurred. When the main air current in a mine is divided into two or more separate splits or currents the velocity of the air sweeping the working face is much reduced. This not only reduces the friction of the air current, but exposes the workmen often to less discomfort, arising from too strong a wind, and reduces the danger of the flame of the lamps being blown through the gauze.

Relative Diameter and Length of Post Timber

Ques.—Is there any rule that will apply, in general, to post timber in mines, by which the proper diameter of a post may be determined for any given length?

Ans.—The practical question relating to size of posts, in mine timbering, is to determine the minimum diameter, or diameter of small end of a post, such that the post will have equal tendency to crush or bend. It is evident that a long, slim post may bend before the pressure exerted is sufficient to crush the fibers. On the other hand, a short, thick post will probably crush under a weight that is insufficient to cause bending. It can be shown that, for practically all kinds of mine timber, the tendencies to crushing and bending are about equal when the ratio of the diameter of the small end of the post to its length is 1:12. This gives the following practical

Rule: To secure the greatest efficiency and economy, in post timbering, make the smallest diameter of the post, in inches, equal to its length, in feet. Thus, the least diameter of a 6-foot post should be about 6 inches; that of an 8-foot post, 8 inches, etc.

This rule assumes a good and uniform quality of timber, free from knots that would seriously impair the strength of the timber. The ends of the post are also assumed to be squared. Due allowance should be made where the timber does not fulfill these conditions.

Glen Jean, W. Va., Examination

Proper Use of Explosives

Ques. J—(a) What does the law require with regard to the use of explosives in mines? (b) What dangers are likely to arise from the use of explosives in blasting coal or rock in mines, and what precautions should be used to minimize those dangers?

Ans.—(a) The precautions to be incorporated in the mine rules and to be rigidly enforced are:

(1). Take no more powder into the mine than is required for the work of one shift, and what is taken in must be in 5-lb. canisters.

(2). Use clay for tamping, or stemming.

(3). The powder, in any hole, should not occupy more than one-third of the length of the hole.

(4). All coal should be undermined before blasting.

(5). When making a cartridge the miner should put his lamp at a distance of at least 5 ft. from the powder.

(6). In tamping a hole, a copper-tipped tamping bar and a copper needle should be used.

(7). No more than one blast should be fired at one time, and the miner must give warning to the other workmen when he is ready to shoot.

(8). The miner must wait until the smoke from a blast has cleared out of his place before returning to work therein.

(9). Blasting is strictly prohibited in a place where gas may be detected by an approved safety lamp.

(10). All dry and dusty places must be thoroughly watered for a distance of 60 ft. from the face before blasting is permitted.

(b) Careless handling of explosives, using slack coal instead of clay for tamping, putting in too large a charge of powder, and shooting from the solid any of these may be the initial cause of an explosion of either local or general character. Then there is the possibility of the premature explosion of the charge, either when the cartridge is being made or when it is being tamped. Accidents sometimes happen to men who walk up to blasts without having been warned, and when more than one shot is fired at a time, the miner is likely to be mistaken as to the number that explode and be injured or killed instantly by a delayed blast. The practice of firing more than one shot at a time is not approved in this State.

Again, a blast at the face of a room may knock out posts and weaken a dangerous top.

Blasting in the presence of explosive gas, or in a place that is dry and dusty, is a dangerous practice.

If too large a charge of powder is used, if the hole is loosely tamped or stemmed with fine slack, or if a blast is fired in an improperly placed hole, there may result an explosion of the fine coal dust suspended in the mine air. In such cases, the flame from the shot extends into the mine atmosphere and heats the suspended particles of coal dust to incandescence. These particles transmit heat to others, which also ignite, and all of them evolve gas that is inflammable.

The following precautions are suggested as supplemental to those mentioned above. The shooting of the center shot first, following it by shots near the rib, is to be preferred. There is plenty of opportunity for a center shot to do its work with a maximum of certainty. When the center coal is broken down, the two side shots (being loose below in the undercutting and loose on one side where the center coal has been shot out) shoot easily. Thus there are no hard shots to make. In some cases vertical shearing, usually by machine, is used as a supplement to undercutting, thus heavy blasting is rendered unnecessary. With the adoption of any of these methods there is less danger of dust ignition from heavy shooting.

The use of a copper needle and a copper-tipped tamping bar is to be strongly urged and is demanded by law. When a needle is of iron it is liable to strike fire as the hole is tamped. It must be remembered that the needle may move in the auger hole if the hole is not drilled perfectly true, and its point may be in contact with an "iron" ball or nodule. On being suddenly jerked by the action of the tamping bar, the needle may "strike fire." Similarly, as the tamping bar moves forward it may strike an offset in the hole and sparks may be generated, which will ignite the powder prematurely.

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

Liquor Problem in Mining Communities

By C. L. Fay

The Donahoe Coke Company has taken up a comprehensive scheme of welfare work at its mines in Crabtree, Westmoreland county, Penn., included in which is a method for reducing the excessive consumption of liquor. To show, however, that the company's improvements are not merely attempts to control the indulgences of their employees I quote C. Rae King, the superintendent of the mines and the originator of the Greenwald Welfare Plan.

C. Rae King on Welfare Work

He says, "When four- to six-roomed cottages can be built for about the same price per room as the standard eight-room, two-decker-double-red-painted houses, there is no excuse for the tenement-like conditions that exist in the average mining town." Mr. King adds, "Get a good class of men and at the time you employ them make a record of their nationality, whether married or single, their citizenship, religious faith, occupation in the old country and America. Supplement this with a similar census of old employees, including also the number of boarders in each house and you will have a valuable record when it comes to carrying out a definite welfare plan." To quote further, "Provide employees and their families with warm, single houses, encourage them to fix up and clean up, furnish fruit trees and flowers for the yards and control the drink traffic and you will not only assist in developing the character of the young Americans to-be, but you will secure a great increase in the efficiency of your *human machinery* with consequent financial saving to the industry and in part liquidate the obligation you owe to your fellow man and your God."

From these statements of Mr. King it is noticeable that while he is dealing with the liquor problem from the economic standpoint he is, nevertheless, prompted by motives deeper and nobler than those of the mercenary schemer and this will hold true in the cases of all individuals or industries that successfully cope with the problem.

However, the more unique feature of the welfare work of the Donahoe Coke Company is its Greenwald Welfare Committee with its activities in reducing the disposition to indulge in liquor drinking and inebriety. The purposes and aims of this committee as set forth in its code of rules are given below.

Greenwald Welfare Committee—Rules and Regulations

First. The objects of the Greenwald Welfare Committee are to control and minimize the distribution of intoxicating liquors among the workmen of the Donohoe mines; to aid and assist the needy and unfortunate; and to bring about such improvements in the living conditions and general welfare of the community as will appeal to the better class of foreign workmen.

Donahoe Coke Company Mach'ne Shop, Showing Charts That Are Posted Weekly

In order to secure the greatest results in the shortest possible time, the Committee asks that all workmen who desire to make this a clean and law-abiding community in which they can permanently settle and rear their families, coöperate and assist in the removal of the antagonistic and undesirable citizens and workmen.

Second. The officers shall consist of a president, secretary, treasurer and peace officer, and shall be appointed by the superintendent of the Donohoe Coke Company and shall hold office during the pleasure of the superintendent. The offices of secretary and treasurer may be held by one person.

Third. Only one agent of the various breweries and distilleries hereinafter named shall be permitted to solicit orders for beer or whisky upon and about the lands of the Donohoe Coke Company.

Fourth. The said beer and whisky agent shall pay over to the treasurer of the Welfare Committee, for the use of the committee, all moneys and compensation received by him for his services in the soliciting and sale of beer or whisky in excess of the sum of per week, and all such sums so paid as aforesaid shall be devoted to charity work, in accordance with the objects of this committee.

Fifth. Each week a statement will be posted showing in detail the placements of beer and whisky for that week and the amount of money turned into the treasury by the agent; the books of the committee shall at all times be open for the inspection of the public and officers and workmen of the Coke company; and semi-annually a statement will be posted showing the distribution of charity funds.

Sixth. The agent shall explain fully to the workmen the intent and purpose of this movement; he shall comply in every respect with all laws and court rulings as to the sale of beer and whisky.

Seventh. The value of an agent will be determined by the extent to which he is able to reduce the consumption of liquors and beer without causing dissatisfaction among the workmen. He shall show no favors to any particular company for whom he acts as agent; and a reward of $25 is offered for satisfactory proof of the agent's having wilfully favored any brewery or distillery, which $25 shall be paid by the agent.

Eighth. Unless otherwise directed by the secretary of the committee, the agent is to solicit orders only on Tuesday morning of each week and to deliver on Saturday of each week, unless holidays or election days disturb this arrangement, in which case the agent shall call the same to the attention of the secretary in ample time for other plans to be made.

Ninth. The agent is to report and transact all business, relative to orders, with the secretary no later than Wednesday morning of each week.

Tenth. The agent shall gather up empties on Monday of each week, and he shall be responsible for each and every keg or case lost; in the event he reports the party losing the same, the president of the committee will assist in recoveries.

Eleventh. A copy of all orders shall be left by the agent with the secretary.

Twelfth. Until further advised the agent is to solicit as follows:

*Secretary, Coal Mining Institute of America, Wilkes-Barre, Penn.

Note—This is the fifth article discussing the above subject.

Red whisky, $2.25, $2.50, $3, $3.50, $4; bottled in bond, $1.25 per quart. White whisky, $2.50, $3 per gal. Wines, etc., $1.50, $2, $2.50, $3, $4. Rum, gin, brandy, *et al.*, $2.50, $3, $3.50 per gal. Can sell as small a quantity as quarts.

(................) Distillery: Can sell no less than gallon lots. Prices: $2, $2.25, $2.50, $3, $3.50, $4 per gallon.

Thirteen. The said agent shall act as such for the following breweries only: (..............), (..............), (..............).

Fourteenth. Brewers, distillers and other persons interested may send a representative around at any time with the agent while he is taking orders, to ascertain if any influence is being exerted by the agent to cause workmen to buy beer or liquor from any particular company.

Fifteenth. No more than five kegs of beer shall be delivered to any one house in one week unless the occupant of said house obtains an order from the superintendent's office for more; and the agent shall report anyone loaning or giving kegs of beer to another.

Sixteenth. Before transacting any business the agent shall be registered in the clerk of court's office of Westmoreland county, as the agent of the breweries and distilleries by which he is employed, stating the particular territory in which he works, as required by the rule of court.

Seventeenth. Said agent shall act as the *bona fide* agent of the breweries and distilleries employing him; he shall not buy the liquors from the breweries or distilleries and then sell to the customers; the goods must be set apart for the purchaser at the brewery or distillery; the agent shall invariably take the order from the customer in writing and at the time of taking the order he shall inquire of the customer what brewing or distilling company said customer desires to purchase from, and the agent shall take the written order accordingly.

Eighteenth. The dealer can sell only at one place, namely, at the place named in his application for license, and orders received by him for the goods must be filled at that place and title must pass from the dealer to the purchaser then and there. The goods, which then belong to the purchaser, can be taken away by the purchaser himself, or can be delivered to him in the county by the dealer in marked wagons, or can be delivered by the dealer to a common carrier to be shipped to the purchaser; but no device by which the delivery is made, which passes title at any other point than the place licensed, will be tolerated.

Liquor Drinking Reduced

The work of the committee is but partially comprehended in the printed rules. The Donahoe company considered it best not to print the details of the welfare plan in their entirety, but by encouragement and thoughtful leadership to endeavor to inspire the mine employees gradually to develop and request coöperation in the securing of the conditions and privileges which the officials of the company had, in thought, already anticipated.

Mr. Donahoe, in paying a tribute to Mr. King, said: "His plan not only comprehends the philosophy of the survival of the fittest, but it also aims to make the unfit *fit*."

This plan has been in operation since December, 1908.

Before the Welfare Committee started its operations the average consumption of beer at Crabtree was as follows:

Before Control of Traffic

Week ending	
Oct. 3, 1908	880 gal. beer
Oct. 10,	688 gal. beer
Oct. 17,	744 gal. beer
Dec. 5,	564 gal. beer
Dec. 12,	412 gal. beer
Dec. 19,	1188 gal. beer

while under the control of the Welfare Committee there was a decrease as indicated by figures taken from a few of the weekly reports:

After Control

Week ending	
Dec. 26, 1908	396 gal. beer
Mar. 6, 1909	368 gal. beer
Mar. 13,	276 gal. beer
Mar. 20,	340 gal. beer
June 12,	460 gal. beer
June 19,	468 gal. beer
June 26,	412 gal. beer
Aug. 19, 1911	380 gal. beer

When this plan was inaugurated at Crabtree, the company had the usual red-painted double houses and "shacks" to rent to employees. The streets were not graded. The yards were filled with mud, rock, tin cans and beer kegs. There were no gardens, fruit trees or flowers. Some of the miners owned half-starved cows, which were not kept and milked under sanitary conditions. Drunkenness, fighting and disorder were as much in evidence as in similar mining towns.

Chart No. 1 shown below, indicates the purchase of beer and whisky made at each house and shanty under the Greenwald Welfare Plan, Chart No. 2, which follows, exhibits the accrued profits, and the disposal which has been made of them. On page 222 is a view of the

CHART NO. 1. COPY OF WEEKLY REPORT OF THE GREENWALD WELFARE COMMITTEE—Week Ending Aug. 19, 1911

House	Boarder	Beer	Whisky	House	Boarder	Beer	Whisky	House	Boarder	Beer	Whisky	Shanty	Boarder	Beer	Whisky
1		O.K.		26	6	3	½	51	11	7	½	101		O.K.	
2		O.K.		27		1		52	O.K.			102		O.K.	
3		O.K.		28		2		53	O.K.	1		103		O.K.	
4		O.K.		29		O.K.		54	1			104		O.K.	
5		O.K.		30	3	1		55	O.K.	6	1½	105		O.K.	
6		1		31	1	O.K.		56	1	1		106		O.K.	
7½	3	1		32		O.K.		57	O.K.		½	107		O.K.	
7	1	2		33	2	O.K.		58	O.K.	1		108		O.K.	
8	1	1		34		O.K.		59	4	1	½	109		1	
9		12	½	35		O.K.		60	O.K.			110		O.K.	
10	8	10		36		O.K.		61	O.K.			111		O.K.	
11	1	O.K.		37		1		62	O.K.			112		O.K.	
12		1	1	38		O.K.		63	O.K.			113		Empty	
13	9	3		39		1		64	2	1		114		Empty	
14		O.K.		40		1		65	3			115		Empty	
15	1	O.K.		41		O.K.		66	O.K.	1		116		Empty	
16	1	O.K.		42		O.K.		67	1			117		Empty	
17	2	O.K.		43		O.K.		68	O.K.	1		118		Empty	
18		O.K.		44	5	3		69	2	1		119		Empty	
19		O.K.		45	2	5	1	70	O.K.			120		Empty	
20	4	1		46		1	½	71	O.K.	1	½	121		Torndo'n	
21	6	3	½	47	7	5	1	72	4	1	½	122		Torndo'n	
22	2	2		48	3	1	1	73	O.K.	1		123		Torndo'n	
23		2	½	49	3	1	1	74	5	2		124		Torndo'n	
24		O.K.		50	7	2	½	75	2	1		125		Torndo'n	
25		O.K.	½												
	39	39	3		39	28	5½		36	27	4			1	

Sales for the week ending August 19, 1911.

95 kegs and cases beer at $1.00, total	$ 95.00
12½ gallons whisky and wine, total. .	34.00
Sales for the week	$129.00

Note.—O.K. means, no liquor sold.

Expenses for the week ending August 19, 1911.

Agent S. Haraintz, self allowance for the week	$ 7.50
Postage and stationery	0.15
Sundries	
Total expenses	$ 7.65

Income for the week ending August 19, 1911.

95 empty kegs and cases at 25 cents, total	$ 23.75
12½ gallons whisky and wine, $34.00, profit	7.91
Income for the week	$ 31.66
Expenses for the week	7.65
Balance paid into charity fund	$ 24.01

J. J. JOYCE, Sec'y and Treas.

blacksmith shop where chart No. 1, signed by the secretary, is exhibited weekly. Thus every detail of the plan can be followed by all who are interested.

CHART NO. 2

GREENWALD, PENN., June 1, 1911

THE FIFTH SEMI-ANNUAL STATEMENT OF THE GREENWALD WELFARE COMMITTEE FROM DEC. 1, 1910, TO JUNE 1, 1911

Donated by brewers' and distillers' agent for charity		$750.99
Fines for trespass, etc., returned by A. C. Books		3.37
Total amount contributed		$754.36
Expenses for the six months from Dec. 1 to June 1:		
Lumber for new ice house	$305.51	
Carpenters putting up ice house	80.81	
Hauling sawdust, ashes, etc., for new ice house	33.44	
Labor putting up ice	61.50	
Refreshments for men putting up ice	6.00	
Total expenses for six months		$406.45
Balance available for charity		$347.91
Amount available for charity as per Dec. 1 statement		1050.25
Total amount for charity purposes		$1398.16
Amount contributed for charity from Dec. 1, 1910, to June 1, 1911:		
Tony Cashmere, hospital service	$ 7.00	
Tony Cashmere, Dr. Bailey for service	11.50	
Mike Watchio, Dr. Eberhart for service	4.00	
John Smith	15.00	
John Marone, lost his life in mine, paid his mother in Italy	100.00	
Amount contributed for charity from Dec. 1 to June 1, 1911		$137.50
Total amount for charity purposes, June 1, 1911		$1260.66

..............Sect. & Treas.

FIFTH SEMI-ANNUAL REPORT OF THE BREWERS' AND DISTILLERS' AGENT

GREENWALD, PENN., June 1, 1911.

1842 $\frac{1}{8}$-bbl. beer, delivered @ $1.00	$1842.00
40 $\frac{1}{4}$-bbl. beer, delivered @ $2.00	80.00
699 cases beer, delivered @ $1.00	699.00
502$\frac{1}{4}$ gal. whisky, delivered	1437.00
Total cash received by brewers' agent from Dec. 1, 1910, to July 1, 1911	$4058.00
Empty packages returned to brewers on which agent's salary is based:	
1745 $\frac{1}{8}$ bbl.	$436.25
36 $\frac{1}{4}$ bbl.	18.00
632 cases	158.00
Distillers pay whisky agent on 20 and 25 per cent. of sales:	
199$\frac{3}{4}$ gal. whisky and wines, $1410.25, 20 per cent	282.05
9$\frac{1}{2}$ gal. whisky and wines, $26.75, 25 per cent	6.69
Total amount retained by agent for 6 months	$ 900.99
Agent's expenses for six months from Dec. 1, 1910, to July 1, 1911:	
Delivering beer and whisky	150.00
Balance donated by agent to Greenwald Welfare Committee	$ 750.99

[The sixth and last article by C. L. Fay, which will pertain to the general social well being of the citizens of Crabtree, will be published in the next issue.—EDITOR.]

Sanitation in Coal Villages

The Alabama Coal Operators' Association has engaged the service of Morris Knowles, an expert sanitary engineer, to make a study of the social and sanitary conditions in the coal regions of Alabama for the purpose of improving the living and laboring conditions of employees. The association includes practically all the coal-mining companies in the district.

Capt. J. V. Allen, secretary of that body, is authority for the statement that the study would cover the water supplied for drinking purposes, sewerage, garbage disposal and the problems relating to education and recreation.

Mr. Knowles will make a systematic inquiry into every mine camp owned by members of the association, and will then make recommendations to the society suggesting what should be done to improve the conditions of the employees. It was announced furthermore that Maurice Roos Scharff, of the Massachusetts Institute of Technology, a sanitary engineer, formerly employed by the New Jersey board of health, would be in the field assisting Mr. Knowles in the accumulation of data required to formulate the report to be made.

The working and living conditions of the workmen of this district have been greatly improved by the methods adopted by the Tennessee Coal, Iron and Railroad Company. However, some of the smaller companies have not possessed sufficient capital to carry on such a work alone. It seems to be the general idea that the course to be pursued in the undertaking will be to apportion the cost to each company, according to whatever possessions it may have. In that way the expense of general reforms will be borne uniformly and they will be carried to completion along the best possible lines with comparatively small cost to each operator.

BETTER MINERS

The work undertaken will bring, it is anticipated, great satisfaction to those workmen in outlying mining towns who are wholly dependent upon the employers for living environments.

It was announced yesterday by Captain Allen that never before in the history of coal operation had an association of mine owners begun such a work with such ideal views and with such a purpose to guide them in the work.

Mr. Knowles, who is to prosecute the inquiry, is an engineer of eminence. He was formerly with the Federal Government and is known here principally through his late connection with the Tennessee company's operations at its lake construction. He has written articles for the Survey, dealing with social conditions in Alabama fields.

First Aid Hints

A primary requisite of any first-aid subject is air. The first impulse of everybody present is to crowd around. Let the experienced come to the front to treat the patient and let all the mere well-wishers stand back and give the patient air and light.

In cases of asphyxiation, be patient in using the stimulus known as artificial breathing. Cases are known where patients who showed no sign of life after an hour of such exercise have yet been brought to life by patient adherence to the prescribed methods of artificial respiration.

A patient who is but slightly affected by gas should be walked around slowly with loosened collar and open shirt. You may give him half a teaspoonful of aromatic spirits of ammonia in a third of a glass of water every 15 min., but not more than four doses. Soda water may be given a person nauseated by gas to lift off his stomach the foul air he has swallowed.

Don't forget the doctor. Don't be so anxious to do the doctor's work that you fail to see that he is sent for. That would be first-aid run to excess. Remember you are only administering preparatory treatment.

In carrying with stretchers break step; take a short pace not exceeding 20 in.; allow no springing from the forepart of the foot. Keep the knees well bent when advancing your foot.

Watch to see that the stretcher is kept level. Don't choose a squad of tall and short men if you can get them all of a size. Unless the patient has a recent fracture of the thigh or rib, take him foot foremost down hill and head foremost up hill.

All three methods of restoring respiration are based on the expansion and compression of the lungs, due to certain artificial actions. Sylvester expands and compresses the lungs by a raising or lowering of the arms. Marshall Hall produces the same effect by laying the patient on his back and rolling him to and fro, so that sometimes he rests on his back, and sometimes on his chest, while Howard keeps his patients steadily in one position, but pushes the flanks of his naked chest together, by an upward motion, releasing the pressure suddenly when the mouths of the kneeling operator and reclining patient come close together. One man can apply Sylvester's method, but at least three are needed to successfully apply that of Marshall Hall.

When a first-aid patient is wounded in the head, see that the canvas of the stretcher does not press on the wound. Use a rolled coat as a pillow and let the uninjured side of the head rest on it. See that the chin is not leaning forward on the breast.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

The following appropriations for the next fiscal year have been requested for the Bureau of Mines. The figures given for the current year show the actual current appropriations.

The total appropriation asked for the coming year is $784,800; the total for the current year is $425,000.

General Expenses, Bureau of Mines

For the general expenses of the Bureau of Mines, including the pay of the director and the necessary assistants, clerks and other employees in the office at Washington, D. C., and in the field, and for every other expense requisite for and incident to the general work of the Bureau of Mines in Washington, D. C., and in the field, to be expended under the direction of the Secretary of the Interior: For the coming year, $74,300; for the current year, $54,000.

Investigating Mine Accidents

For the investigation of the causes of mine explosions, methods of mining, especially in relation to the safety of miners, the appliances best adapted to prevent accidents, the possible improvement of conditions under which mining operations are carried on, the use of explosives and electricity, the prevention of accidents and other inquiries and technological investigations pertinent to the mining industry: For the coming year, $360,000; for the current year, $310,000.

Fuel Investigations

For the analyzing and testing of the coals, lignites, and other mineral-fuel substances belonging to and for the use of the United States: For the coming year, $135,000; for the current year, $100,000.

For Investigations into the Treatment of Ores and Other Mineral Substances

For investigation into the treatment of ores and other mineral substances, with special reference to the prevention of waste in the mining, and utilization of important mineral resources: For the coming year, $100,000.

Investigation of Coals in Alaska

For the investigation of the coals in Alaska with reference to their mining, transportation and utilization, to be immediately available: For the coming year, $50,000.

Inspecting Mines in the Territories

For the salaries of two mine inspectors, authorized by the Act approved March 3, 1891, for the protection of the lives of miners in the Territories, which states that said inspectors are authorized to inspect coal and other mines in the District of Alaska, to which District the provisions of the Act, except so much as requires six months' residence in a territory prior to appointment, are extended and made applicable; and for per diem, subject to such rules and regulations as the Secretary of the Interior may prescribe, in lieu of subsistence at a rate not exceeding $3 per day each, while absent from their homes on duty, except while in Alaska, and then for actual necessary traveling expenses, including sleeping-car fares: For the coming year, $9500; for current year, $9500.

Books and Publications

For technical and scientific books and publications: For the coming year, $2000; for the current year, $2000.

Building

Toward the construction of a fireproof building for the experimental work of the Bureau of Mines, the cost not to exceed $200,000. For the coming year, $50,000.

Lands, Leases, Etc.

For the purchase or lease of the necessary land where and under such conditions as the Secretary of the Interior may direct, for the headquarters of five mine-rescue cars, and for the construction of the necessary railway sidings on the same, it being provided that the Secretary of the Interior is hereby authorized to accept any suitable land or lands that may be donated for said purpose: For the coming year, $4000.

Alabama

Birmingham—The Bryan Coal corporation has purchased about 1000 acres of coal lands in Walker county comprising the holdings of the Red Star and Eldorado coal companies. Frank Nelson Jr., president of this concern announces that steady development and increased activity will follow.

The Woodward Iron Company has been incorporated with a capital stock of $13,000,000, in Dover, Delaware. It is understood that an issue of $25,000,000 of 5 per cent. bonds will be authorized.

The formal completion of the government mine rescue station was announced Nov. 9 when the State mine inspector, and the various coal companies in the Birmingham district, were informed that the station was ready to answer any and all calls that might be made.

The Alabama Coal Operators' Association has employed Morris Knowles, a well known engineer, and Maurice Scharff, of the Massachusetts Institute of Technology, to study the social and sanitary condition of this district and report a plan for improvements.

Colorado

Meeker—The Lion Cañon coal mine, one of the biggest producers in this locality, has been leased to E. S. Babcock, a well known coal operator, who is making arrangements to operate it on a large scale. Lion Cañon coal compares favorably with the bituminous coal found in Routt county.

Denver—The fourteen union coal miners sentenced to jail on July 14 for contempt of court were released on Nov. 15. The reason given is that the plaintiff, The Northern Coal and Coke Company, having been absorbed by the Rocky Mountain Fuel Company, is not now extant, and is therefore no longer interested in the matter. Judge Whitford's order of release, however, in no wise affects the injunction issued against the men in July, restraining them from interfering with the employees of the various companies in the northern coalfield when a strike is in progress, and from molesting their property.

Illinois

Springfield—The sinking of the shafts of the first of the new mines that are to be put down at Kincaid, midway between Pawnee and Taylorville on the line of the Pawnee railroad, is well under way.

This operation belongs to the Peabody Coal Company, which has extensive holdings in this district and plans to develop them along the most modern lines.

The Jones & Adams coal mine of this city, which claims to hold the State record for the greatest amount of coal mined by solid shooting in one day, has broken its own record. Recently, in eight hours, the men employed in the mine brought to the top 3400.35 tons of coal. Previous to this the shaft held a record of 3017 tons for one day.

Marion—The Burlington is building an extension of about three miles in length

from a point six miles northwest of Marion, to the coal mines adjoining this city. It will connect with the two big Peabody mines and the Chicago-Big Muddy mine.

Indiana

Linton—The Vandalia Coal Company has started mines Nos. 2 and 4, with a force of 150 men each. These mines are located near Linton and have been shut down for three months. Mine No. 2 is the old Island City plant and was the first mine opened in the Linton field.

Lincoln—It is reported that one miner was asphyxiated and 15 were overcome by gas, the morning of Nov. 14 when blackdamp in an entry of the Latham coal mine drove 200 miners from their work.

Oakland City—The Ayrshire Coal Company, owned by the Ingle Investment company, of this city, has begun the work of sinking a shaft for its No. 7 mine, a few miles east of here. The new mine will have a modern tipple of steel construction. Electric haulage will be used and the mine lighted by electricity.

Iowa

Albia—Fire, in the morning of Nov. 11, destroyed a portion of the outside property of the No. 15 Buxton mine of the Consolidated Coal Company. The total loss was about $10,000.

Des Moines—New coal lands are to be developed north of this city, it is said, on a tract of 174 acres, which has been purchased from T. M. Walker by the Claremont Development company for $75,000. It is believed that rich coal deposits underlie the land.

Kentucky

Louisville—The Consolidation Coal Company, building the new city of Jenkins, on Elkhorn creek, in Letcher county, has started another model city on its property across the mountain from the head waters of Elkhorn, on Wright's fork of Boone creek, at the terminus of the extension of the Lexington and Eastern railroad, under construction. The new city has been christened McRoberts, and a post office will shortly be established.

Eighty-five per cent. of the twenty-eight-mile coal road, which has been in process of construction during the past six months from Shelby, Ky., to Elkhorn, is now completed, and it is hoped by spring that the entire line will be finished.

The Wilhoit Consolidated Coal Company, Bell county, has filed with the Secretary of State a notice to the effect that the corporation has changed its name to the Wilhoit Coal Company.

The mine of the Majestic Coal Company near Centralia is producing coal in small quantities and as soon as railroad facilities are obtained it is hoped to obtain an output of 500 tons per day.

Barbourville—It is reported that the Black Mountain Coal Company will develop 5000 acres of coal land in Harlan county.

Michigan

Lansing—What is believed to be the largest field of bituminous coal in Michigan has been discovered in a territory comprising 775 acres of land a mile west of Flint. It is said that development of the property by the Genesee Coal Mining Company, which is now operating a mine east of Flint in Burton township, will soon be begun.

Minnesota

Duluth—A total of 810,642 tons of coal, both bituminous and anthracite, was received at the local coal docks during the month of October, according to the records just compiled at the customs offices.

In a recent test made by the Pittsburg Coal Company of its new dock No. 7, the steamer "J. S. Ashley," with 8983 tons of lump coal, was unloaded in 10 hours and 15 min., and the cargo of the "J. E. Upson," 8747 tons of the same grade, was taken out in 10 hours and 55 min., actual working time. This dock has just been completed and is equipped with three bridges of the most modern pattern.

Missouri

St. Louis—It is reported that representatives of the Iowa Central and Minneapolis and St. Louis railroads, have been in the Novinger field inspecting the coal properties there and that they have been negotiating with the owners of the Great Northern Fuel Company and the Manufacturers' Coal and Coke Company with the view of buying their mines.

Ohio

Cleveland—The National Coal Company, of Cleveland, petitioned the Interstate Commerce Commission, Nov. 16, for $30,000 reparation from the Baltimore & Ohio Railroad Company on shipments of coal from Guernsey county, Ohio, during the years 1900 to 1908. It was said that the company went into business in 1900, and owing to the coal-car distribution rules of the railroad suffered great losses, which it now wishes to be made up to it.

Vessels are coming in for at least one or two cargoes of coal at a profitable freight rate before the close of navigation this fall. Some charters were made recently at 50c. a ton, 20c. higher than the rate paid for months.

Bellaire—The Pennsylvania company has required the Rail and River Coal Company to change the position of some of its tipples. They must be set back further from the tracks. Material for the work is on the ground and is being installed as rapidly as possible.

Columbus—With a view to meeting the sentiment among the independent coal operators in Ohio, the railroads which penetrate the coalfields are working on a schedule of freight rates on coal shipments which is expected to satisfy many of the malcontents; but it is not believed the movement is strong enough to influence the coal companies from withdrawing the litigation which is pending in a number of courts. The coal operators are asking for a flat rate of 75c. from the assembling yards at Nelsonville to Toledo, whereas $1 is the present rate.

Pennsylvania

Bituminous

Punxsutawney—At an inquest held by the coroner in the cases of the eight men who were killed by the explosion at the Adrian mine of the Rochester & Pittsburg Coal and Iron Company, it was found that two of the men were killed by the force of the explosion while the other six died later, from carbon-monoxide poisoning. The jury reported that it was unable to determine the cause of the explosion.

Uniontown—It is estimated that at least $100,000 in improvements is being expended by the Rainey company at the Mt. Braddock works, in addition to the amount spent during the past two years in changing the ovens from the beehive to the Mitchell type. The present improvement consists in the erection of a large brick boiler and compressor house, and the instalment of a complete outfit of boilers and air compressors.

Saltsburg—The Penn-Mary Coal Company, of Heilwood, will establish a mine-rescue station, with full equipment. Several crews for first-aid work are being organized.

Du Bois—It is reported that the Buffalo, Rochester & Pittsburg railroad interests are making arrangements for a new opening in this field, about a mile and a half above Jacksonville, on the Rhea farm, where, it is said, a new mining town will be laid out in the near future. Recently this company purchased about 600 acres of the best land in that locality. Other territory in the immediate vicinity has either been purchased or is under option by this company.

Extensive repairs are being made on the company's properties at Ernest and Lucerne, and it is understood that the output of these mines will be increased.

Pittsburg—Col. H. C. Newcomer, of the local United States engineers office has submitted his report on the preliminary examination for the canalization of the Allegheny river, to the chief engineer, Washington, D. C. He recommends the

construction of five additional locks and dams in that river at the present time, which will carry slackwater above the mouth of the Mahoning river.

The Interstate Commerce Commission's hearing on the Pittsburg-Lake coal rate began Nov. 21, at Washington, D. C. It is believed that this hearing is the crucial one in the case and that it will result in a substantial reduction of the 88c. rate. The shippers are making their leading argument a comparison of ton-mile rates, after allowance for terminal expenses, between the Pittsburg district and the competitive districts in Ohio, West Virginia and Kentucky. Even with a large terminal allowance the Pittsburg-to-Lake ton-mile rate is shown to be relatively high.

Anthracite

Scranton—Because of the high price that coal sold for at tidewater during October, the mine workers of the anthracite region will benefit to the extent of an increase of 8 per cent. over the regular rate of wages. Only once before in the history of the award made as a result of the 1902 strike has the sliding scale reached 8 per cent. That was in April, 1906.

One of the most serious caves that has taken place in Scranton for some time occurred on Monday morning, Nov. 20, in Ross avenue. The subsidence engulfed a double frame building and seriously damaged a number of houses in the immediate neighborhood.

The cave is at least 40 ft. wide and 50 ft. deep. The settling began at 5 o'clock in the morning and the house sank into the cave five minutes afterward. The residents had an exceptionally narrow escape. A lamp exploded, setting fire to and completely destroying the building.

The settling was due to the workings of the Von Storch mine of the Delaware & Hudson Coal Company.

The Delaware & Hudson company, according to C. S. Sims, vice-president and general manager, has in the neighborhood of 200,000 tons of coal in storage at Carbondale, Penn., and Schenectady, N. Y. Mr. Sims states that the prospects are that the Delaware & Hudson mines will work uninterruptedly through the winter, not because of the expiration of the contract with the mine workers, but because of the demand for coal.

Wilkes-Barre—A party of men entered the mine of the Pennsylvania Coal Company in the vicinity of Cork Lane, and undertook the task of blowing down a mass of coal and rock without the company's knowledge. The matter is now being investigated. Their object was to protect a certain house which was in danger, should the pillar of coal be removed.

Pennslyvania's production of anthracite coal reached the total of 83,683,994 tons during 1910, according to the annual report of the chief of mines, which has just been issued. This production is the largest in the history of the hard-coal industry, with the exception of 1907, when the tonnage mined aggregated 86,056,412.

The Lehigh Coal and Navigation Company is making experiments with a new type of motor boat, which, if successful, will result in displacing the tow-path mule.

Hazleton—The repairs being made to the company houses at Drifton by the Lehigh Valley Coal Company, have noticeably improved the appearance of the whole town.

Washington

Spokane—The Western Fuel Association, composed of 500 retail dealers in Washington, Oregon, Idaho, Montana, Utah and Wyoming, will discuss various matters of interest to the trade at its convention in Spokane on Nov. 27.

Seattle—Patent to 150 acres of coal land in Whatcom county was issued by the government land office recently, this patent being the first to go from the local branch in a period extending over almost a year. The land is in the Glacier district and cost $20 an acre.

West Virginia

Charleston—It is reported that the explosion in the Bottom Creek Coal Company's mine, at Vivian, McDowell county, on Saturday last was due to gas, which had accumulated in a temporarily abandoned entry of the mine, the gas being ignited by an engineering crew who were exploring the mine. The men used open lamps, and from the information received at the Department of Mines, the workings, although known to have a little gas, had not shown it in any quantities, and a notice that the particular section had been temporarily abandoned had not been posted by the fireboss, as required under the rules.

Of the 18 men killed, it is believed that the deaths of only four, or eight at the most, were due directly to the gas explosion, which was local. It is thought that the others lost their lives under falling slate. To the fact that there was no explosion from coal dust a great many men who were in the mine at the time owe their lives. The mine was well watered, making a dust explosion practically impossible.

This is the first serious explosion of any kind in this region for a long time, and the first in the Norfolk & Western section for several years. The engineers were sent into the mine by the owners of the land and not by the coal company; all were killed outright. Chief of the Department of Mines John Laing and a number of his deputies are now on the scene, and an effort will be made to fix the responsibility for the explosion.

Huntington—Announcement was made recently of a deal closed by Parkersburg people, with Pittsburg and Philadelphia capitalists, involving the transfer of 3400 acres of coal land on Spruce fork of Little Coal river, in Logan county, the purchase price being $250,000. This coal region has recently been opened up by the extension of the Guyan Valley line of the Chesapeake & Ohio Railroad, and the purchasers will begin development in the territory at once.

Virginia

Bristol—The Dominion Coal Company, with a $150,000 capital, operating mines in Lee county, Virginia, under lease from Black Mountain Coal Lands Company, of Bristol, is now in the hands of a receiver.

Norfolk—It is reported that the general offices of the Chesapeake & Ohio Coal and Coke Company will be moved to Norfolk in the near future.

Canada

British Columbia—Three thousand miners, who have been on strike for more than six months at British Columbia and Alberta coal mines, have returned to work. It is understood that the miners have accepted terms which mean an increase for some men but involve a reduction for contract and pillar work, according to Gordon's findings. The check off is to be handled by the secretary of the union, who must have each man sign for it every month at his option. This virtually means open shop. The agreement is for four years expiring April 1, 1915. It is claimed that the mines will be producing as usual about Dec. 1.

Vancouver—As a result of the October visit to Vancouver island of Andre Lazard, of London, England, manager of the English financial institution known as Lazard Frères, that house has invested $3,000,000 in coal properties on the island's east coast. A large part of the investment will be used for exploration work and for installing haulage power, made possible by hydroelectric plants which utilize the natural water force near the Extension and Cumberland coalfields. This undertaking will occupy the greater part of 1911 and 1912.

Personals

W. H. Loomis has resigned as general manager for the G. B. Markle Coal Company, at Jeddo, Pennsylvania.

O. H. Reinholt, formerly of the Mesabi range, the Philippines and California, reported for duty in the Bureau of Mines, July 14.

H. S. Matthews, former vice-president

and general manager of the Alabama Consolidated Coal and Iron Company, has succeeded Joseph H. Hoadley to the presidency of that company.

Frank H. Crockard, vice-president and general manager of the Tennessee Coal, Iron and Railroad Company, recently escorted a party of Steel Corporation officials over the company's property.

Lowther Ferris has resigned as sales agent of the Carnegie Coal Company in Wisconsin and Minnesota, to take charge of the sales department of the Canadian Collieries Company, with mines on Vancouver island.

T. H. Watkins has been elected president of the reorganized Pennsylvania Coal and Coke Corporation. T. H. Watkins, C. D. Simpson, W. A. Lathrop, Samuel Heilner, Stacey C. Richmond and A. J. Hemphill are directors.

James Bonnyman has resigned as general manager of the Birmingham Coal and Iron Company, effective Jan. 1. This company has been absorbed by the Woodward Iron Company. Mr. Bonnyman will open several small mines near Cardiff, in Jefferson county, Alabama.

James Ashworth, of Vancouver, B. C., has been engaged by the Head Syndicate, Ltd., of London, England, to examine and report on its coal-mining property, situated on the south fork of Old Man river, southwestern Alberta, which property is being developed by the syndicate, with Leslie Hill, of Nelson, B. C., as manager.

Frederick P. Cook, former secretary of the Milwaukee Locomotive Manufacturing Company, has been placed in charge of the New York offices of the company, with headquarters at 111 Broadway. Mr. Cook will handle sales in the States of New York and New Jersey, and will also look after the company's foreign business.

Book Reviews

AMERICAN RED CROSS ABRIDGED TEXT BOOK ON FIRST AID. Industrial Edition, by Major Chas. Lynch and First Lieut. M. J. Shields, 49 illustrations, 175 pp., 16-mo. P. Blakiston's Son & Co., 1012 Walnut street, Philadelphia, 1911.

There can be no better indorsement of the contents of this book than is provided in the names of its authors. It is needless to add here the statement on the title page that the work was "prepared for and indorsed by the American Red Cross."

The introductory chapter describes in simple words with the aid of five diagrams the nature and work of the parts of the human body, leaving out all considerations not pertaining to first aid. Then follows a chapter on the material used in preliminary treatment of the injured. This is followed by others on shock, mechanical injuries, injuries from heat, cold, electricity and poisoning. Carrying the injured and the avoidance of accidents are treated in separate chapters and the book winds up with a suggested method of organizing for first aid and finally a good index which makes it possible to locate the treatment for any ailment without delay. The book has already been published in the Italian, Slavish and Polish languages.

JOHNSON'S FIRST AID MANUAL. Suggestions for First Aid to the Injured in Accidents and Emergencies. Edited by Fred B. Kilpmer. Fourth edition revised, 128 pp., octavo. Johnson & Johnson, New Brunswick, N. J., 1909. Price 50c. cloth bound, 25c. in paper.

There are few books as simple and as practical as this little manual. It has the advantage of being self contained. Does the reader want to know how to stop bleeding of the head? There is a practical page full of illustrations which show just how the work is done and then to make the methods plain in the center of that same page is a head with all the arteries showing. These blood passages are in bright red so that they cannot fail to be distinguished. The charts of circulation are in close companionship with the treatments based on them. There is no necessity to search the volume through to correlate the treatment and the facts on which that treatment is based. The book is well illustrated and practical and well arranged for reference.

Publications Received

Report of Topographic and Geologic Survey Commission of Pennsylvania. 1908-1910, giving the results of two years' work in coöperation with the U. S. Geological Survey. Papers on the present status of natural-gas development and a preliminary list of the fauna of the Allegheny and Conemaugh series in western Pennsylvania are embodied in the report.

"The Resources of Tennessee," for October, containing a preliminary report on the coal resources of the Pikeville special quadrangle of Eastern Tennessee. This is a monthly publication of the State Geological Survey.

"Geology and Mineral Resources of Parts of the Alaska Peninsula," by Wallace W. Atwood, Bulletin 467 of the U. S. Geological Survey.

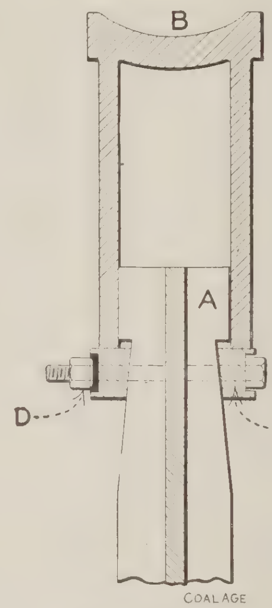
Industrial Item

The General Electric Company reports having sold mining locomotives as follows: One locomotive to Asker Coal Mining Company, for Dorothy, Ky.; one to Ben Franklin Coal Company, for Braeburn, Penn.; one to Inland Steel Company, for Crosby, Minn.; and one gathering locomotive to Davis Colliery Company, for Elkins Colliery Company, Bower, W. Va.

Coal and Coke Patents

UNITED STATES

Prop for mines; August Winz, Rüttenscheid, Germany. No. 1,006,163. As indicated in the drawing, this device consists of an I-shaped support, a head piece and a bolt and nut with two beveled clamps. The support has a head which, projecting up inside the top section, holds it rigidly in a vertical position. Below the head of the I-shaped support the flange faces are slanted and the length of the prop can be altered to a limited extent by adjusting the bolt to hold the clamps at the desired point. Each clamp extends across the two faces of the I-beam on each side and the web of the latter is slotted to permit an up and down adjustment of the bolt.



PROP FOR MINES

Attachment for mining machines; Louis F. Hess, Hawks Nest, W. Va. No. 999,-996.

Coal-mining machine; John Sutch and William M. Clark, Somerset, Colo. No. 998,654.

Briquet press; James John Shedlock, Little Bentley, England. No. 1,000,204.

Calorimeter; Gordon Maynard Evans, New York, N. Y., and John Scouller Beckett, Fanwood, N. J., assignors to Fuel Engineering Company, New York, N. Y. No. 1,000,082.

GREAT BRITAIN

Improvements in coal washing, etc.; W. M. Mackey, Leeds, England. No. 763 of 1911.

Improvements in miners' safety lamps; R. Cremer, Leeds, England. No. 8632 of 1911.

Improvements in and means for quenching the coked product of coke ovens, etc.; A. O. Jones, Whitley Bay, England. No. 28,662 of 1910.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The cold wave, prevailing in all parts of the country, has resulted in a vigorous buying movement, the effects of which have been felt at every producing center. Prices are firmer than at any time this season, and reports of cutting are infrequent.

On the Atlantic coast, gales and generally inclement weather, causing the total loss of one coal freighter, have seriously interfered with coastwise shipments. As a result, water freights are the highest they have been for a number of years and supplies, particularly in some sizes, are short, with orders usually behind.

The Pittsburg mines continue working on about 60 per cent. capacity, although adjacent distributing points report heavy tonnages and demands good. Prices remain at the same level with some cutting, and the coke market shows a slight improvement.

In Ohio and fields to the south supplies are small and the trade brisk. Prices are firm, even advancing in some instances, and consumption heavy. Indications are that more than the usual tonnage is being stored on vessels at eastern Lake ports to be held over; this in anticipation of labor troubles the coming April.

A restricted movement of Eastern coals to the Middle West and an acute car shortage on the Gould and Illinois Central lines have materially strengthened this market. Prices are variously reported as advancing or low but firm. The cold weather has seriously depleted stocks and an unprecedented demand is reported in some districts which railroads and mines are unable to meet.

Mines in the West are working full capacity and a slight fuel shortage in the Northwest appears inevitable as a result of the Crow's Nest strike during the summer. On the Pacific coast cars are becoming scarce with large accumulations on sidings in need of repairs due to the strike on the Harriman lines.

New York

The shortage of marine transportation is being felt here as elsewhere and exists not only in the supply of barges and scows engaged in the Sound business, but is also in the harbor transportation. Many boats engaged in the Sound trade are taking more than twice the usual time for round trips and the slowness of the vessels is interfering with the movement of coal from the New York loading ports, which is causing some accumulations at the piers. Railroad movement, however, does not seem to be as good as it has been and the coal is not accumulating to any serious extent. With the return of favorable weather conditions for marine transportation, the stocks now on hand at the piers will be quickly reduced. Except in one or two instances, there are no consumers along the Sound, reporting shortage on account of delayed transportation. This is probably owing to the fact that most consumers are rather heavily stocked this year.

On account of the slow movement, the market here at New York for the better-grade steam coals, while not strong is fairly firm. For inferior steam coals there is little demand, either spot or contract, and they can only be sold at prices that in most instances do not equal the cost of production. The amount of new business coming into the market is limited and is for the standard grades of steam coal only.

The slack market in the territory tributary to New York is considerably improved from the weak position it has been in this fall. There is a good deal of inquiry for spot shipment but the supply is apparently reduced and as the shipments to the Lakes are discontinued, the supply of this fuel will be further contracted.

There has been no material change in the prices at which tidewater coal has been quoted, for the past two or three weeks.

Boston, Mass.

The heavy storm a week ago and the succession of gales since has made decidedly worse an already complicated situation, and all interests are trying to "find" themselves.

F.o.b. prices on Pocahontas and New River are being firmly held at $2.60, and it is quite likkely, if freights hold up, that there will soon be some new business. Then the operators who have not tied themselves up with long-term delivered-price contracts in the East may reap some reward for their prudence. New England must have coal and the shortage must be made up. Prices on cars at Mystic wharf are said to be up to $3.85, the highest figure for some seasons, and prices at the other points range from 10c. less at Providence to 10c. to 20c. more at Portland and Portsmouth. At retail in Boston an advance to $4.50 per net ton is likely soon to be made.

On the Pennsylvania soft coals there is little change. A large proportion of those loaded at Philadelphia for this market comes in anthracite barges, and the movement of these has been much better than on sail tonnage from the Southern ports. On coals dependent on outside transportation freights are up, and from New York to Long Island Sound points 60c. has been paid this week. Prices for the better grades of Somerset county are still at $1.15@$1.20 at the mines, only slightly higher than the summer figures.

Buffalo, N. Y.

Soft coal is moving decidedly faster than it did last month, though there is nothing to account for the improvement but the season of the year, as it would be unusual if there was no stir as the cold weather comes on. Some factories are starting up and it is the rule to put in an extra stock against unforeseen contingencies. If prices were going up with the increased consumption there would be no complaint, but they do not show any improvement yet.

The improvement in the soft-coal demand has enabled practically all the Allegheny Valley mines to run full time and if they could secure an advance of even 5c. a ton there would be a different tone to the market. As it is, the competition from districts farther away from Buffalo is such that it is impossible to advance prices.

The near future of the soft-coal trade, especially in the Allegheny valley, is not promising and there is much talk of the day when production will be controlled in some way, so that it cannot exceed the demand. Prices remain nominally unchanged at $2.50 for Pittsburg three-quarter, $2.40 for mine run and $2 for slack, with Allegheny Valley 15 to 25c. less. Coke is still dull at $4.25 for Connellsville foundry and $3.50 for stock coke.

Philadelphia

There has been no change in the situation this week as compared with last in the retail trade. The demand continues unabated for all sizes, with stove and chestnut still leading the van, and reported from all sides as behind on orders. The advance in the price of chestnut seems to have added to its popularity, rather than detracted from it, and it is understood that this holds true in almost every section of the country. Pea

coal is used extensively in this locality for furnaces as well as kitchen ranges, its use as a domestic fuel seeming to increase and, as a result, it will not be long before there will be a shortage in this size.

In the wholesale trade, there is still no let up. From all quarters come hasty inquiries for tidewater as well as rail coal, and to all of these requests there is but one reply, that orders will be filled as promptly as possible. No other guarantee can be given. Outside vessels for the movement of coal are reported to be short, and freights are accordingly inflated. To Southern ports freights are anywhere from 10 to 25c. over quotations earlier in the season, with nothing particular offering at that. Prices remain unchanged.

Pittsburg

Bituminous—Some belated shipments are being made in the Lake trade, but the movement is practically over. Manufacturing demand has been only fair, while the past week saw a material increase in demand for domestic, which has been quite good. The early buying was unusually light, but the cold snap of a week ago brought buyers more freely into the market. Mine operations have been somewhat curtailed, the present average being not much above 60 per cent. of capacity in the Pittsburg district. There continues to be much price cutting by interests which have not much contract business on books. Slack has not yet firmed up any, as it usually does at the close of the lake season. We quote as the average market level: Nut, \$1@1.05; mine-run, \$1.05@1.10; 3/4-in., \$1.15@1.20; 1 1/4-in., \$1.25@1.30; slack, 40@50c. per ton at mine, Pittsburg district.

Connellsville Coke—Sales of over 150 cars of prompt furnace coke have been made in the past week, all at \$1.50. Several consumers have been buying regularly in the past few weeks, having insufficient coke on their contracts which, of course, are at a higher price than the prompt market, and no more coke is taken on contract than the buyer is obligated for. As a rule negotiations for next year's contracts have not been taken up, but in a few instances buyers and sellers have gotten close together, and news of two or three contracts being closed may come any day. Foundry coke shows no change. We continue to quote: Prompt furnace, \$1.50@1.55; contract furnace (nominal), \$1.65@1.75; prompt foundry, \$1.80@1.90; contract foundry, \$2@2.25, per ton at ovens.

The *Courier* reports production in the week ended Nov. 11 at 323,363 tons, an increase of 600 tons, and shipments at 3639 cars to Pittsburg, 4873 cars to points west and 1048 cars to points east, a total of 9560 cars, a decrease of 500 cars.

Cleveland, Ohio

A large amount of coal ordered to the lake front, is still being loaded in boats for storage to be held over at this end of the route. Vessel men are getting 20c. a ton for holding cargoes. There will be a large amount of coal on board at this end, as well as at the upper end of the Lakes. This surplus is prompted largely by the miners' scale coming up next April, and the uncertainty of a strike, in which case this coal will insure a supply, for a time at least.

The domestic trade in the past week has been brisk, owing to the cold snap. There is little improvement in the steam trade, and prices range about the same as a week ago, except in slack, which owing to Lake shipments being shut off, are holding stiff and gradually advancing.

Columbus, Ohio

Real winter weather in the shape of a cold wave was the salvation of the coal trade in Ohio during the past week and improvement has been reported from every mining district in the State. One of the best features of the trade is the better demand for domestic grades and activity is shown in every department of the business. Prices on all grades rule firm to the extreme and complaints of price cutting are not as numerous as several weeks ago.

One of the worst features is the approach of a car shortage which is affecting mines on both the Hocking Valley and Toledo & Ohio Central Railways. The cold snap caused some inconvenience upon that score and in some places deliveries were delayed for several days. Other of the coal roads up to date have been able to move shipments promptly, although the indications are good for a general car shortage in Ohio and contiguous States.

The steam business has also shown some improvement in the past few weeks, although the requisitions of the larger manufacturing concerns are not being increased fast. The reports show that stocks in the hands of the large steam users are small and the cold weather is expected to stimulate that trade as well as the domestic business. Contracts which expire at this time are being renewed at the same figures which prevailed during the past year.

Prices prevailing in Ohio fields are: Domestie lump in the Hocking valley, \$1.50; domestic lump in Pomeroy Bend district, \$1.60@1.75; 3/4-in., \$1.35; nut, \$1.15; mine-run in eastern Ohio, 95c.@\$1.05; mine-run in the Hocking valley, \$1.05@1.15; nut, pea and slack, 40@50c.; coarse slack, 35@45 cents.

Cincinnati, Ohio

The car situation is tightening and coal offices are kept on edge for fear orders will be filled in railroad cars objectionable to the purchaser. That should be sufficient evidence that "things are looking up" in the local coal market, which they are. When the operators are tempted to disregard orders and take a chance on sending hopper cars when flat-bottoms are specified in the contract, it is an indication there is no surplus of equipment which means heavy production.

This friction because of equipment ordered and that actually used has arrived about 30 days late, and corresponds well with the lateness of the season. The cold weather, which has continued for almost two weeks now, has relieved the market of a large surplus. In addition, the orders for steam fuels are increasing, and altogether the coal offices are enjoying a good business. The lower grades of fine coals are still to be had at low prices, but this does not apply to the higher grades, which are in fairly good demand and are being held for the price which has ruled in this market for some time—50 to 75c.

Charleston, W. Va.

Unless there is an increase in demand for domestic coal there is likely to be a slump in output in the Kanawha and New River territories by the end of the year. The last shipments for the lakes were scheduled for Wednesday, and unless changed, it will be necessary to cut down in output, providing the increase for domestic, due to the cold weather, does not relieve the situation. Weather conditions are rather favorable, but whether they will be sufficient to make up for the loss in the lake trade is doubtful in the opinion of the coal men.

There has been no general complaint about cars, but with the increase in shipments for domestic trade East some trouble, as usual, is anticipated a little later.

The same usual complex conditions prevail in the Kanawha and New River territories. In some instances conditions are looked upon as being good, while in others there is the usual hard-luck cry with business anything but encouraging. The time cannot be recalled when the conditions were the same from one end of these contiguous territories to the other.

Gas coal from the Kanawha territory is quoted at the mines, mine-run, 85@90c., and lump or screen at \$1.25@1.40. In the New River district nearly all coal is run-of-mine, and at the mines brings from 95c.@\$1.15.

Nashville, Tenn.

The several days of cold weather last week tended to give the mines in this district all the work they could handle and although at the present time the weather has again turned, the coal business is still in a fairly healthy condition.

Unless something unexpected happens, the price on all grades of fuel in the West Kentucky field seems destined to remain unchanged for the present. This means that price fluctuations will be small during the winter, if any at all.

Quotations on domestic lump in the West Kentucky fields is $1.25 per ton; nut coal, 95c. to $1, and screenings, 25@30c. The demand for steam coal has changed but little, if any.

In the two largest cities in Tennessee, Nashville and Memphis, which use coal principally from the West Kentucky field, the stocks carried by the dealers are quite small. In fact there is hardly a dealer who has over a week's or 10 days' supply in his yards. A spell of weather which would have a tendency to retard the movement of coal will find most of these dealers in a bad fix, and such conditions as this will tend more than anything else to make prices better in this field.

Indianapolis

Indiana coal operators report a spasmodic stimulation in the coal-mining business during the past week, but the recent cold snap was not of sufficient duration to bring the demand up to expectations. They say if the cold weather had continued or even been followed after a few days by another cold snap, increased demand for domestic would have resulted. The domestic trade, however, is not depended on for much by the operators. They say that enough coal can be mined in a comparatively short time to supply the demand for home use for many days. It requires continual and steady work by the large power plants to make the coal-mining business boom.

There are so many factories either closed or working short time that their demand is far below normal at this season of the year. During the first few days of the week some complaint was made because of car shortage.

Chicago

A sharp drop in temperature combined with the continued car shortage has caused a marked upturn of coal prices in the Chicago market. There has been such a restricted movement of Hocking coal that it has been possible for Western coals to sell in competition with Eastern coal at relatively the same price. Hocking Valley at $1.50 brings $3.15 f.o.b. Chicago. Leading operators of the Franklin county field have decided to advance their price to $2 a ton, owing to an unusually brisk demand.

The price of smokeless lump and egg has strengthened materially. The minimum price is $2 and some orders are being placed at $2.25. While the coke trade makes a strong showing in the domestic branches, there has not been very much change in hard cokes or furnace and foundry.

Prices direct from the mines in net tons to retail dealers and steam users on spot shipments are as follows:

	F.o.b. Mines	Chicago
Clinton:		
Domestic lump	$2.17@2.37	$1.40@1.60
Steam lump	2.00@2.20	1.25@1.45
Mine-run	1.82@2.02	1.05@1.25
Screenings	1.27@1.37	0.50@0.60
Pocahontas and New River:		
Mine-run	$3.00@3.10	$0.95@1.05
Lump and egg	4.05@4.30	2.00@2.25
Coke:		
Connellsville	$4.50@4.65	
Wise county	4.50@4.65	
Byproduct, egg and stove	4.95	
Byproduct, nut	4.55@4.65	
Gas house	4.85	

Minneapolis—St. Paul

There is a perceptible change in the coal trade all over the Northwestern States, due to the zero weather in mid-November. November 12 and 13 this year made a record for snow and blizzardy winds. While temperature was not extremely low, the high wind made it equal to 20 deg. below zero weather. This sample of cold and snow has continued for a week, and we can now say, "I told you so."

The all-rail shippers now have trouble in pacifying their customers even with every mine running to full capacity. Prices on Southern Illinois lump and egg are now held at $2 per ton at the mine, and other grades of Illinois in relative proportion. It is not thought likely that prices will go beyond this, but customers who stored coal during summer will be taken care of during the stress.

A similar condition exists at head of the Lake docks. The orders have come so thick and fast, it has been beyond both the dock companies and the railroads to keep up with the demand. Cars are difficult to obtain on the Great Northern and Milwaukee roads, especially for shipment off their lines.

St. Louis, Mo.

There has been a slight change in the local market, but it is spasmodic—up one day and down the next, depending largely upon the car supply. Conditions improved the early part of the week on practically all coals, although the advance on Standard was slight.

The local domestic trade is just fairly good—and as usual one or two large dealers who have the output of mines at a low figure are keeping the retail price down to a point where it is a losing proposition to the average operator. This applies both to the high-grade and Standard coals.

The car shortage is so severe on the Gould lines that the mines are only working from one to two days per week. On the Illinois Central it is such that the mines do not get over two to three days a week, and on the 'Frisco lines the mines are working about four days, while in the Standard field about four and a half days is the average. There is very little coal coming in from the Springfield district and the Saline and Gallatin Counties field.

The prevailing prices are:

Carterville	
6-in. lump	$1.50@1.65
3-in. egg	1.50@1.60
No. 1 nut	1.20@1.30
No. 2 nut	1.10@1.20
No. 3 nut	0.90@1.00
2-in. screenings	0.55@0.65
Mine-run	1.00@1.15
Franklin Co.	
6-in. lump	$1.65@1.75
3-in. egg	1.65@1.75
No. 1 nut	1.60@1.70
No. 2 nut	1.40@1.50
No. 3 nut	1.15@1.25
Jackson Co. (Big Muddy)	
6-in. lump	$2.25
2-in. lump	2.00
Du Quoin	
6-in. lump	$1.30@1.40
3-in. egg	1.25@1.35
No. 1 nut	1.10@1.15
Standard	
6-in. lump	$1.10@1.20
2-in. lump	1.00@1.10
2-in. screenings	0.25@0.35
No. 1 nut	0.70@0.80
No. 2 nut	0.60@0.70
Anthracite	
Chestnut	$7.20
Stove and egg	6.95
Grate	6.70
Smokeless	
Lump	$4.50@5.00
Coke, gashouse	4.65
Byproduct	5.00

Spokane, Wash.

Dealers in Spokane report no change in the local situation nor in other parts of the inland empire. The supply on hand is sufficient for domestic and factory purposes, though it is thought it will possibly be 60 days before the mines in the Crow's Nest country resume shipping extensively to this territory.

Prices are reported to be from 25c to 50c. lower this year than at the same time in 1910. Best domestic lump and nut, $8.25 to $9; anthracite, Pennsylvania, $17.50; steam coal, $6.25.

San Francisco

The arrivals of coal are not keeping pace with the consumption. Since our last report but 5831 tons have arrived from Australia and 697 tons from Seattle.

The last cargo from British Columbia arrived on Nov. 2 and another is not due from there until Nov. 20; nor can more than 3500 tons arrive from Australia before December.

Stocks held by wholesalers are quite adequate to present demands, but should the State be visited by a few weeks of cold rains, and heavy snowfall in the mountains, which would be seasonable, the consequent delays to rail shipments would reduce supplies to the danger point.

The car shortage still continues. A large accumulation of cars needing repairs is noticeable at all railroad division points. Dealers in the interior are compelled to wait several days beyond the customary time before their orders can be filled.

All prices remain the same with the exception of the Utah Fuel Company's local-yard prices, which advanced on Nov. 11 to $8.50 per short ton. Anthracite briquets have been reduced from $10 to $8.50 per short ton.

Portland, Ore.

Portland has had its first cold spell this winter. It came without notice and disappeared about as suddenly. Its duration was about a week and during that time the lowest temperature was 31 deg. above. Naturally the cold wave made quite an inroad on the fuel stored away for the season and it inspired many to replenish the supply, fearing that another cold wave may leave them short at the wrong time.

Following are the prices asked here per ton, including cost of delivery to points within the city proper:

Japanese	$7.50	
Washington lignite	$7.00@ 7.50	
Australian	10.00@10.50	
Rock Springs, Wyo	10.00@10.50	nut $9.50
Diamond, Wyo	10.00	
Carbon Hill, Wash., lump	10.50	
Carbon Hill, steam	7.50	
Newcastle, Wash	7.00	
Beaver Hill, Ore	9.00@ 9.25	
Blacksmith coal	17.00	

Production and Transportation Statistics

Kanawha Record Association

The following is a summary of shipments according to the report of the Kanawha Record Association for the fiscal year ending Aug. 31, 1911:

	Tons Coke	Tons Coal
Kanawha district	48,450	8,590,025
Kentucky district	13,020	1,247,900
New River district	198,420	6,224,900
Total	259,890	16,062,825

Railroad, Rivers and Canals

Statement of coal and coke over various railroads, rivers and canals, September and nine months ended September, 1910-1911, in short tons:

Railroads	September 1910	September 1911	Nine Months 1910	Nine Months 1911
Baltimore & Ohio[1]	3,251,239	3,194,579	27,298,982	25,385,086
Buffalo, Rochester & Pittsburg[3]	713,171	718,062	5,917,364	5,997,738
Buffalo & Susquehanna[3]	150,761	155,627	1,246,057	1,429,985
Chesapeake & Ohio[1 2]	1,409,472	1,610,537	10,783,007	10,452,464
Huntingdon & Broadtop Mountain[1 3]	117,313	110,815	940,772	815,400
New York Central & Hudson River[3]	603,574	649,915	5,768,971	5,918,423
Norfolk & Western[1 3]	1,678,194	1,933,132	14,939,635	15,113,959
Pennsylvania (east of Pittsburg and Erie)[1 4]	5,263,383	5,387,090	48,552,283	46,874,400
Pittsburg & Lake Erie[3]	1,619,639	1,561,644	13,220,065	11,897,848
Pittsburg, Shawmut & Northern	111,315	122,713	876,931	1,054,039
Southern Railway[2]	370,237	351,685	2,820,551	2,474,885
Virginian Railway[3]	195,122	271,756	1,065,362	1,975,659
Western Maryland Railway	243,783	222,942	2,456,782	1,963,660
Rivers and Canals				
Chesapeake & Ohio Canal	19,393	21,411	129,250	126,586
Davis Island Dam	36,770	157,955	1,542,915	2,227,740
Great Kanawha River	101,280	147,920	980,120	942,400
Monongahela River	753,570	610,345	7,319,260	6,759,592

[1] Includes coal received from connecting lines.
[2] July and seventh months' figures.
[3] Includes company's coal.
[4] Does not include company coal hauled free.

Ohio Coal Traffic Statement

Statement of bituminous coal mined in Ohio and shipped over railroads specified, September and first nine months, 1910 and 1911, in short tons:

Railroads	September 1910	September 1911	First Nine Months 1910	First Nine Months 1911
Hocking Valley	468,449	367,949	3,367,089	2,517,884
Toledo & Ohio Central	204,506	206,606	1,564,869	1,335,270
Baltimore & Ohio	255,130	154,780	1,783,233	1,259,002
Wheeling & Lake Erie	331,264	399,809	2,771,902	2,556,251
Cleveland, Lorain & Wheeling	218,661	306,407	2,311,963	2,166,127
Zanesville & Western	87,268	126,173	878,291	802,169
Toledo, Division Pennsylvania Co	199,530	156,202	1,664,120	1,379,682
Lake Erie, Alliance & Wheeling	131,645	117,610	902,946	891,973
Marietta, Columbus & Cleveland Railway	7,992	2,236	75,474	20,844
Wabash Pittsburg Terminal Railway	6,267	4,919	45,723	48,470
Kanawha & Michigan Railway	....	16,348	....	72,697
Total	1,910,712	1,859,039	15,365,610	13,050,369

Chesapeake & Ohio Railway

The following is a comparative statement of the coal and coke traffic over the Chesapeake & Ohio railroad for the months of August, 1910 and 1911:

COAL

To	1911	Per Cent.	1910	Per Cent.
Tidewater	338,195	21	373,217	27
East	164,761	10	141,868	10
West	1,062,805	67	851,644	61
Total	1,565,761		1,367,429	
Bituminous from connections	21,930	1	6,663	1
Anthracite from connections	3,288	1	1,178	1
Grand total	1,590,979	100	1,375,270	100

COKE

To	1911	Per Cent.	1910	Per Cent.
Tidewater	330	2	4,729	14
East	10,520	54	18,771	55
West	6,002	31	8,021	23
Total	16,852		31,521	
From connections	2,706	13	2,681	8
Grand total	19,558	100	34,202	100

The Baltimore & Ohio Railroad Company

Statement of bituminous coal and coke shipments for the month of September:

	1910 Tons	1911 Tons
Coal	2,650,172	2,614,201
Coke	372,988	341,350
Total	3,023,160	2,955,551

Norfolk & Western Railroad

Coke shipments, originating entirely in the Pocahontas field, were 91,619 tons.

Production according to districts at mines on the Norfolk & Western Railroad in West Virginia for the month of October, 1911, were as follows in short tons:

	Coal
Pocahontas	1,185,594
Tug River	194,028
Thacker	206,302
Kenova	78,998
Total	1,664,922

Anthracite

The following are the monthly shipments of anthracite coal, 1910-1911:

Months	1910	1911
January	5,306,618	5,904,117
February	5,031,784	5,070,948
March	5,174,166	5,996,894
April	6,224,396	5,804,915
May	5,679,601	6,317,352
June	5,398,123	6,215,357
July	4,202,059	4,804,065
August	4,996,044	5,531,796
September	4,967,516	5,730,935
Total	46,980,307	51,376,379

Foreign Markets

Great Britain

Tonnage is still being delayed by heavy weather, and the market is quiet for prompt loading. For forward delivery prices are firm, with an improving tendency. Quotations are approximately as follows:

Best Welsh steam coal	$4.08
Seconds	3.90
Thirds	3.63
Best dry coals	3.96
Best Monmouthshire	3.66@ 3.69
Seconds	3.48
Best Cardiff small steam coal	1.92@ 1.98
Seconds	1.80@ 1.86

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½ per cent discount.

Belgium

Coal production in Belgium for the first half of the present year, ended June 30, was 11,546,970 metric tons. For the same period last year the production was 11,828,990 metric tons.

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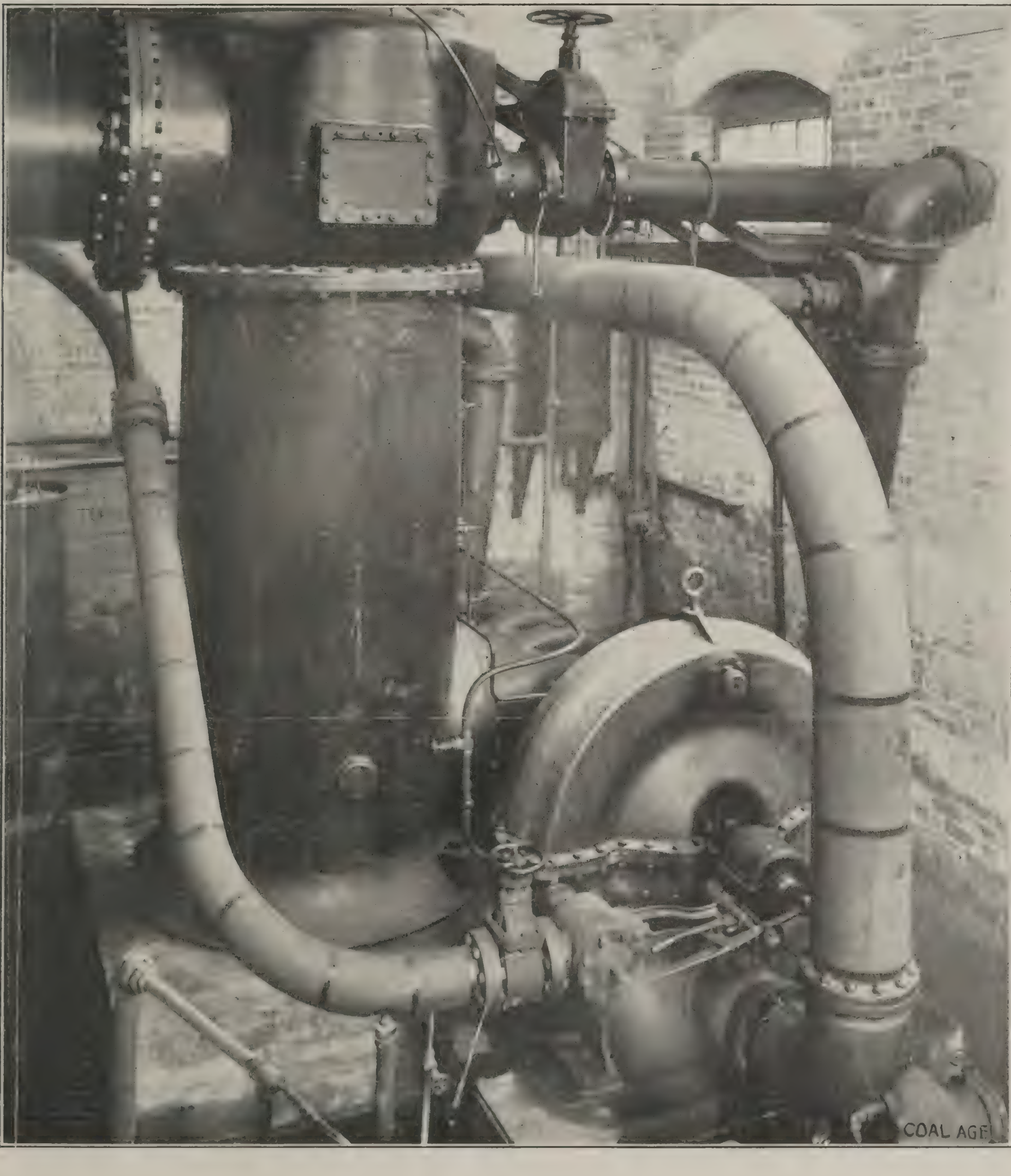
U. S and Mexico, $3 per year.
Canada, $4; other Countries, $5.



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COAL AGE

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EVERY man in charge of mines believes he is traveling the road that leads to safety and economy in operation. None will claim to have reached the goal, and all will admit there are numerous routes to follow, but each aspirant is convinced that his course is the best to pursue.

Did you ever stop from your own labors, and in a moment of relaxation watch the other fellows struggling along? And did you notice as you stood there, that one well-beaten thoroughfare was crowded with men of hardened visage, scowling, cursing, jostling by?

Well, the men you saw were all struggling for safety and economy (mostly economy) in coal mining, and they were the ones who travel the road of the Bully. To their way of thinking, results can only be obtained by intimidation, and they attempt to drive, coerce and browbeat everyone with whom they come in contact.

If you were to call one of these fellows aside, he would say kindness is a mistaken virtue, tell you the men under him are an ignorant lot, and suggest that you will fail if you distinguish between the machine at the face and the man who runs it.

Such men in one way remind me of the squatters who lived in the mountains of West Virginia and Kentucky a few years ago. Many of them are still voting for Jeff Davis, and had never seen a steam locomotive until railroads were built in to develop the coal. Few of them could see through a pane of glass, or, at least, so I gathered from the fact that they always threw the window in the railway coach wide open even when it was zero weather outside. These mountaineers followed one invariable rule, "Never let the other fellow think you are afraid." They might knock your hat off, tramp on your foot, or accidentally poke their rifles in your eye, but never an apology would you hear. They were sorry in their hearts for causing you distress, but for outward expression of such feeling, you might look in vain. An apology, so they thought, would be sure indication of physical cowardice.

So it is with some mine officials; they believe that an exercise of reason, or application of "The Golden Rule" in dealing with their men, is an acknowledgment of incompetency, or inability to fill the bill as boss of the mine.

You can force up tonnage and drive down costs for a day, but such a record cannot be continually used as a pry for a better average on the day that follows. Mule-nature, human-nature, even the rope, will not stand such treatment. Moreover, when the man higher up discovers you are a whipper-in, and depend on physical force instead of mental caliber, the end will be near.

Just as the provision of good houses and pleasant surroundings will attract superior men, so will a capable humane management secure the most intelligent class of labor. It requires in the neighborhood of 700,000 miners to produce the coal needed in America each year, and it is reasonable to conclude that the man who has the most ignorant and vicious of this great army of men, will have difficulty in meeting the competition of the fellow who has secured the best of the lot.

If you honestly believe that the men under you will only respond to coercion, consider a minute whether or not the fault is your own. What reputation do you bear among your miners? Are you unreasonable, dictatorial and difficult of approach? If so, what kind of men do you expect to get in an industry that has no waiting list, and where jobs can be had for the asking?

In conclusion—safety and economy are not to be attained through the sole exercise of physical force, and mine officials who travel that road are going to find it hard sledding. Most unfortunate of all, it is difficult to convert such men—in fact, I never knew but one who did change, and that was brought about by a young mule with a five-foot reach and a two-year memory. In some ways it is a shame the mule is being replaced by the gathering motor.

A Modern Twin Coal Mining Plant

By Warren R. Roberts*

Two mines are developed through twin shafts and twin tipples. The boiler house, power plant and remainder of the equipment are shared in common. The construction of the entire plant is typical of the best modern practice and is described in detail.

*President of Roberts & Schaefer Company, consulting engineers, Chicago, Ill.

The Bunsen Coal Company, the western fuel-producing subsidiary of the United States Steel Corporation, has several operating mines in the Danville, Ill., district. It has recently purchased, and is now developing through the plant described below, a large tract of coal land, located on a branch of the Chicago & Eastern Illinois Railroad, five miles southwest of Clinton, Indiana.

It was decided to develop two seams of coal on this property, the No. 4 and No. 5, and as a matter of economy, both in regard to first cost and the cost of operation, it was decided to build a combined plant to serve the two mines and thus avoid a duplication of machinery, buildings and railroad tracks. It was not found advisable, however, to combine the tipples, as at first contemplated, and therefore two main hoisting shafts were sunk at points about 200 ft. apart, one shaft going down only to the No. 5 seam and the other passing on down through the No. 5 to the No. 4 seam. As a further economy it was decided to sink a combined air and escapement shaft for the two mines. This shaft has two air compartments and two manways, one of each running to the No. 5 level only and the others passing on down to the No. 4 seam.

As a precaution against mine accidents, a large pillar of coal was left surrounding the No. 4 shafts where they pass through the No. 5 seam. The underground development will not be discussed in this article, but it may be remarked in passing that all arrangements for both mines are most excellent, and in keeping with the character of the surface plant.

General Construction

It was the desire of the management of the Bunsen Coal Company, as expressed through their general superintendent, Clay F. Lynch, to have these mines developed along lines which would typify the best modern practice. It was also desired that, in so far as possible, and consistent with such practice, all materials used in the construction of the entire plant should be those manufactured by the subsidiary companies of the United States Steel Corporation. The Roberts & Schaefer Company, to whom were intrusted the designing and building of the complete plant above ground, adopted the following general forms of construction to meet these requirements.

The foundations for the buildings and for all machinery are of concrete. The walls of all buildings are of reinforced concrete, excepting those of the office building, which are of concrete blocks. The roofs, excepting that of the office building, which is slate, are of cement tiles laid directly on steel purlins. The roof frames are entirely of structural steel. The floors, excepting that of the blacksmith shop, are of concrete, and the window frames and sashes are of steel.

The tipples are built entirely of structural steel and have their roofs and sides covered with corrugated steel. It will be seen therefore that this plant is as nearly fireproof and permanent as the present status of the building art permits.

Fig. 1. General View of Tipples, Hoisting Plants and Boiler Plant

The combined plant for serving the two mines consists of two steel tipples and two reinforced-concrete hoisting plants, one for each main shaft. These are the only units composing the plant which it was found advisable to duplicate. The boiler plant, generator plant, shops, storehouse, miners' bath house, ventilating plant, granary, stable and office were so designed and located as to serve both mines equally well.

A general view of the tipples, hoisting plants and boiler plant, looking down the railroad tracks from the "empty yard," is shown in Fig. 1. This view was taken before the sheet-metal roofing and siding had been put on the tipples and when

some other parts of the plant were not quite complete. It illustrates fairly well, however, the arrangement of the two hoisting plants with the tipples facing each other and seven railroad tracks passing between, three under each tipple and one "passing track." The tipples are of the style termed "end pull," that is, having the engine brace running parallel with the railroad tracks. This design locates the two hoisting plants alongside of the tracks as shown. The boiler plant is placed adjacent to the No. 5 hoisting plant, and the balance of the plant, with the exception of the stable and granary, is on the hillside in the rear of the boiler house.

Fig. 2. View of Twin Tipples under Construction

The Steel Tipples and Boiler Plant

A view of the twin tipples, looking up the railroad tracks, is shown in Fig. 2. This photograph also was taken before the sheet-metal roofing and siding were in place, in order to illustrate the equipment.

The tipples are substantial steel structures and contain the usual Indiana equipment, consisting of self-dumping cages, standard Akron bar screens above the weigh hoppers; weigh-hoppers for weighing screened lump and a pair of the Roberts & Schaefer Company's standard roller shaker screens for making screened coal and loading on three railroad tracks. All this equipment is of the best construction and has every convenience for changing the grades of coal.

The steel trestle connecting the two tipples, shown in this view, is for handling mine cars and all necessary supplies to and from the No. 4 shaft across the railroad tracks to the shops and storehouse, which are located on the same side of the tracks as the No. 5 shaft.

An end elevation of the boiler plant and a view of the concrete smoke stack during construction are given in Fig. 3. The general construction of the boiler house is uniform with that of all the other buildings, as described in the beginning of this article. Attention is specially invited, however, to the large windows with steel frames and sash.

The smokestack seen in this view is built entirely of reinforced concrete and is 10 ft. in diameter on the inside and 175 ft. high. It is connected with the boilers by a steel smoke flue and is lined for 50 ft. above the top of the flue with firebrick.

Fig. 3. Boiler House and Stack, under Construction

The method of constructing this stack is particularly well shown in the illustration. The materials were taken in through an opening in the bottom and hoisted up through the inside by means of the tower, above the stack. The vertical reinforcing rods are shown and also the movable forms used for holding the concrete.

An interior view of the boiler house is given in Fig. 4, which shows the coal bunkers for receiving and storing the slack coal used for feeding the boilers. The steel chutes for delivering the coal from the bunkers into the stokers may be seen in the farther end of the view. These coal bunkers, including all supporting columns, braces, etc., are entirely of reinforced concrete. It will be noted from this view that the boiler room is unusually light. This condition was obtained by having ample window space as illustrated in Fig 3, and by placing the coal bunkers high enough above the windows to prevent their shutting out the light.

This view also shows the four 375-h.p. Stirling boilers and the chain-grate stokers, all in the process of construction. Room has been provided for two additional boilers when the development of the mines warrant their installation.

There is a concrete tunnel beneath the rear of all stokers, extending throughout the length of the boiler house and a distance beyond sufficient to enable the ashes to be taken in a car directly from the ash hoppers below the stokers to a hoist outside, and thence, by an ash-handling equipment, to a dumping ground at some distance from the plant.

Coal is delivered to the bunkers from beneath the slack screens in the tipples by coal conveyers. By the installation of these conveyers and the stokers, the coal is handled by machinery directly from the mines into the boilers without any hand labor whatever. The ashes also are handled entirely by mechanical means.

The Power Plant

The general appearance of all the buildings composing this plant (excepting the office) is shown by the view of

the boiler house given in Fig. 3. This view shows the concrete foundations; the reinforced-concrete walls; the cement-tile roofing and the steel window frames and sash. These buildings are not intended to have any architectural features, but care was exercised in their design to make the proportions and general lines as good as possible.

Fig. 5 is an interior view of one corner of the generating room, showing two of the 250-kw. direct-connected generators, also the switchboard, some of the steam piping and the five-ton overhead crane used for handling equipment in the power house. It will be noticed that the engines driving the generators are of the four-valve Corliss type. This in indicative of the class of machinery and equipment used throughout the entire plant, showing that within certain reasonable limits the first cost was increased for the purpose of securing economy in maintenance and operation.

The combined shop building for the two mines, containing three compartments, one each for the carpenter, blacksmith and machine shop, is shown in Fig. 6. This building has an ample ventilator, the portion over the blacksmith shop having louvers and the portion over the carpenter and machine shops having pivoted windows. It will also be noted that the windows, instead of being made into an upper and lower sash, as is usual, have the main sash made stationary and contain two small, pivoted sashes. This is an improvement over the old arrangement, inasmuch as it enables the main sash and frame to be built into the walls and weatherproofed and leaves only a small window loose.

Miners' Bath House

There is a general tendency on the part of the better class of mining companies to go beyond the mere letter of the law in providing wash houses for their miners. Experience has taught that there is really small benefit to the miner in appearance or comfort, when simply provided with a wash basin and water. If he is to improve his appearance upon coming out of the mine and be presentable while passing along the streets to his home, he must be provided with facilities for properly washing and bathing himself. Where coal companies have provided such facilities there seems to have been a commendable spirit upon the part of the miners to make use of them.

Based on the experience of the Frick Coke Company and other fuel-producing subsidiaries of the United States Steel Corporation, the Bunsen Coal Company has taken a step in advance of other Indiana operators and provided at this plant excellent facilities in the way of a modern miners' bath house.

The building illustrated in Fig. 7 is some 32x62 ft. in size, and is built of reinforced concrete with concrete floors and cement-tile roofing. The roof is of open steel construction, allowing the superheated air in the building to pass up and out through ventilators. The building is provided with plain, substantial, wooden benches for the use of the men in changing clothing and with ample facilities for washing and with shower baths. The entire interior construction is such that the building may be washed out by the use of a hose and the water

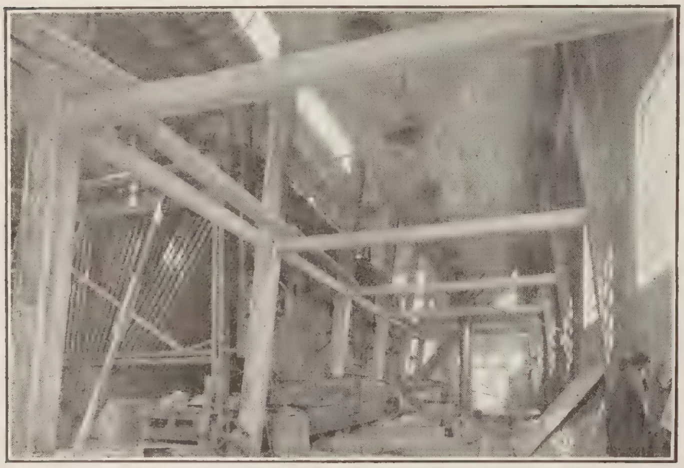


Fig. 4. Interior of Boiler House, Showing Concrete Coal Bunkers

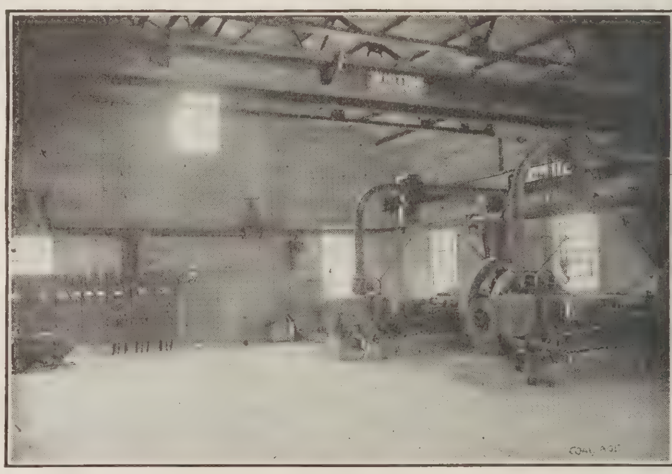


Fig. 5. Interior of Power House, Showing One Corner

Fig. 6. Blacksmith, Carpenter and Machine Shop

Fig. 7. Miners' Bath House, During Construction

drained off to the sewer. This latter facility enables the attendant to keep it always in a cleanly and presentable condition.

Ventilating Equipment

The ventilation for both mines is supplied through separate air compartments forming a single shaft, as explained in the beginning of this article. The fan is a Clifford-Capell, 20 ft. diameter by 5 ft. 6 in. wide, designed to run as a blowing fan but made reversible. It is driven by a pair of four-valve Corliss type engines direct connected to the fan shaft by clutches. These engines are placed one on either side of the fan and each engine has sufficient capacity to drive the fan under ordinary working conditions. In case of an accident to either engine the other is available; or in case of emergency, where unusual demands are made on the fan, both engines can be connected.

The casing for the fan wheel and the connection to the air shaft are entirely of steel plate. The balance of the housing, the roofs, side drifts, engine houses, etc., are entirely of reinforced concrete.

Mine Office

In providing comforts and conveniences for the superintendent, engineer and general mining force, this company has also gone beyond the usual custom by erecting a most excellent office building. It is a two-story structure, 30x40 ft., built of cement blocks with slate roof and has a large porch on the front which gives the building a pleasing and substantial appearance.

The plain reinforced-concrete walls adopted for the other buildings were not considered appropriate for the office building, where an architectural effect was desired. The results obtained with the cement blocks are quite satisfactory.

The interior finishing and furnishings of this building are plain but substantial and in keeping with its character. The rooms are all steam heated and electrically lighted and the sleeping compartments are provided with bath, toilet, etc.

Penn Mary Coal Mines, Heilwood, Pa.

By R. Dawson Hall

The equipment in these mines has some important features not duplicated at mining plants elsewhere. A low-pressure turbine is installed to use the exhaust steam from all the reciprocating engines previously installed at the plant.

The Penn Mary mines of the coal company of the same name are remotely situated from all main lines of communication. A winding branch, designated after its terminal, Possum Glory, connects through the Cherry Tree & Dixonville Railroad with the line of the New York Central & Hudson River Railroad. The town of Heilwood is on the boundary line between Cherry Hill and Pine townships, in the center of the eastern part of the county of Indiana, Penn.

Geology

For the most part all over that county, the Allegheny series of coal measures lie entirely below water level and are hard to reach, but across the Indiana field is a long, irregular scar where the elevation of the measures and the erosion of the streams have combined to lay bare the upper members of the Allegheny beds, to wit, the Upper and Lower Freeports. It is interesting to note that the butt and face cleavages of the coal are not distinct. The ragged-edged scar seems to embrace both the Chestnut Ridge Anticline and the Brush Valley Syncline, together with the valleys of Two Lick and Yellow Creek and their unimportant tributaries.

The mines of the Penn Mary Coal Company are in the Lower Freeport seam. This is about 42 in. thick, but of this about six inches in the bottom is not desirable. There is, therefore, the usual difficulty in getting a large production and sufficient men. On the whole, considering the thinness of the seam and the remoteness of the town, both difficulties seem to be admirably met. The large interval of about 75 ft. between the Freeports is maintained here as in the other parts of Indiana county, though the upper measure at this place is not of workable thickness.

Motors on Steep Grades

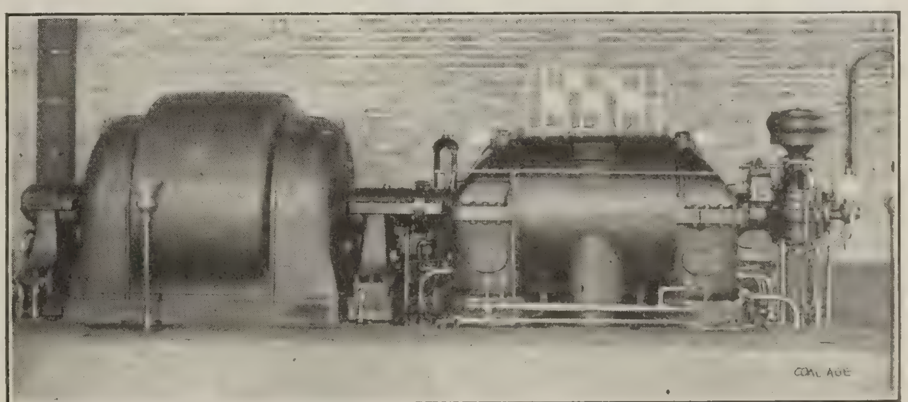
The Freeports at Heilwood are marked by awkward dips, which make drainage and haulage alike troublesome. Beside this, there are the heavy pitches away from the Nolo Axis. Thus the main haulage road of Penn Mary No. 1 dips with much irregularity on an average grade of 5 per cent., while No. 3 has a grade of 16 per cent. against the load. These uneven dips are not well suited to engine planes, though a tail-rope or a continuous-rope system might be adopted.

The method followed has been to use motors assisted by electric hoists, using the motor on entering the mine to unreel the rope and pull the cars where the downgrades slacken, and, on coming out, to help pull the trip; the rope and the motor mutually aiding each other. This manner of operation is proving satisfactory. When the trip is detached from the rope the motor is ready to perform the work required on the level stretches and by using a hoist wherever needed the motor never has to double and never burns out on the heavy lifts. As many as 75 cars per trip are pulled out of Penn Mary No. 1, but only 10 can be pulled out of No. 3.

Heilwood Village

It is not the intention to describe Heilwood. It is a model town in all respects, well laid out and clean. It has a hospital better than many a town of ten thousand inhabitants and in Doctor McHenry, a company physician with an enthusiasm in his work which is back of many of the provisions for the sanitary improvement of the town.

The company is now building two mine-rescue buildings, one at tipple No. 1 and one at tipple No. 2. Each building will house two Draeger helmets of two-hour capacity and one half-hour apparatus of like make. There will also be a Pulmotor in each building.



Westinghouse Parsons Low-pressure Turbine with Generator

At present, tipple No. 1 is making 1200 tons per day. Tipple No. 2 drawing from 2, 3, 4 and 5 mines, handles 2250 tons. Tipple No. 3, is handling 650 tons of coal from No. 6 mine. A new tipple is to be built to handle the coal from mine No. 7. The tonnage could be doubled if necessary at these plants. The main feature of interest in the plant centers around the electrical equipment, in charge of B. F. Smith, chief electrician and master mechanic.

Older Electrical Equipment

The original equipment, constituting the direct current side of the power house, consists of four complete units, all 200-kw., 250-volt, 800-ampere generators, driven at 225 r.p.m. by four 16x18-in. Fleming engines, of the Harrisburg Foundry and Machine Works. The Rochester forced-feed oiling system is used on these engines and with this arrangement there is no risk of the attendant being burned by the bursting of sight-feed oil gages. It is said that the installation of these lubricators effected a saving of $3 every 24 hours in the oiling of the four engines. This saving would doubtless not be as marked now as it was when the change was made, because at that time, the boilers were inadequate for the work imposed on them, the steam was therefore exceedingly wet and a large proportion of the oil used was carried off by the moisture without reaching the cylinder walls.

Each generator unit is supplied with a Vermont-marble switchboard panel and the general distributing system is protected by six Westinghouse double-pole circuit breakers mounted on four panels which are uniform in construction with the others mentioned. All the electrical machinery in use at the plant was furnished by the Westinghouse Electric and Manufacturing Company.

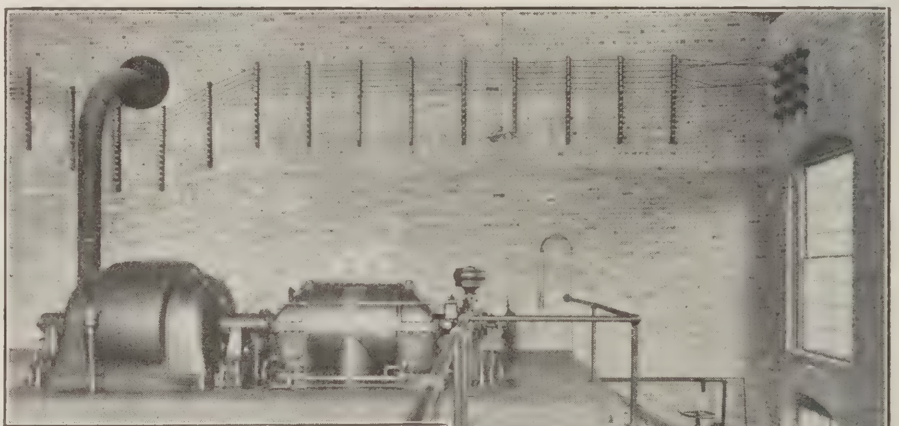
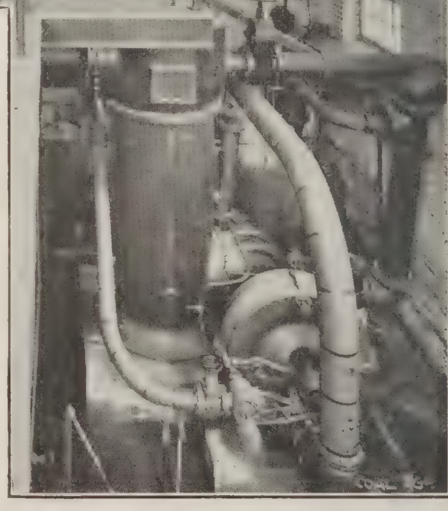
Low Pressure Turbine

The exhaust from the high-pressure engines in the direct-current section of the power plant, together with that from all auxiliaries around the central station is conducted to a Westinghouse-Parsons turbine which drives a 3-phase, 60-cycle, alternating-current generator, mounted on the same shaft with it at 3600 r.p.m. The latter has a rated capacity of 750 kv.a., 2400 volts, and 180 amperes per terminal.

A 25-h.p., shunt-wound direct-current motor, running at 1100 r.p.m., on 250 volts and 86 amp., actuates the exciter of the turbine generator. This exciter unit is a 15-kw. generator, producing 120 amp. at 125 volts pressure.

A No. 13 LeBlanc condenser takes care of the exhaust from the low-pressure turbine and produces a vacuum of 26.5 in. of mercury, that is, the back pressure from the condenser together with the weight of a column of mercury 26.5 in. long would equal the atmospheric pressure.

This condenser, Fig. 2, is of extremely simple construction. An illustration showing the outside appearance will be found on the front cover and a sectional view can be seen in the body of this article. A pipe *A* connects the top of the condenser with a large tank of water outside the building. This tank is termed the "cold well." The low pressure established in the condenser serves to draw the cold water continuously through the pipe *A*. The water passes through the spray nozzles *B*, mingling with the exhaust steam from the turbine which enters at *C*, and the resulting hot water is collected in the chamber *E*.

Low-pressure Turbine with Condenser

The condensation is rapid and reasonably complete, but extremely low, absolute pressures cannot be obtained by this device alone, because the exhaust steam and the cold condensing water both contain air and no simple condenser, unaided by mechanical means for removing this air, can possibly succeed in producing even an approximate vacuum.

In some systems a more complete vacuum is sought by the use of reciprocating air pumps. The objection to this method of evacuation is to be found in the necessity that always exists in a reciprocating engine to provide for a clearance space at the end of the cylinder. The LeBlanc condenser proceeds on a principle similar to that of the Sprengel air pump which is as perfect a rarefier of air as any known. Whereas in the Sprengel pump discontinuous drops of mercury in a narrow tube impel the air forward and out of the receptacle to be evacuated, in the LeBlanc pump, water is used, and the discontinuity of its discharge is obtained by the use of a wheel, section *N N*, Fig. 2., the vanes of which are filled with water from the port *H* which is in turn filled from the stationary chamber *G*.

The mixture of air and steam in the upper part of the condenser *E* is taken by the pipe *D* down past the edges of the blades of the rotor of the so called air pump *P*, which is driven in the direction of the arrow. The water driven discontinuously from the blades of this wheel entrains the air and steam in the narrow passages *F*, into which the water is forcibly discharged. Thus an efficient vacuum is obtained. The air pump is operated by a steam turbine using live steam from the boilers. Mounted on the same shaft with both air pump and turbine is a centrifugal pump for removing water from the condenser to the hot well.

The three units are inclosed in a common case and are of a construction so simple that they can scarcely get out of order. There is a side passage *L* in the discharge *J* from the air pump by which steam can be admitted to start the condenser after a shutdown, but this is not necessary where, as at Heilwood, the cold well is over 3 or 4 ft. above the basement floor on which the condenser rests. It is said that the small live-steam turbine, for driving the two pumps, requires only about 2 or 3 per cent. of the power delivered by the main engines.

Distributing of A. C. Current

The alternating-current switchboard consists of five panels, one fitted for two exciter units, one a blank for future development, one equipped for the present 750-kw. low-pressure turbine outfit, one equipped with two present distributing circuits and one a blank panel for use

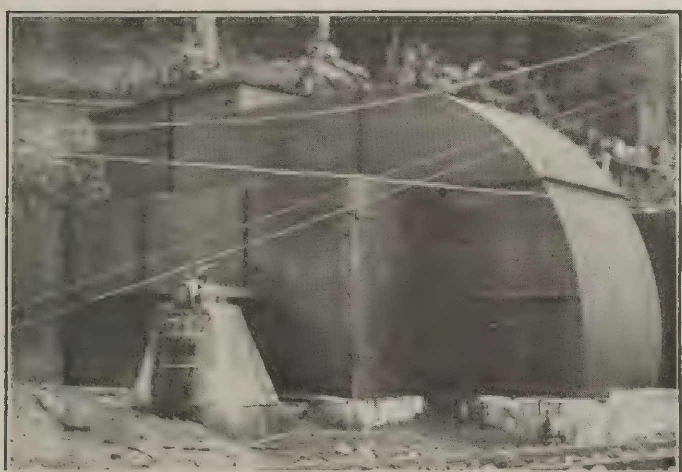
when other circuits have to be distributed. A Tirrell regulator is employed to maintain a constant voltage.

The transmission lines to the substation at tipple No. 2 are of No. 1 hard-drawn copper wire, supported on chestnut poles set 120 ft. apart. The line is protected from lightning by a No. 6 soft-drawn wire which is strung from end to end and connected to the ground at various points. This arrangement has has given excellent satisfaction.

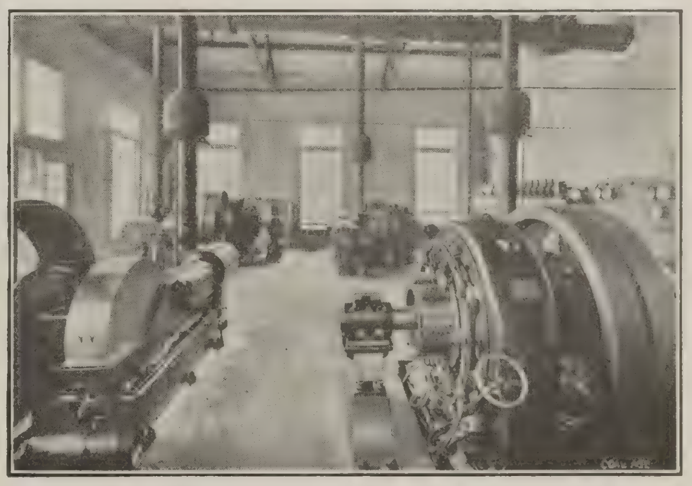
The First Substation

A substantial substation of brick has been erected near tipple No. 2. This contains a motor-generator set consisting of a 450-h.p. synchronous motor, running at 900 r.p.m., which receives a current of 94.1 amp. per phase at 2200 volts potential and a 300-kw. direct-current interpole generator delivering 1200 amp. at 250 volts.

Electric Rock Larry. Capacity 10 Tons



Fan Near Tipple No. 2



Direct-current Engine Room, Heilwood, Penn.

The exciter for this outfit is a 4½-kw. machine, rated at 36 amp. and 125 volts at 900 r.p.m. The plant is reversible. The direct-current machine can be supplied with direct current from the power station and thus drive the alternating-current motor as a generator to supply alternating current for the town houses and street lighting, and for the fans. Ordinarily the a.c. generator can be run either in parallel with the four d.c. generators at the main station or it may be run as an independent plant.

Lightning arresters with choke coils are located at the substation together with oil circuit breakers for the alternating-current lines; also a circuit breaker and switches for the direct current. All mines except No. 5 can be cut out at the switchboard of this substation. The motor-generator set is brought up to speed by running the d.c. generator as a motor and not by induction-motor action in the a.c. machine.

By regulating the field of the a.c. synchronous motor, the power factor of the circuit can be adjusted to unity. James Lytle is the acting electrician at Penn Mary, under the direction of Mr. Smith.

Electrical Hoisting

There are two 200-h.p., Lidgerwood hoists, a steam hoist at No. 1 and an electric hoist at No. 3.

The following tables show the cost sheets of the two latter for labor and material. The labor item does not include the wages of the operator, which is the same at the two hoists. Of course, the power cost is not considered in this estimate.

Running Cost of Steam Hoist

	Material	Labor	Total
August, 1911.....	$29.19	$23.60	$52.79
September, 1911.	8.04	13.60	21.64
October, 1911....	7.77	6.58	14.35
November, 1911..	2.51	0.77	3.28
Total.........	$47.51	$44.55	$92.06

Electric Hoist

	Material	Labor	Total
August, 1911.....	$4.64	$0.00	$4.64
September, 1911.	7.70	0.00	7.70
October, 1911....	0.00	0.00	0.00
November, 1911 .	0.00	0.00	0.00
Total	$12.34	$0.00	$12.34

In connection with the haulage motors on steep grades, as has been mentioned, small hoists are used of 5-h.p. capacity, running at 725 r.p.m. and taking 22.2 amp. at 250 volts.

Fans, Mining Machines and Motors

The fan at Penn Mary No. 1 is a 16-ft. Capell fan. No. 3 mine is ventilated by a J. C. Stine fan 12 ft. in diameter, driven by a 100-h.p. induction motor running at 690 r.p.m., receiving 3-phase, 60-cycle current at 2000 volts potential and 27 amp. per terminal. Electric power is being used for eight 12-ton and four 15-ton Baldwin-Westinghouse locomotives; also for thirteen Pneumelectric punchers and one Hirst electric rotary cutter, which are used for undercutting the coal. Electric pumps with wood-pipe discharge lines are installed at appropriate places in the mines.

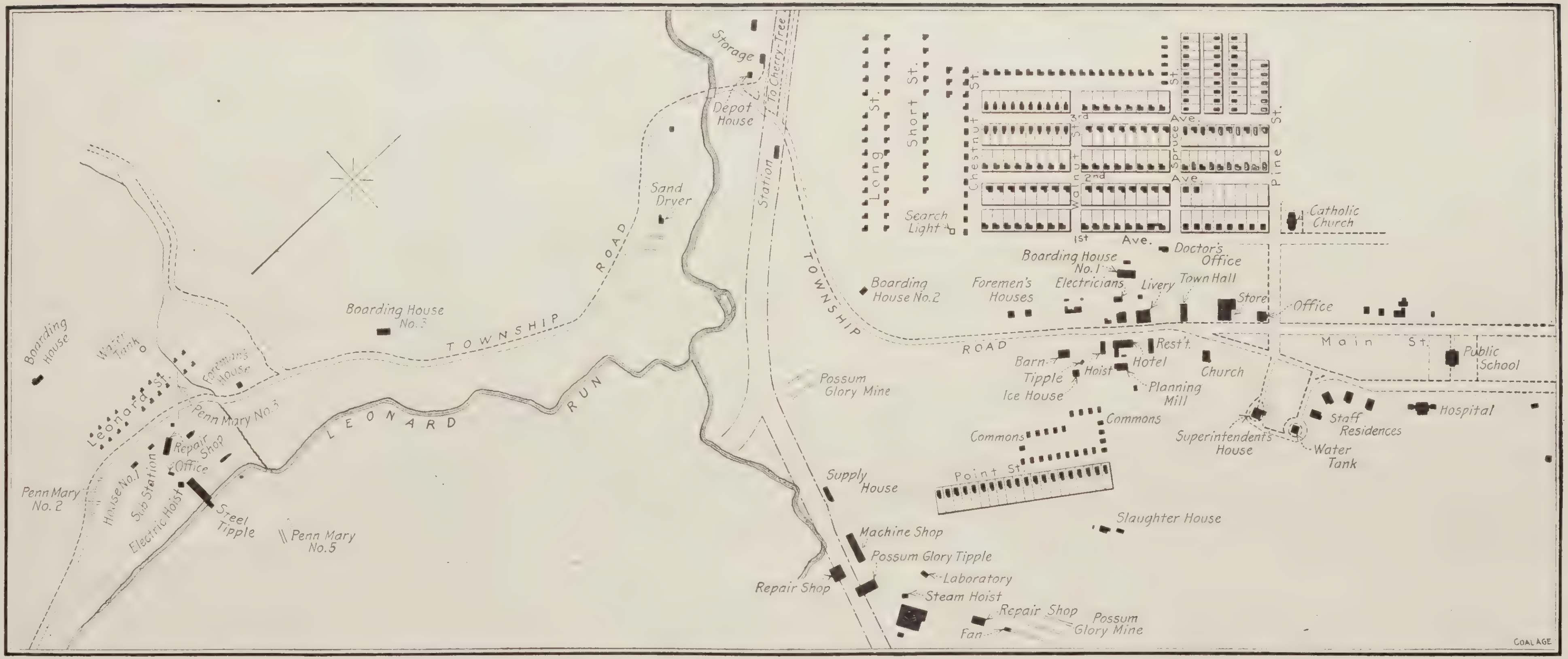
Boiler Equipment

The boiler equipment consists of six 300-h.p. water-tube units, four of which are Babcock and Wilcox boilers, the other two being built by E. Keeler, of Williamsport, Penn.

The feed-water supply to the boilers is controlled by Cope boiler-feed regulators and pump governors. Under ordinary conditions the water level is so maintained by these devices that it does not vary more than an inch from the desired elevation in the boilers.

Fuel is brought to the firing floor in Ernst Weiner steel cars filled from chutes at the side of the boiler room; these run on tracks in front of the boilers, making the work of stoking light and keeping the space in front of the boilers clean.

Two Smith-Vaile steam pumps, 14x10 x18 in., either of which is adequate to supply the power house and town, pump water from a reservoir on Yellow creek, a distance of about 1000 feet. As an auxiliary supply two drilled wells take water from the sandstone above the "B" bed. One of the pumps is located in the boiler house and one about 100 ft. away.



Map Showing Location of Penn Mary Mines and Surface Buildings, Heilwood, Indiana County, Penn.

This last pump is arranged so that when the water in the tank reaches a predetermined level, a switch is automatically thrown which breaks the circuit to the motor by which the pump is driven. This switch is operated by a float in the tank.

Compressed Air

Except as used in the Pneumelectric punchers, the only considerable use of compressed air at the plant is in the large machine shop of the Penn Mary Coal Company. Here, air is used to operate the power hammer, and is supplied by three standard Westinghouse locomotive-type steam-driven air pumps 9½x9½x10 in. in size. The line pressure for the service is 75 lb. per sq.in. The air is used also to some extent for general cleaning in the power house. All the auxiliaries of every sort driven directly by live steam furnish their quota of exhaust to the low pressure turbines so that no power is wasted.

Chemical Laboratory

The water used is analyzed every week by the chemist, C. W. McGregor. All oils, cements, and paint used are also analysed. In preparing the coal for analysis it is ground to such a fineness that it will pass a 100 mesh, by means of a disk pulverizer, made by the Denver Fire Clay Company. This is driven electrically by a direct-current motor of 2 h.p., running at 1200 r.p.m., and using 9 amp. at 220 volts. The grinding is performed on the face of the revolving wheel, the distance between the wheel and the friction plate being regulated by capstan screws. The coal escapes through small slots in the grinding face.

Rock Disposal

The question of rock disposal is made difficult by the thinness of the coal and the fact that it outcrops low down in narrow valleys. A large quantity of rock has consequently to be taken a long way from the drift. The rock is dumped from the tipple into a large 10-ton electric larry. This larry has a bottom sloping toward the two sides and also toward the rear end. It is run backward onto the dump. Large doors on the sides and rear of the larry are opened by a simple lever, and once released the rock falls without further assistance from the car, unloading in three directions.

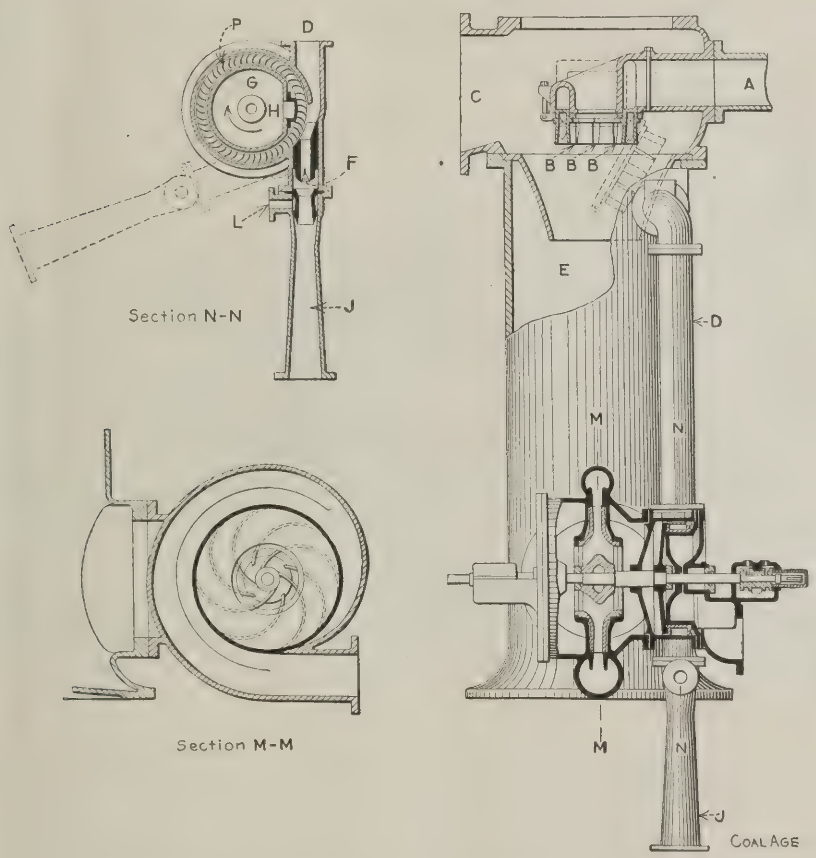
Blacksmith Shop

A large blacksmith shop is equipped for the manufacture of mine cars and for all simple repairs to machinery. As a guide to those who may have to equip such a shop the following figures are given. The shop measures 32x138 ft.

The motive power is furnished by a 30-h.p. motor, run at 600 r.p.m. on 115 amp. and 220 volts. The plant includes:

One 22-in. x 10-ft. lathe for general work.
One 26-in. x 12-ft. lathe for turning axles.
One 38-in. x 16-ft. wheel-turning lathe.
One 18 in. x 5-ft. planer.
One 25-in. radial drill press.
One 30-in. radial drill press.
One 5-ton air hammer.
One bulldozer for preparing car irons.
One 14-in. power hacksaw.
One combination shear and punch.
One pipe machine to cut and thread from 1¼- to 6-in. pipe.
One 1-ton triplex block in car-repair shop.
One 1-ton Triplex block in machine shop.
One 2-ton Triplex block in machine shop.
One double-spindle, 14-in. emery-wheel stand.
One 3-ft. grindstone.
Two forges, one driven by a 30-in. Buffalo blower and one by an 18-in. Champion blower.
One heating furnace for preparing iron for the bulldozer.
And for woodworking:
One 36-in. band saw.
One 14-in. rip saw.
One 16-in. cutoff saw.

The machine shop, while in general charge of Mr. Smith, is under the direct supervision of William G. Davis.



Showing Details of the Le Blanc Condenser

The general management of the operation is in the hands of H. P. Dowler, assisted by M. H. Kalloway. The mining engineering is directed by John T. Hoover. To these and all those whose names have been already mentioned I desire to make acknowledgment for assistance in preparing this article.

The railroad is being extended to tipples 3 and 4, and some time next spring these important additions to Penn Mary will be shipping coal. It was in anticipation of these further developments that the a.c. electrical installation was provided.

Winter Meetings of the Mining Institutes

The West Virginia Coal Mining Institute will hold its winter meeting at the Masonic Temple, Fairmont, W. Va., on Dec. 4, 5 and 6. The program includes a number of addresses on subjects of great interest to the coal-mining fraternity in general as well as several dealing with more particularly local matters. An interesting feature of the meeting will be the tour of inspection to the coal mines and industrial plants in the neighborhood of Fairmont, on Wednesday Dec. 6, under the auspices of the Fairmont Chamber of Commerce.

The following addresses will be given: "A Mine Foreman," John Laing, chief of the department of mines, Charleston, W. Va.; "Forestry for Mining Companies," R. C. Eggleson, forester, Consolidation Coal Company, Jenkins, Ky.; "The Relationship of Manufacturer to Operator," F. C. Albrecht, E. E., Westinghouse Electric & Manufacturing Co., Pittsburg, Pa.; "A Method of Testing for Black Damp," W. R, Crane, E. M. Dean, School of Mines, Pennsylvania State College, State College, Pa.; "Technical Education with Special Reference to Mining Interests," Dr. Thos. C. Hodges, president, West Virginia University, Morgantown, W. Va.; "A History of the Fairmont Region," Ex. Gov. A. B. Fleming, Fairmont, W. Va.; "The Recovery of Coal from the No. 2 Gas Seam, in the Kanawha District," James J. Marshall, chief engineer, Loup Creek Colliery Company, Page, W. Va.; "The Economical Production of Steam in the operation of Coal and Coke Plants," Chas. N. Hays, Pittsburg, Penn.

On Monday, after the president's address, Judge W. S. Haymond and Hon. E. M. Showalter will welcome the Institute. Five minute responses will then be in order from a number of prominent members. The Fairmont Chamber of Commerce will tender a banquet on Tuesday, Dec. 5. Frank Hass, Fairmont, W. Va., is president of the Institute and E. B. Day, Pittsburg, Pa., is secretary-treasurer.

Coal Mining Institute of America

On Dec. 19 and 20 a joint session of the Coal Mining Institute of America and The Engineers' Society of Western Pennsylvania will be held in the rooms of the latter organization, Oliver building, Pittsburg, Penn. This is the regular winter meeting of the mining institute.

Addresses will be delivered by Walter Riddle, Ph. D., president of the Engineers Society, and by S. A. Taylor, president of the mining institute. Mr. Taylor's subject will be "The Coal Fields of the World, with Some Statistics and Data Thereon," and will be illustrated by stereopticon. The institute dinner will take place in the evening of Dec. 20, at the Seventh Avenue hotel.

The following papers will be presented: "Power Plants with Special Reference to Requirements in Western Pennsylvania" (illustrated with lantern slides), O. S. Lyford, Jr., R. W. Stovel, engineers with Westinghouse, Church, Kerr & Co., New York City; "A Remarkable Coal Formation," Jesse K. Johnston, Charleroi, Penn.; "Special Methods of Testing for Mine Gases," W. R. Crane, Ph.D., dean The School of Mines, Pennsylvania State College; "The Construction and Maintenance of Telephone, Signal and Trolley Lines in Mines," E. M. Weir, Western Electric Company; "Application of Gas Analyses in Coal Mines," G. A. Burrell, chemist, U. S. bureau of mines; "The Price of Coal Compared with the Price of Materials Used in Mining," E. N. Zern, assistant professor of coal mining, University of Pittsburg; "Electrical Symbols for Use on Mine Maps to Indicate the Character and Location of Electrical Apparatus, H. H. Clark, electrical engineer, U. S. bureau of mines; Mr. Randolph, of Wood & Randolph, electrical engineers, Pittsburg; "Lignite Mining in Colorado," C. J. Griswold, assistant professor of mining, Carnegie Technical School, Pittsburg.

Coal Mining Methods in Michigan

By R. B. Hosken*

An interesting description of mining methods in Michigan in which the use of machines in low seams is discussed. The coal beds range from 26 to 42 in. in thickness and have a poor roof. Unusually large quantities of water are encountered.

From an economic standpoint, Michigan is a small factor as a coal-producing State. In 1909, its production, about a million and three-quarters tons, placed it twenty-third in the list of coal-producing States, below Montana, Arkansas, Utah and Texas. In 1910, the tonnage was reduced to 1,473,874, and but 2474 workmen were employed in this industry.

The student of coal-mining conditions and methods, however, can well afford the time needed for a closer glance at the Michigan situation than these figures would seem to warrant. With the exception of the extreme northern part of the Appalachian region, the Michigan coalfield is the only one within the drainage area of the Great Lakes. It covers some 6500 to 8000 square miles, the seams having an average thickness of about 26 in. No coal is mined less than 2 ft. thick at present, and of this there are estimated to be about eight billion tons still unmined. Active mining is confined to the eastern portion of the field in a line drawn between Bay City and Jackson; and Bay and Saginaw are the two counties in which the bulk of the coal is produced. Small tonnages are credited to Clinton, Eaton, Genesee, Ingham, Jackson, Shiawassee and Tuscola counties.

Coal mining was reported in Michigan as early as 1835; but for many years wood remained the chief fuel for both domestic and industrial purposes. It was 1898 before the tonnage rose to the quarter million mark, and the maximum output thus far was that of 1907, amounting to a little over two million tons. Development has been slow, and no very great increase can be looked for, owing to the competition encountered from West Virginia and other larger fields. Nearly the entire production of the State is used locally, therefore, and some of the mines operate only during the fall and winter months, when the domestic trade affords the best prices.

Fig. 1. Power House and Tipple at Beaver Mine, Bay City, Mich.

Geology

Geologically, Michigan coal seams are correlated with the Lykens Valley group of the Pottsville series and the lower carboniferous formation in Pennsylvania and Ohio. The beds vary greatly in different parts of the field. They lie horizontally, but in some cases local undulations, called "rolls" or "swamps," are found, which increase the difficulty of mining. The depths of the seams from which the heaviest production now comes, are from 130 to 175 ft. The beds overlying the coal are chiefly weak black shales, making poor roof. Black bituminous limestone, full of shells, or wet sandstone are also found as roof. The bottom is usually fireclay or a soft sandstone, and the mines, as a rule, lie beneath low ground and are wet.

The coal itself varies considerably in hardness. In some mines it is soft and friable, breaking up easily. In other portions of the same bed where the seam is thinner, the coal is much harder, and rolls out in firm blocks, after being undercut.

The seam which is especially considered in this article is about 145 ft. from the surface, and the following is an average analysis: Specific gravity, 1.26; moisture, 10.67; volatile matter, 33.59; fixed carbon, 53.80; ash, 1.94; sulphur, 1.01; British thermal units, 13,000.

It will be seen from this rough summary that mining problems and methods will vary in detail in nearly every mine. In general, however, the method of operation is uniform.

System of Mining

The mines are opened by double-compartment hoisting shafts with an air shaft 300 to 500 ft. distant. In this latter there is a separate manway or escapeway compartment with spiral staircase.

The underground workings are laid out on the double-entry system, with a pillar

*Engineer, 1459 Olive avenue, Chicago, Ill.

18 to 25 ft. thick between the haulage road and the air course, which are from 8 to 15 ft. in width and from 5 to 6 ft. high (necessitating brushing the roof and lifting bottom). Crosscuts are made at intervals of 40 or 50 ft. These are closed up and made airtight as the entry advances, to maintain proper circulation of air. Cross entries and air courses are driven at right angles to the main entry, 300 to 400 ft. apart.

Rooms are turned from the cross entries on 40-ft. centers, and in machine-operated mines are carried 30 ft. wide. They are driven 150 to 200 ft. deep to meet the corresponding room from the next succeeding entry. Breakthroughs for ventilation between rooms are 6 ft. wide, and are spaced not over 60 ft. apart. The room necks are 8 ft. wide. They are kept in good order and especial care is given to the haulageways. These are timbered with crossbars in the entries, and in rooms, when necessary. The curves are carefully laid, to prevent delays to cars or mining machines.

Ventilation and Haulage

Blowing fans of various patterns are used in the Michigan field. Slow-speed types are the rule, as the mines are not sufficiently developed to make the ventilation problem a large one. The air current is forced down the air shaft, through the air courses and working places, and back via the haulage road to the hoisting shaft, which is, therefore, the upcast. This arrangement is a convenient one, as it keeps the hoisting shafts free from ice in the winter months. The current is usually reversible, in case of emergency, by opening and closing doors in the fan casing.

The pit cars are of wood, and hold from 750 to 1000 lb. of coal each. They are pushed to and from the face in the rooms by hand, and collected in the entries and hauled to the shaft bottom by mules. Power haulage has not been generally adopted as yet, because of the small area of the workings. In the No. 2 mine of the Robert Gage Coal Company, at St. Charles, the trips are hauled from partings on the cross entries to the bottom by electric locomotives. Rope haulage is employed at the No. 5 mine of the same company, at Auburn. Self-dumping cages deliver the coal direct to shaker screens.

Mines Have Poor Roof

As already noted, mining in this field is handicapped by poor roof, a large amount of water and thin seams, which range from 26 to 42 in. in hight. Timbers must be placed at frequent intervals and brought close up to the working face; and with drainage represents a heavy charge on the tonnage mined. One mine in particular is obliged to keep an 8-in. discharge pipe running full most of the time, to keep the mine dry enough to be worked.

The pictures illustrating this article were taken in the Beaver mine, about 6 miles southwest of Bay City, and at the Bliss mine, at Swan Creek.

The photograph showing the machine cutting across the face was taken in one of the driest rooms in the district; even so, trouble was experienced in keeping the flash powder dry enough to enable a good picture to be taken. In taking the picture of the machine just ready to sump under the face, the camera tripod had to be placed in about 3 in. of water. This place is about the wettest being worked at this time, and the dripping from the roof causes no little annoyance to the miners and makes the haulage roads hard to keep up.

Undercutting is usually done in the coal itself, as neither the gritty fireclay nor the sandstone bottom which sometimes replaces it, is suitable for mining. A sulphur band near the bottom of the seam gives trouble in some mines, and makes it necessary to cut above the sulphur and lift the bottom coal after the rest of the seam is shot out. In other cases, the machines cut through the sulphur, as will be described later.

In order to make coal mining a paying investment under such conditions, the operator must employ the most economical means possible to win the coal. In early days the coal was undercut by hand pick. Pick machines were introduced in 1898, but have not been extensively adopted. Eighty-five machines, including a few of the chain-breast pattern, were used in 1904, when 23.09 per cent. of the total product was mined by machine. By this time hand-pick cutting had practically disappeared, and the remaining 77 per cent. was won by shooting from the solid, a dangerous practice and a wasteful one, on account of the high proportion of slack coal produced by the heavy powder charges necessary. In the year ending Dec. 1, 1910, 561,688 tons out of a total of 1,473,874 were mined by machines, or 38.1 per cent.

Fig. 2. The Bliss Coal Company's Plant at Swan Creek, Mich.

Continuous Cutters

In the last two years, the situation has been changed materially by the introduction of electric chain machines of the Sullivan continuous-cutter pattern. The chain-breast type was less satisfactory than these, because the machine occupied so much room in front of the coal that props had to be moved and replaced to permit its passage, while the rear jack, forced into the roof at frequent intervals, constituted an added danger from falling top. The bulk and weight of breast machines and the severe labor connected with handling them in such low coal, also proved a serious handicap. The typical advantages of the continuous cutter are of great value in this field.

The Sullivan class "CE6" low-vein machine is the pattern in principal use. More than 80 per cent. of the chain machines now actually at work in this field are of this type and make. This machine stands only 21 in. high when cutting,

and 30 in. high on its power truck. Props can be set less than 6 ft. from the working face, and need not be moved while the machine is cutting. The cut made by these machines is a clean kerf 4½ in. high, and perfectly free, without sprags at the back, while a square working face is left for the next cut. But little powder is needed for shooting, so that not only is the roof left unshaken, but very little coal is wasted in cutting. The proportion of lump coal is much higher than that obtained by any other method.

The Sullivan continuous cutter is shown in operation in the accompanying illustrations, taken in the Beaver mine. The machine in Fig. 4 was unloaded in the room neck, which in this case was at the left side of the room. A jack was set at the end of the right rib nearest the entry, and the machine pulled itself along the floor to this point on its feed chain.

Fig. 3. Machine Leaving Room on Self-propelling Truck

Fig. 4. Sullivan Machine Cutting across the Face

Undercutting the Coal

The rib and the face were then cut in one operation, with no other hand labor than that involved in setting the anchor jack and the takeup rig when the corner was reached, and in shoveling out the coarse cuttings from the cut behind the machine. In the picture the machine is part way across the face. The anchor jack is set to hold the feed chain and the machine with it, a little away from the face, to square it up, as it was being cut by machine for the first time. The mining is 5 ft. 3 in. deep. This particular machine was equipped with feed gears which propelled it along the face on its chain at the rate of 15 in. per minute. The room was mined in less than an hour, including 60 ft. of undercut, unloading, handling, and reloading the machine on its power truck, for transportation to the next working place, as shown in Fig. 3.

Practice regarding cutter bits varies in different mines. In the Sullivan machine, the bits are staggered in five positions or rows. In clean, hard coal, bits with pick points are used altogether. In coal that is clean and soft, the most rapid progress is made with chisel-pointed bits. In both the Beaver and Bliss mines, sulphur occurs near the bottom of the seam in sheets $\frac{1}{32}$ to $\frac{1}{16}$ of an inch thick. A combination of the two styles of bits is used here, the proportion of chisel points increasing when more impurities are met, in order to protect the cutter chain from the file-like cutting of the sulphur sheets.

These machines load themselves on their trucks, unload and propel themselves in all operations on and off the truck, under their own power. This is a very important advantage in the low head room available, where lifting and moving heavy machines is handicapped by the cramped space in which the men must work.

The Beaver Mine

The Beaver mine is operated under the same management as the Robert Gage Coal Company, and is one of the oldest openings in the district. Owing to natural difficulties, such as the sulphur referred to above, and the large amount of water encountered, as well as lack of capital, it has never passed the development stage. The present owners are attacking their problems in a systematic and intelligent manner, and the methods they have adopted promise to overcome the difficulties and place the mine on a paying basis. At present, the Sullivan machines are used almost entirely in development, cutting entries and room necks and widening rooms. When enough working places have been squared up to provide cutting for all five Sullivan machines, the mine will become quite a factor in the production of the district.

The Robert Gage Coal Company and mines under the same management now employ about 20 Sullivan continuous coal cutters.

The surface equipment of the Beaver mine, shown in Fig. 1, is adequate to handle a large tonnage and is uptodate in all respects. It includes a modern steel-plate ventilating fan. The mine is equipped with a steam hoist and a steam-driven electric generator for lights and power. Well appointed machine and blacksmith shops enable equipment to be kept in constant repair. A company store is maintained for the convenience of the employees.

The labor in the Michigan field is of a high class and the men are all members of the union. The basis of payment is $1.01 per ton for all coal shot from the solid which will pass over a ⅞-in. diamond bar screen. The slack which falls through the screen is not credited to the miner. When machines are used, the percentage of slack is smaller and the miner has little dead work to do. The wage scale in machine mines give 59c. per ton of screened coal to the loader, and 19c. to the machine runner and his helper, or a total of 78c., which, deducted from the hand-mining rate, leaves a margin of differential for the operator of 23c. per ton. This is an inducement for machine mining, aside from the greater value realized from the output.

The men are paid off twice a month. Because of the proximity of the mines to towns and cities, the mining camp customary in other fields is generally lacking. The mine buildings stand in flat, rather desolate, fields, aloof from the other signs of civilization. The men live in Bay City, St. Charles or Saginaw, where their families can enjoy schools and other advantages. They go to and from the mines each day by train. Most of the mines in this section run wash rooms for the miners, where the men can leave their pit clothes to dry. An attendant keeps the building clean, sees to drying the clothes, and provides hot water, towels, soap, etc. For these conveniences a charge of 4c. or 5c. per day is made.

I am indebted to the mine officials of the Beaver Coal Company and of the Bliss Coal Company for photographs and for assistance rendered in preparing this article.

Determination of Meridian

By D. J. Browne*

This method permits Polaris observations to be taken at any hour of the night, and offers an easy graphic method of computing the results.

*Mining engineer, Rossland, B. C.
NOTE—From *The Engineering and Mining Journal*, Nov. 11, 1911.

The mine surveyor, in the course of his work, is often called upon to determine meridian, especially when surveying at remote places out of convenient reach of established survey lines. In such a case, unless he is prepared with the data necessary for one of the solar methods—and these need an accurate knowledge of the time and current tables of solar declination, both of which may be difficult to obtain at short notice—the remaining methods at his disposal are limited to two or three, all based on stellar observations. The best known of these are: (1) Method of equal altitudes, and (2) Observation of Polaris, or another star, at elongation. Both methods are satisfactory, and their accuracy is limited only by the care taken and fineness of instrument employed; but either may entail the disagreeable necessity of an all-night session, with the risk of failure, should a cloud intervene at a crucial moment.

This risk is obviated by the following method, in which the position of the pole is determined by two or more observations on Polaris (in northern latitudes). These may be taken at irregular intervals, at the will of the surveyor; a useful feature, if, owing to clouds, the star cannot always be seen. The only data needed are the polar distance of Polaris, and the approximate latitude of the observer. Between latitudes 25 and 50 deg., knowledge of the latitude to the nearest quarter degree is sufficiently accurate for this purpose.

The polar distance of a star is its angular distance, on the celestial sphere, from the pole. The polar distance of Polaris on Jan. 1, 1911, was 1 deg. 10.1 min., and it is lessening by about 19 sec. each year.

Method of Observation

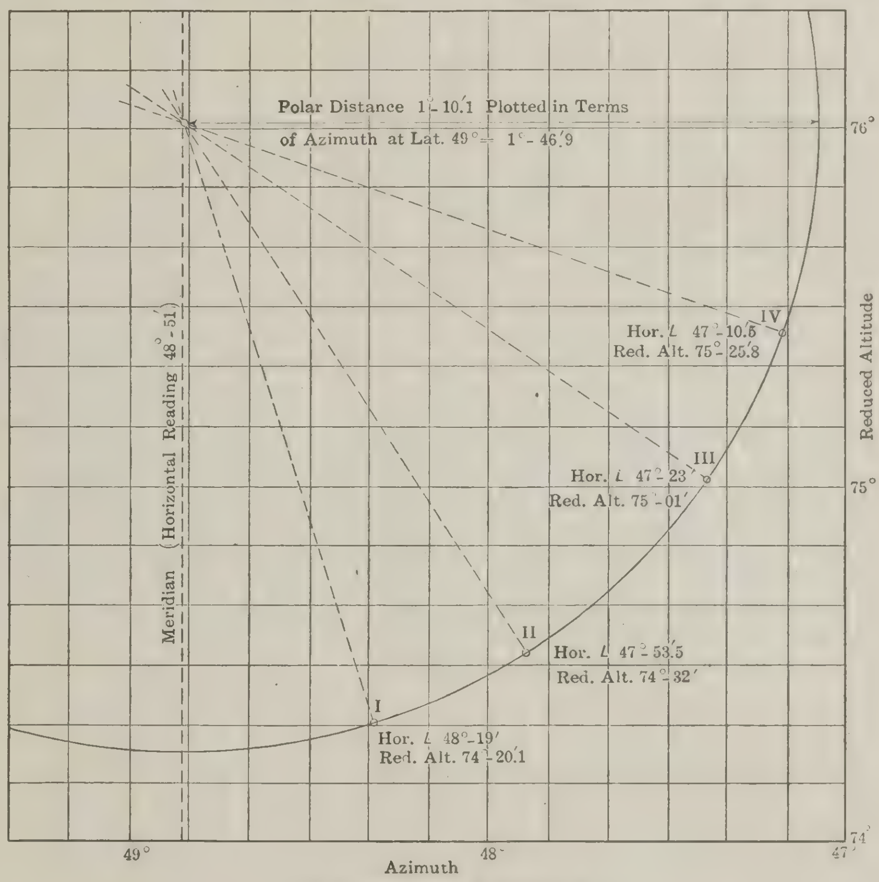
The field operations are as follows: Set up the transit over a hub of a permanent kind in a spot sheltered from the wind, and with an unobstructed view of the northern heavens. Then, with the horizontal vernier clamped at zero, backsight to another station 100 ft. or more away, the position of which should be precisely indicated by an illuminated plumbline centered over it. Set the lower clamp, reverse the telescope and sight Polaris, following the star with both vertical and horizontal tangent screws until it is at the intersection of the cross-wires, so that both altitude and azimuth can be read. Note the time and read both circles. Then, after an interval of one hour or more, make a second observation.

Theoretically, all the data necessary for determining the position of the pole have now been obtained, but in practice it is desirable to make at least two more observations, as a check against errors of manipulation and to eliminate partly any faulty adjustments of the instrument. With the latter object in view, make the first pair of backsights with the telescope direct, and the last pair with it reversed. The main source of error, to be corrected by this means, lies in the horizontal axis of the instrument, particularly in high latitudes where there is a great difference in elevation between backsight and foresight, owing to the greater altitude of the pole.

The object has been to find the position, relative to the survey line, of the circular path in which Polaris appears to move round the pole, and this has been done by fixing two or more points in it. The radius of this circle is the polar distance of the star, and as this distance is an angular one, the problem of finding the center belongs to spherical trigonometry. Polaris, however, is so close to the pole, and consequently involves so small a portion of spherical surface in its apparent orbit, that the methods of plane geometry may be used without introducing appreciable error. The task of reducing the observations, therefore, becomes the simple one of finding the center of a circle, given two points in its circumference, and its radius.

Graphic Solution

This may be easily and quickly done graphically, especially if squared paper be used, by plotting the horizontal components of the points on the circle as abscissas, and the vertical components as ordinates, first reducing the radius, or polar distance of the star at elongation, to terms of azimuth. In explanation of this, it should be pointed out that polar distance is measured in a plane either containing, or parallel to, the earth's axis; and that in consequence, it is not the same angle as the azimuth of the star at elongation, except at the equator. The relation for any latitude is:



Determining the Meridian

Sine azimuth = sine polar distance ÷ cosine latitude.

Hence it follows that the azimuth of a star at elongation is variable with the latitude, and increases as the observer goes north, until a latitude equal to the complement of the polar distance is reached when it would be N. 90 deg. E., or N. 90 deg. W., according as the star is in eastern or western elongation.

Determining Path of Polaris

Now, a little consideration will show that the horizontal and vertical readings

TABLE OF MEAN REFRACTIONS

Computed from barometer 30 in., and temperature 50 deg. F.

Altitude	Refraction		Altitude	Refraction	
Deg.	Min.	Sec.	Deg.	Min.	Sec.
10	5	19	20	2	39
11	4	51	25	2	04
12	4	28	30	1	41
13	4	07	35	1	23
14	3	50	40	1	09
15	3	34	45	0	58
16	3	20	50	0	49
17	3	08	60	0	34
18	2	58	70	0	21
19	2	48	80	0	10

of the transit, if plotted to the same scale, will indicate the apparent path of Polaris, not as a circle, but as an ellipse. This is because the abscissas represent azimuths and not horizontal components, or projections of polar distance, while the ordinates, or altitudes, are true vertical components of polar distance. Therefore, in order to restore the circular form to the orbit, the altitudes must be plotted to a scale greater than that of the azimuths according to the ratio, azimuth at elongation ÷ polar distance. Thus, if a length of 3 in. represents 1 deg. of azimuth, then 1 deg. of altitude should be represented by a length of 3 in. × azimuth ÷ polar distance. When, however, the latter scale is such as to be difficult to adapt to prepared squared paper, plot instead the product, altitude × azimuth at elongation ÷ polar distance (preserving its angular form of degrees and minutes) on the ordinate axis, 1 deg. of this "reduced altitude" being drawn to the same scale as 1 deg. of azimuth. The observations having been plotted in this way, find the center of the circle, or the pole, with dividers or compass set to a radius representing azimuth at elongation.

When working to an error limit of 30 sec., which is all that is usually required of the mine surveyor, it is not necessary to apply the correction for refraction at latitudes higher than 10 deg., as a glance at the following table of mean refractions will show:

As there is little more than 2 deg. difference in altitude between the upper and lower culminations of Polaris, the correction for refraction is, for our purpose, the same for all positions of the star. If, however, the observations have been made with the double object of determining both azimuth and latitude, it is hardly necessary to say that the correction must be applied.

Example of the Process

The following is a practical example of the method:

Latitude of observer, 49 deg. N.

Date, Jan. 1, 1911.

Polar distance of Polaris, 1 deg. 10.1 minute.

The instrument was a 4-in. mine transit, with full vertical circle, both circles reading to minutes and by estimation to half minutes. Four observations were made, at intervals varying from 1 to 1½ hours, first backsighting to a station situated about 100 ft. to the southwest, inverting the telescope, and turning a left deflection angle to Polaris. The first pair of backsights were taken with the telescope direct and the last pair with it reversed. Then, after calculating azimuth at elongation as follows:

REDUCED FIELD NOTES

Observation No.	Time	Horizontal Angle		Observed Altitude		Reduced Altitude (Altitude × azim. at elong.) / polar dist.	
		Deg.	Min.	Deg.	Min.	Deg.	Min.
1	7:10 p.m.	48	19	48	44½	74	20.1
2	8:10 p.m.	47	53½	48	52½	74	32
3	9:40 p.m.	47	23	49	11½	75	01
4	10:40 p.m.	47	10½	49	28	75	25.8

$$Sin.\ azimuth = \frac{sin.\ polar\ distance}{cos.\ latitude.}$$

$$= \frac{sin.\ 1\text{-}deg.\ 10.1\ min.}{cos.\ 49\ deg.} = sin.\ 1\ deg.\ 46.9\ min.$$

$$Log.\ sin.\ 1\ deg.\ 10.1\ min. = 8.309410$$

$$Log.\ cos.\ 49\ deg. = 9.816943$$

$$Log.\ sin.\ 1\ deg.\ 46.9\ min. = 8.492467$$

the vertical reading at each observation was reduced to the form necessary for plotting, as shown below:

The third and fifth columns were plotted on squared paper as abscissas and ordinates, respectively, with the result seen in the accompanying diagram, the scale being 1 in. to 20 min. Then, with compass set to a radius representing 1 deg. 46.9 min., the position of the pole was found by the intersection of arcs drawn with centers at each plotted point in turn. Its azimuth reading was angle, left 48 deg. 51 min.; hence the bearing of the survey line from back station to instrument was N. 48 deg. 51 min. East.

World's Production of Coal

The total coal production of the world in 1910 was approximately 1,300,000,000 short tons, of which the United States contributed about 39 per cent. This country has far outstripped all others, and in 1910, according to the United States Geological Survey, it exceeded Great Britain, which ranks second, by over 200,000,000 tons. Great Britain's production in 1910 was less than 60 per cent. of that of the United States, and Germany's was less than half. The increase in both of these countries in 1910 over 1909 was comparatively small, whereas the increase in the United States was nearly equal to the entire production of France and was more than the total production of any foreign country except Great Britain, Germany, Austria-Hungary and France.

The United States has held first place among the coal-producing countries of the world since 1899, when it surpassed Great Britain. In the 11 years since 1899 the annual output of the United States has nearly doubled, from 253,741,192 short tons to 501,596,378 tons, whereas that of Great Britain has increased only 20 per cent.

The following table shows the coal production of the principal countries of the world in 1910, except those for which only the 1909 figures are available.

THE WORLD'S PRODUCTION OF COAL, IN SHORT TONS

United States (1910)	501,596,378
Great Britain (1910)	296,007,699
Germany (1910)	245,043,120
Austria-Hungary (1909)	54,573,788
France (1910)	42,516,232
Belgium (1910)	26,374,986
Russia and Finland (1910)	24,967,095
Japan (1909)	16,505,418
Canada (1910)	12,796,512
China (1909)	13,227,600
India (1909)	13,294,528
New South Wales (1909)	7,862,264
Spain (1909)	4,546,713
Transvaal (1910)	4,446,477
Natal (1910)	2,572,012
New Zealand (1909)	2,140,597
Mexico (1909)	1,432,990
Holland (1909)	1,235,515
Queensland and Victoria	1,119,708
Italy (1909)	611,857
Sweden (1909)	272,056
Cape Colony (1909)	103,519
Tasmania (1909)	93,845
Other countries	5,236,903
Total	1,278,577,812
Percentage of the United States	39.2

Fans at Bruceton

The following is an official statement of the sizes of the fans installed and to be installed at Bruceton mines. The one which was in use at the time of the explosion was a Sirocco, 3 ft. 6 in. in diameter by 21 in. wide and had a nominal capacity of 12,000 cu.ft. against a 1-in. water gage.

The larger Jeffrey fan to be installed is 8 ft. in diameter, and 2 ft. 6 in. wide and has a capacity of 80,000 cu.ft. of air against a 2-in. water gage or 20,000 cu.ft. against a 6-in. water gage.

Coal Gas Explosion, Vivian, W. Va.

Editorial Correspondence

> *This explosion might have been recorded among the most destructive mine disasters had not the mine been kept damp by humidification of intake.*

The Bottom Creek Coal and Coke Company's Mine No. 1, at Vivian, W. Va., was the scene of an explosion at 11 a.m., Saturday, Nov. 18, in which eighteen men were killed and three injured. There is no question as to the real cause of the explosion; a body of gas collected in the face of Room 7 in 11th Left and was ignited by an open lamp carried by one of the members of an engineer corps. These men were engaged in surveying the new work in the mine on behalf of the Crozer Land Association, the lessor of the property.

The Bottom Creek Mine No. 1

The Bottom Creek mine is situated on the right bank of the Elkhorn creek at a point where Bottom creek enters the larger stream. The Elkhorn has made a narrow valley, not over 600 ft. wide for the most part, with hills about 600 ft. high on either side. The Indian ridge, which is the northern watershed of the Tug river and of its branch, the Elkhorn, lies nowhere more than four miles distant. The Tug branch lies about as far to the south, so that there is but little water received by the Elkhorn on either bank, and consequently, as a stream, it is of little importance. However, as the Pocahontas bed known as No. 3 crops out conveniently nearly all along the stream from its headwaters in the Blue Stone ridge, the economic importance of the valley is immense and plants follow one another along the narrow waterway in a manner almost continuous. The coal dips toward Welch, the capital of McDowell county, and at that town it is below water level. At Vivian, however, the coal is still 40 ft. above the water level of the Elkhorn. Being about to be submerged below water level, the coal at Vivian has more gas than at points further up the valley. The plant is situated, like all others in McDowell county, on the Norfolk & Western Railway at Vivian, which lies about six miles east of Welch and 28 miles west of Bluefield.

Gas in Virgin Coal

The main entry is nearly on the strike and consequently the point at which the explosion took place is above the water level of the Elkhorn. But, as stated, probably owing to the submerged condition of the coal to the west, the measure emits firedamp, and firebosses have been employed for over fifteen years. The mine is worked without the use of safety lamps, as are all the mines in this district.

It has been customary also to employ entry bosses at each section of the mine, some bosses having one and some two entries in charge. The duties of the entry boss are to superintend the work and unless some company men happen to be absent, the entry boss is not required or expected to perform any other duties. The entry boss has a safety lamp and he is supposed to aid in watching for the presence of firedamp.

The Workings of the 11th Left

It must be remembered that here, as in many of the newer fields, the principles of conservation are being diligently followed by all the coal operators, though by some more than others. Many mines are in a transition stage from an advancing room-and-pillar system by panels to a retreating system of like kind. The Bottom Creek Coal Company is changing its method, but the headings are not advanced as much as is needed for that purpose. The mine inspectors are urging upon the operators a course of action in heading driving which is not required by the law, but which makes for safety in gaseous mines. This safety provision, which will be described later, is being observed at Bottom Creek. It has delayed heading driving and the the change from advance working to retreating is proportionately slow. Consequently the new working scheme, though adopted in principle, is temporarily not being put fully into practice.

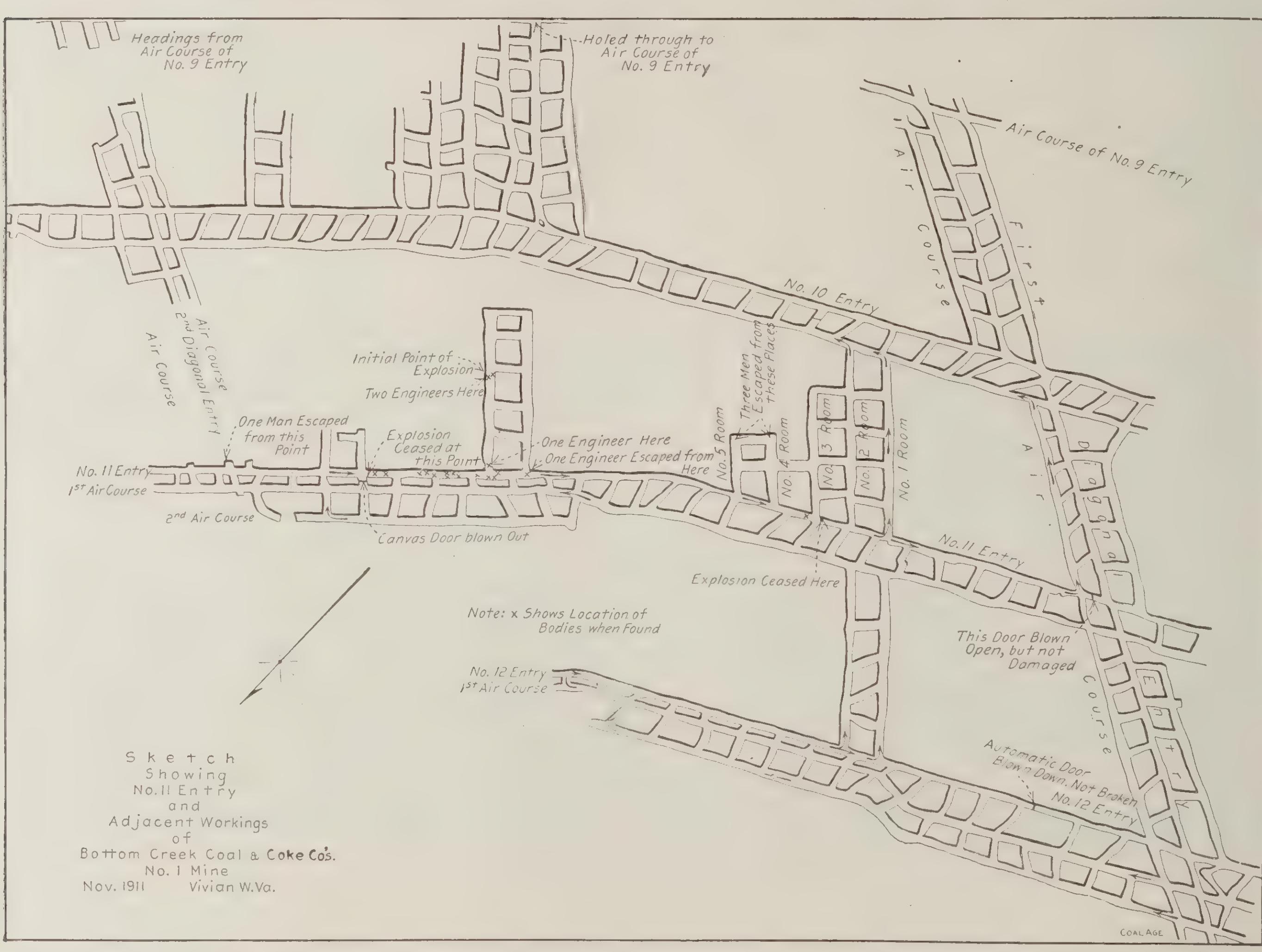
An occasional pair of rooms is driven up so as to provide the coal needed to maintain the output. This will account for the irregular appearance of the workings in 11th Left, the rooms numbered from 1 to 9 being driven in irregular sequence, and leaving places for others yet to be started in between them. On Nov. 18, rooms 4 and 5, 8 and 9 were still working and acting in pairs as airways to each other, but the other five rooms were idle, having been extended as far as was necessary. The track was drawn out of them, but they were standing in good condition, the intention being to draw the pillars when rooms inbye from them were finished and their pillars were being drawn back.

Tipple of Bottom Creek Mine No. 1, Vivian, W. Va.

The Chain Pillars

Perhaps a digression may be made here to explain the reason for the inequality of the two chain pillars at the end of the heading. The inspectors do not favor the driving of headings, where there is any firedamp present, over 80 ft. beyond the last crosscut. At this distance the West Virginia mining law requires a crosscut to be driven between the headings and the inspectors recommend that no further progress be made in advancing the pioneer work until the crosscut is completed. When the pillar between the haulway and airway was maintained at a thickness of 40 ft., the driving of this crosscut took so long that the advance of the headings was seriously impeded. For this reason the pillar is cut down to 20 ft. It will be seen how much narrower the right-hand chain pillars are in the recent work than they formerly were. The second airway, as it is termed on the plan, is driven up to reduce the velocity of the air and the consequent friction. This airway is allowed to lag a little behind the other two and the crosscut between it and the first airway is driven ahead of the lagging aircourse. Sections of heading, as can be seen in the case of the 11th entry, are often driven from the ends of the crosscuts back to meet the face of the advancing airway.

The coal measures 5 ft. 9 in., the immediate roof consisting of from 9 in. to 2 ft. of loose gray slates or shales, which are here extremely friable and which change their condition and fall when exposed to the air. Above this is a black slate, 1 ft. to 2 ft. thick. This slate breaks off in many cases close to the point of support. Above this the roof consists of hard, thick, gray slates on which reliance can be placed.



Plan of Three Entries in Bottom Creek Mine, Where Explosion Occurred

Engineers of Crozer Land Association

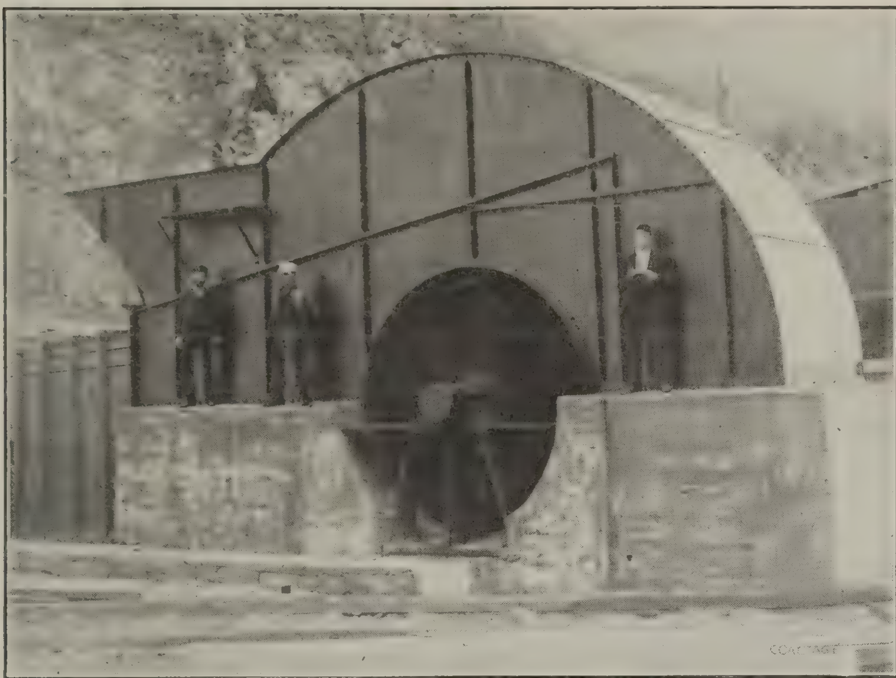
The Bottom Creek concern leases its coal from the Crozer Land Association. The mining companies in McDowell county for the most part lease either from the Pocahontas Coal and Coke Company, or from the association just mentioned. Close check is kept to see how much is extracted and what proportion it bears to the whole content of the field mined. On Saturday, the surveying corps of the association, with W. H. Henderson in charge, entered the mine to make surveys preparatory to posting up the maps. They passed the fireboss on the road in but did not speak to him, nor he to them. It is said that they did not see the entry boss in charge of the heading. It has been the custom for the engineer of the Bottom Creek Coal Company to notify the entry boss before entering any abandoned place, and to keep out of that place till it had been examined by him. This was not done in this case, the corps evidently feeling assured that there would be no risk in entering any of the abandoned rooms. Two men went into room 7 to measure it up, and had probably reached a point opposite the third crosscut, 240 ft. from the haulway when the firedamp was ignited. This point is 160 ft. from the face of the twin rooms. The men were found lying at that point, when the search was made. Two others of the party were at or about the entry to this room. A helper was at the entry to room 6. He saw the flare coming down that room and fell down on his face or was knocked down. His story varies. The time must have been very short and it is probable that this act was not so much voluntary as the outcome of force. His hands were spread out before him and the passing blaze burned them severely. While unable to walk, he crawled some

hundred feet to a place lower down, where he was found by a rescue party and removed to the hospital. He is doing well and is expected to show few signs of his terrible experience. That he was not asphyxiated may have been due to a short circuiting of the air current as a result of the explosion. The four other members of the party were instantaneously killed by the violence of the expanding gases.

Thirteen Unnecessary Fatalities

The explosive violence proceeded in both directions from the mouths of rooms 6 and 7, and in traveling toward the first diagonal heading shown in the right-hand side of the plan, it killed one driver and two mules. It passed two drivers, each driving two mules in a team. One mule was killed and one saved in each team. The plan accompanying this article is that furnished the mine inspectors for filing with their report. A note shows where the explosion ceased, but from information from the company it is clear that the concussion traveled somewhat further, but its main evidences were confined between the limits indicated.

In view of the fact that almost everyone would have done what the men did who were back of the explosion in the 11th Left, it seems an unfair judgment to pass to say that through fear or mistaken reasoning they ran to a common and fearful death. But it is unfortunately true, and it is to be hoped that the statement may have some value as a warning. The shock must have been mild where they were working, as their pails were found full of water. The men rushed down the heading, which was a return airway, and all but one perished from after-damp or rock-falls between rooms 7 and 8, which are about 300 ft. apart. Piles of fallen rock were found over and under their recumbent bodies. Some may have been killed by rock-falls, but possibly all died from suffocation or monoxide poisoning and were covered by rock afterward. It is impossible to assert with confidence the actual cause of death, except that they were not killed by the force of the explosion, nor were they burned by the flame. Among them were two company men, four slatemen and seven miners. One man working in the diagonal airway placed his cap over his mouth and got out, passing all the others. It is to be regretted that the men with one accord ran down the haulway by which the air returned instead of taking the intake airways, one at least of which contained only pure air.



16-ft. Fan, Which Delivers Air to Bottom Creek No. 1

A Firedamp Explosion

The Pocahontas coal dust has a bad quality of aiding explosions, making it possible for comparatively small accumulations of gas once ignited to cause severe dust explosions. That a severe catastrophe, involving all the 150 persons in the Bottom Creek mine, did not result from the puff of flame which directly killed only five men, was because the mine was kept thoroughly wet by humidifying the air with exhaust steam from the fan engines. This fan, shown in the illustration, is 16 ft. in diameter. At the time of the explosion it was making 120 r.p.m., and the full exhaust passed by an 8-in. line into the workings. To show the effect of this discharge of steam on the exposed surfaces in the mine, it may be stated that canvases erected by the rescue parties are wetted through already by the damp air passing through the mine. Only a few mines in this region humidify the air with steam and the fact that this explosion did not extend beyond narrow limits will tend to make the practice more common. Beside humidification by steam, the coal dust is watered by tanks at this mine and in others, but the main reliance at Bottom Creek is placed in the use of the exhaust from the fan engines. The system has not been very long in force, but it is most favorably viewed by the management. Mr. Samuel W. Patterson, the general manager of the mines and vice-president of the company, says it has not affected the

Village of Vivian, W. Va.

roof and ascribes the localization of the explosion to the use of steam on the intake.

The Mechanical Effects

The explosion blew down some of the stoppings near the center of detonation. They were built of stone, but were not as strong as such stoppings often are, the cementing of one face rather than the thickness of the wall being depended upon to preclude the passage of air between the headings. Strong stoppings increase the violence of explosions by giving them no chance to spread sideways and are not generally favored. However, where dry dust can be found everywhere the extension of an explosion in all directions merely increases its severity. In this case the breaking down of the stoppings probably reduced the violence of the explosion and gave it no additional fuel on which to feed. At the same time it short-circuited the air, assisting all men outbye of the explosion but leaving the foul air undiluted to the inbye.

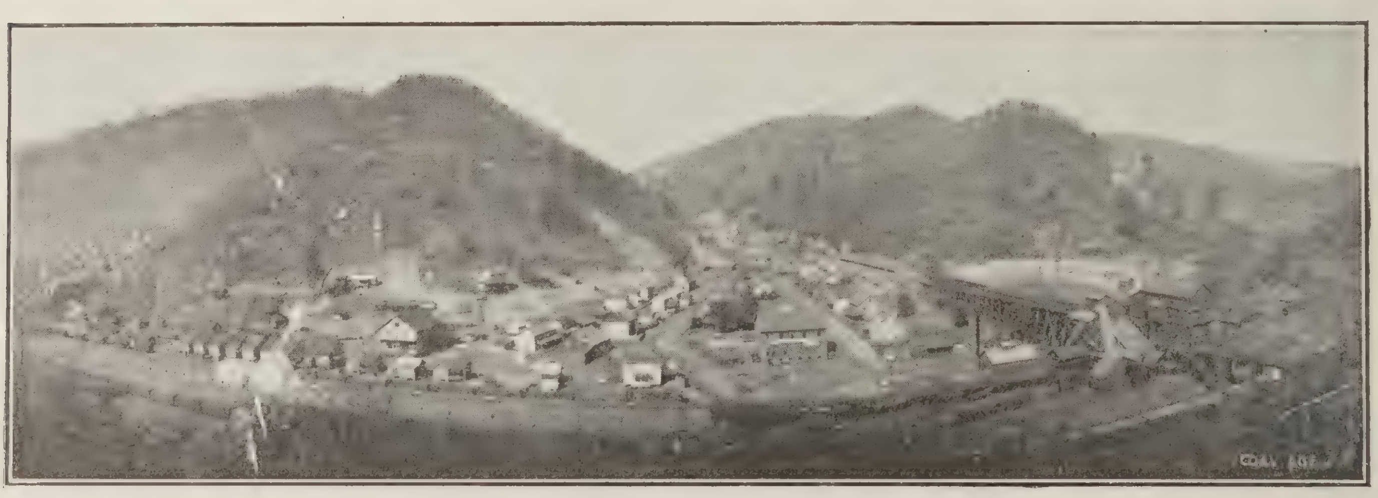
The concussion extended to the 12th left and blew an automatic door in that entry out of the perpendicular, thus short-circuiting the air current to the 11th left. Otherwise there was no damage done and the men in other headings had to be notified to leave, as they did not realize that anything had happened. They made their way out without difficulty.

The Rescue Work

The rescue was easily effected by the mine officials. The foreman pushed back the door in the 12th left, which was in no way injured, thus reëstablishing the air in the 11th left. The rescue party proceeded by the return as far as possible and then completed the work from the intake end. The men in other parts of the mine were meanwhile hunted up and told to leave the mine. Of the men killed four were white Americans, five were colored, three were Hungarians and three Russians. The three others were Slavonian, Lithuanian and Italian, respectively.

The testimony given before the coroner's jury showed that the rooms in which the explosion took place had been examined within a week and found to be free of gas. It was also stated that a danger board had been placed at the mouths of those rooms, but, of course, the explosion rendered a statement of that kind not subject to verification. When the mine foreman, two days before, measured the air in the last crosscut of the split, he found 15,000 cu.ft. per minute circulating through it. This split, it may be added, carried the air which ventilated the 10th, 11th and 12th entries.

The coroner's jury found that the men came to their death by an explosion of gas in an abandoned room, No. 7, in No. 11 entry of the Bottom Creek Coal and Coke Company's mine at Vivian, McDowell county, W. Va., on Nov. 18, 1911, at about 11 o'clock a.m., and further, that said gas was ignited by an open lamp carried by some member of an engineering corps then working in room No. 7 of entry No. 11 of said mine.



Bottom Creek Coal and Coke Company's Tipple, Coke Ovens and Houses

Estimating Gas Percentages

A novel method of determining the approximate gas percentages with the ordinary safety lamp, and without the use of any special appliances, has recently been described by an English engineer. It frequently happens when in the mine and away from special appliances, that it is desirable to know roughly the approximate percentage of gas in a certain place, and the following method is recommended for use in such contingencies.

Having made preliminary examination to insure that gas is not present in dangerous quantities, the flame of the safety lamp is lowered until only a mere speck of white light remains at the tip. The eye, being accustomed to the brighter light, will require a few seconds before the cap can again be distinguished. When, however, the outline of the cap is again fully discernible, the flame is slowly and carefully raised. It will be noticed that the size of the cap will increase with the size of the flame, but in the brighter light of the latter, the former will eventually disappear. The point at which the cap becomes invisible determines the percentage of gas, as of course the larger the percentage, the less quickly will the cap disappear.

The fireboss to be able to handle this adequately must, of course, have the opportunity of experimenting in known percentages of gas. In these experiments he will find that with 3 per cent. gas, the cap disappears when the flame has reached a certain hight, while for 4 per cent. the flame is somewhat higher, and so on.

This method should not be construed as an accurate determination, nor is it one that may be used in the presence of large quantities or dangerous proportions of firedamp with safety. It is believed, however, that there are many occasions at the working face when it will be found applicable.

Mining Laws in the State of Washington

Special Correspondence

The Senate bill No. 112, Chapter No. 123, Laws of the 1911 session of the State of Washington provided for the appointment of a commission to revise the State coal-mining inspection laws. The revised and recodified laws of this State, as provided by this commission, will be printed in the form of a Legislative Bill to be presented to the members of the Legislature of 1913 on or before Dec. 1, 1912. Two thousand dollars have been appropriated by the Legislature for the purpose of paying the necessary expenses of the commission. Up to the present there has been no examination provided for superintendents, foremen, shotfirers, or firebosses in this State.

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Of this issue of Coal Age, *we will print 7000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.*

This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

Humidification

There has been a great deal written about the deleterious effects of humidification. It has been asserted that dampness is harmful to the health, endurance and comfort of the men who are subject to its depressing influence. It has even been hinted that specific germs may have been fostered by it. Moreover, it has been said that constant deterioration takes place in the roof, as a result of its adoption, making dangers from falls of rock greater and costs of mine maintenance excessive.

It were well not to argue the point which may in many cases have a reasonable basis. Rather, it would be better for each operator or superintendent to determine for himself the value of the arguments against humidification. To assume results of any line of action when an experiment would definitely determine the problem, is not so practical as it is popular. In cases where a blowing fan is being used and the exhaust can be readily turned into the intake, the experiment will involve no appreciable cost and is well worthy of a fair trial.

The experience at Vivian, W. Va., forcibly exhibits why the experiment should be made. A forceful gas explosion occurred in a mine having well dampened but highly explosive dust spread through its workings. Yet the explosion died out speedily and, as an explosion, pure and simple, it is probable that it did not pass much beyond the two rooms in which it initiated. Expulsions of burned gas undoubtedly traveled further. The concussion, of course, exhibited itself over a still larger area. But even this was evidenced over a space not exceeding 75 acres. The shock did not create a dust-laden atmosphere of the kind or degree on which the flame might feed and the explosion extend. Here then the principle of humidification was conclusively vindicated.

While some dusts, notably those from the coals of the Allegheny series, are fairly inert, it is not safe to assume that any dry dust is harmless under all circumstances. The Adrian explosion appears to have originated from, and to have been propagated by, dust. Yet Adrian slope was a Lower Freeport operation, and the dusts of the Freeport coals are considered relatively inactive. It is a new rôle they fill, when they initiate such a disaster as that at Adrian. Consequently, it is not out of reason to urge that even the more inert dusts of bituminous coal cannot be declared off-hand to be safe.

In cases, therefore, where moistening the air of the mine costs nothing, hurts nobody and destroys nothing, is it necessary that the practice be proved essential for safety in operation in any particular case where its adoption is urged? It seems that the burden of proof should fall on other shoulders. Each operator should prove conclusively that humidification is either not needed, or is harmful or excessively costly in operation. The anthracite operators alone may be able to claim immunity on the first count. Where it is costly and abundantly proved unnecessary, then it might be prudent not to urge it; but where it is cheap and harmless, the argument that it is not proved necessary should not have any weight whatever.

It is for these reasons that the extension of the practice is to be looked for in regions where it has been hitherto known only to the student of mining.

Storing Coal

The storage of large quantities of coal has become an important phase of the anthracite industry. The necessity for such storage was first recognized a number of years ago in connection with supplying the Western markets while navigation was closed on the Great Lakes. As its efficacy to meet the requirements arising from other conditions has been realized and proved, the storage system has been gradually extended throughout the mining region and along the lines of the principal hard-coal railroads, until now all the larger anthracite coal and railroad companies own and operate plants ranging from several hundred thousand to upward of a million tons capacity.

Ordinarily, these plants serve as a sort of industrial flywheel to absorb shocks coming from sharp alterations in the conditions of supply and demand, but their chief reason for being, is found in the labor troubles which periodically threaten the industry and occasionally mature.

From all recent indications, the anthracite operators have been acting on the principle that one way to avert trouble is to be prepared for it, and during the past season have been filling their storage depots to the limit of their capacity. This measure is not threatening or particularly significant; it is the usual and expected action at a time like this when the agreement with the mine workers is about to expire, but in the event of a strike, this accumulated supply of coal is, up to a certain point, the most potent factor in the situation. By it the strength of the operators' position can be pretty accurately gaged.

The system of storing coal against the emergency of a possible strike operates fairly for everyone concerned, and tends to minimize the evil effects of a prolonged disturbance in the industry. The operators, by producing in nine months what they would ordinarily produce in a year, find the effect of three months' idleness to be practically offset, and the increased efficiency of production under full-time conditions, together with advances in price as the available supply diminishes, probably compensate for the additional cost of storage. This stored coal would also have an enormous speculative value during a protracted strike, but it is the policy of the larger companies not to advance their prices and to use the supply chiefly for protecting their markets against inroads from competitive fields.

The miner, no less than the operator, profits by the increased activity of the months preceding the strike and draws his usual annual earnings in the shorter time. If he is prudent and wise, he will accumulate a surplus to tide him over the period of idleness. However this may work out in the case of individuals, the community in general is the better prepared for an industrial depression.

Of course, the necessary result of so much preparation is to compel a period of suspension, strike or no strike, at the expiration of the agreement, in order that the surplus coal may be used and the industry given time to settle back into its normal state.

Present Day Coal Situation

Some timely and pertinent remarks were made on the present state of the coal trade in this country, by the members attending the last Mining Congress, at Chicago, October 23 to 28, 1911.

When these remarks and suggestions are carefully considered, boiled down and allowed to cool they seem to point the growing urgency of the situation. None of the speakers who took part in the discussion could be said to be so organized that his conclusions and suggestions for remedy would meet with general acceptance. It is a large question entailing, in its final solution, much, as yet, of unwritten law.

One of the most forceful utterances made was that of Walter S. Bogle, Illinois, who said, in the course of his remarks, "The problem or work before us appears to be a campaign of education. . . . It may seem a great undertaking; but the time for it is ripe. The entire business of the country is largely paralyzed by the uncertainty of how that law (Sherman anti-trust law) is going to be applied. The Supreme Court of the United States has said that a *reasonable* combination is right; but the meaning of the word "reasonable" would vary with each individual, and the construction put upon it would be governed by personal interest. . . . . Wherever they (the American people) have become educated to understand any great question of the day their decisions have invariably been right."

Referring again to the operation of the Sherman law, the same speaker said, "The object of the law was good. . . . Every self-respecting business man and citizen of this country will stand for a law that will accomplish that (restrain unjust combination in trade)." Mr. Bogle went on to show that, in many industries, the operations of the law had compelled individuals to "a choice between bankruptcy and the violation of the law" and they have not hesitated to choose the latter and risk the consequences.

Self-preservation is, without qualification, the first consideration—the God-given, inalianable right of the individual. No law is complete or successfully operative that compels its own violation or the degradation of the citizen whose purpose it is to safeguard and protect. In the administration and interpretation of all law, both the government and the judicial courts regard this principle. It is agreed that few laws are so perfect as to require no modification, in administration.

It was stated, in support of this argument, that, notwithstanding it has been declared a violation of law by the Supreme Court of the United States, the Interstate Commerce Commission, with the clearly evident approval of the people of the States, has permitted railroads doing business in several States, to combine to establish and maintain regular and agreed passenger and freight rates.

The same consideration, it was suggested, may be necessary in an equitable solution of the coal-trade problem. The problem is far from being a simple one. (1) The questions relating to the production of coal concern both the physical and industrial conditions affecting the mining, preparation and loading of the coal. The geological character and formation of coal seams, the rules and customs of labor organizations, in many instances, increase the cost of production. (2) The transportation of the coal from the mine to the market is likewise beset with difficulties relating to obtaining cars, freight rates, switching charges and other items that favor one mine above another. (3) Competing markets often lower the price of coal till only those mines that enjoy the most favorable conditions are able to continue to run. Likewise the railroads and some other large consumers of coal demand and obtain prices, on contract, that are ruinous, and would, in many instances, result in running the mine at a loss were it not for the general trade, which must pay a price sufficiently high to cover the deficit that would otherwise occur.

H. N. Taylor, in remarking upon this condition, stated, "If the railroads would pay just a trifle more it would not then be necessary to force the sale price of a comparatively small portion of coal to an extraordinary figure.

Mr. Taylor drew attention to the important effect produced by the filling of large orders for a certain size of coal. For example, to furnish 1000 tons of, say 3-in. egg or nut coal, it is necessary, under conditions existing in many States, to produce perhaps twice this quantity of coal of sizes for which there is little demand and which must be "dumped on the market" at a price below cost of production for such coal.

COLLIERY NOTES and COMMENTS

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

Anthracite, the principal household coal in America, is little used in Great Britain except for malting purposes, barley drying, hop drying, heating greenhouses, lime burning, suction and power gas production and on a small scale in steel work.

The habit of using both black powder and dynamite in the same hole is dangerous in the extreme and should be absolutely prohibited. If the dynamite is placed last in the hole, it is apt to blow out the stemming. If placed first, it may blow the slower explosive into the dust raised by the shot.

When working friable coal, the first thought of the miner should be to adopt such a method of mining as will produce the least percentage of small coal. In this respect longwall mining excels all other systems, as the coal is worked in one continuous face, thus necessitating far less cutting, which always increases the small sizes in friable coal.

A continental method for preventing breakage when discharging coal into bins, consists in keeping the bins full of water. The coal is dumped into this water and sinks gradually with little breakage; the water meanwhile overflowing through outlets provided for that purpose. When the bin is full, the water is allowed to drain away and the dried coal is then ready for use.

The practice of tamping a shot with coal dust greatly increases the danger of explosions. Even if wet, the dust is still inflammable; experiments have shown that wet coal-dust stemming gives a flame only slightly shorter than that of dry. Two and five-tenths pounds of black powder and 2.6 lb of dry coal-dust stemming gave a flame 64 ft. long. When the stemming was wet the flame was 50 ft. long.

Tests made at the Pittsburg laboratory, U. S. Bureau of Mines, show that briquets made without binder, from the inferior lignites of Texas, North Dakota and California, give a hot fire with little shaking or poking and burn readily until consumed, with a loss through the grate of only 6 to 8 per cent. of unburned fuel. When burning they give off a small amount of light yellow smoke.

Electric feed wires should be disconnected from the machines when they are being loaded or unloaded, unless the power is necessary for such operations, and all haulage should be suspended where a feed wire is extended for the purpose of fitting a machine. Feed wires should at all times be kept clear of the rails and traffic except when connected, and if they are to be carried across trackage, they should be carried under rather than over the tracks.

Most careful attention should be given to the installation of a pumping plant in a newly opened mine. It should not be designed wholly for the immediate needs, but should be so planned that it will be able to handle the increase of water sure to follow further development of the property. Concentration is the keynote of successful pumping. A central pumping plant, with large capacity pumps, should be the aim of all who desire a well planned drainage system.

Some salient points of economical mine management are as follows: All workings should be concentrated as much as possible. Cutting machines should be kept constantly at work, developing new territory. All main partings should be as near the working faces as possible. Long animal haulages should be avoided and the underground roads receive as much attention as surface roads. Care should be taken that little timber is abandoned in old workings and headings.

In order to attain the highest efficiency in steam production, the coal burned should be spread on in thin layers and small quantities, always taking care to keep the fire level by filling up all hollows. Some prefer depositing the fresh fuel on the dead plate in front of the fire bars and gradually pushing the fire back over the bars as fresh fuel is added. Large quantities of coal should never be shoveled onto a fire at long and irregular intervals. From 6 to 9 in. is a good thickness of fire.

The Arthur D. Little laboratory, of Boston, has designed a coal auger for testing the internal heat of coal storage piles. It is capable of being put down 20 ft. in 5 min. Four-foot adjustable extensions allow it to reach any depth desired. A small maximum thermometer inserted near the point gives the temperature, in about 10 minutes' time, much more accurately than it can be obtained by the old method of a thermometer hung in a pipe, cooled more or less by the circulation of air.

Steel cars have these advantages: they are stronger and hold more coal for the same outside dimensions, while for large loads they are lighter than those of wood and not so easily damaged. When knocked out of shape, however, they are more difficult to get along narrow roads and into cages. As they are constructed of few pieces and without many joints, they do not litter the roads with coal as do wooden cars. They are less suitable for wet mines, because of the effect of acid mine water on metal.

Belgium has 42 factories for the manufacture of square briquets and egg-shaped boulets, which give employment to 610 men. France has 35 briquet-manufacturing plants. England has about 20 plants devoted to briquetting. Spain, China and Japan are also producers of briquets. Compared with other countries the United States is a small producer. At one time 19 plants were in operation, but most of them closed because of inexperience in the methods of manufacture, lack of proper machinery and insufficient knowledge of the use of binders.

At many European plants the coal dust which accumulates in the screening houses is collected for use in the manufacture of facing for iron molders and also of arc-lamp carbons. The dust is collected by means of an exhaust fan, which draws the dusty air through pipes, from underneath hoods built over the shakers or screening tables, into large receptacles where the dust settles and is there loaded into sacks. At a Midland, England, colliery, 2500 lb. of dust per day are removed and sold at a good price. Bituminous- or steam-coal dust is mixed with washed coal for coke making.

In a recent paper before the Institution of Mining Engineers, Mine Inspectors Pickering and Poole remarked that a dread of overwinding accidents is ingrained in miners and managers alike. The reasons are that, when a miner is being raised or lowered, he realizes that he has no control over his own fate. He is dependent upon the skill and attention of others and on the efficiency of the winding appliances. Besides, the fear of falling from a hight is a primary instinct of every heavy animal which walks the face of the earth. The manager knows that, in addition to his responsibility for the safety of persons under his charge, he may be held responsible for serious damage which may stop the pit for some time in the event of a shaft accident.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Mine Checking System

A Good Suggestion

The fact that miners occasionally lose their way in the mine and wander into abandoned workings and become lost therein, emphasizes the importance of having some efficient and generally recognized system of checking both the number and the name of every person who enters the mine. A check office may be situated near the mouth of the mine or at the shaft or slope bottom, and each person passing into the mine should receive a check bearing the number by which he is registered on the books of the company and by which he may be identified in case of loss or accident. At the close of the day when leaving work, or if the person leaves the mine temporarily to return shortly, he should be required to deposit his check in the check room or office, so that it may be known how many men are in the mine at any time, and who they are.

The General Plan of Registry

The arrangement can be made very simple and effective. The labor and expense entailed are not material, compared with the advantage to be derived from the adoption of such a system. First, there is required a mine register that would show the number and name of every man in the employ of the company who would, at any time, have business that would call him into the mine. Such register should also show the name and address of some relative, friend, guardian or other party who should be notified in case of serious accident. All other persons who may, from time to time, enter the mine as visitors, should be provided with a special pass filled out on a blank form printed for the purpose. This pass should be numbered at the check office and the visitor given, in exchange, a brass visitor's check bearing the same number as the pass, which is left at the office while the party is in the mine. The pass, like the mine register, should give the name and address of the visitor and of the party to be notified in case of accident. The pass should, further, over the signature of the visitor, absolve the company from any liability for accident or injury that may be incurred while in or about the mine. This is more necessary with present mine equipment than ever before, because all mine employees are specially warned in regard to the dangers surrounding their work, but visitors to a mine, while receiving the courtesy and attention of a guide, are not familiar with the dangers to which they expose themselves and should naturally assume all risks incident to their visit. The company, in this case, is *host* and not *servant,* in the eyes of the law.

A Card-index Mine Register

Owing to the fact that the list of mine employees is constantly changing, men going away and newcomers taking their places; and, furthermore, because it is desirable that the list of numbers should be continuous and show no voids, but should total the exact number of employees to date, as shown by the highest check number, it is necessary to adopt some system of registering that will admit of change readily.

This could not be effected by any bookroll, but is very simply accomplished by keeping a card index. Each card bears the name, address, age and nationality of the employee, and the name and address of the party he desires should be notified in case of serious accident. Each card, at its time of issue, is numbered, in succession, following the last number of the index, and the party is handed a brass check bearing a stamped number corresponding to the number that is written on his card.

The check is necessary for entering the mine—the same rule applying to every individual employee, from the president down to the door boy. It should be as unchangeable as the old law of the Medes and Persians, which could not be altered. Before entering the mine the check must be deposited in a box and, later, hung on its proper peg, according to its number, where it can be quickly found when the party again comes to the surface.

When a party quits the company he must relinquish his check when drawing his last pay. In order to leave no voids, this check is at once given, in exchange, to the last man on the list; and this man's card is moved up in the index file, and, at the same time, marked with the new number and date of transfer. Not more than one transfer would often occur on a single name, in a long time.

In the absence of a reliable "checking" system, who can say definitely what men are in the mine or out of it? The hysterical, weeping, wailing and screaming of women, who fear that they have been made widows, or have lost fathers, brothers or sweethearts, add to the confusion, which would be greatly reduced by having the exact information that would be afforded by a reliable check board. Aside from this, it is surely "good business" to know, even under "contract working," who are in the mine each day.

Mine Superintendent.

Bolton, England.

German Selling Syndicate

As bearing on the operation of the German selling syndicate, the following criticism from the standpoint of the British Consulate is enlightening.

In a report covering 1910 and the first four months of 1911, Consul-General Sir Francis Opheimer directs attention to the remarkable increase of coal imported into Germany within recent years, and attributes it to the peculiar methods prevailing in the German coal market. He indicates that the progressive concentration of the German coal production in a few concerns, the difficulties placed in the way of unfettered trade, the almost unavoidable necessity of using the syndicate's selling bureau, which practically ignores personal preferences for certain brands, and a price policy which prevents judicious purchases at favorable opportunities, have led the more important consumers to take means to free themselves from the dictatorship of the syndicate by the purchase of British coal, which enjoys the advantages of cheap transit by water.

Sir Francis says the price policy of the syndicate is the greatest help in the sale of British coal, and as long as it lasts the hold of British coal on the German market is not likely to be weakened by any lowering in freight charges by the railways in Germany. He adds that the question of an import duty on coal may safely be left to the German consumers, who are fully alive to the fact that, if they were deprived of the opportunity to obtain British coal, they would be at the mercy of the syndicate.

London, England. R. L. B.

Letter from a Working Fireboss

In regard to the examination of the mine by the fireboss, the Pennsylvania bituminous-mine law requires that the fireboss, three hours prior to the appointed time for each shift, shall examine, for all dangers, all portions of the mine in his charge; and at each examination shall mark the date, at the face and on the side of each place examined. He must, therefore, examine all haulageways and the entrances to all worked-out or abandoned places.

The law requires each miner to examine his place himself, before going to work, to see if the date has been left by the fireboss. If he does not find it he will know that the fireboss has not examined his place. He must then, at once, notify the mine foreman or his assistant before proceeding to do any work in the place.

Now suppose the fireboss should not examine a working place, through neglect or other cause, and the miner should enter the place and go to the head of the room in order to see if the date, which the fireboss should leave there, is marked on the face of the coal. It might be the last of the miner. To avoid this I think there should be a small blackboard placed at the entrance to each working place, and the fireboss should put the date on this board as well as on the face and side of the coal. The miner could then see if the fireboss had done his duty, by examining the board at the entrance to his place, before proceeding to the working face. If the proper date has not been put on the board by the fireboss, the miner should place his check number on the board and see that his working partner does the same; these check numbers to remain on the board till the fireboss makes his round the next morning or till he next examines the place. After the examination of the place the fireboss should erase all on the board and place there the date of the examination.

This system, if adopted, would allow the mine foreman or any other person to see and to know what men were at work. In case of an explosion the boards would show what men had entered the mine and were at work that day, in each working place.

A Pennsylvania Fireboss.

British Solution of Minimum Wage Problem

It will be recalled that one of the demands formulated at the recent convention of the United Mine Workers of America at Pottsville, Penn., was a minimum daily wage for miners. This point has been vigorously contended for at other times and in other fields—notably by the miners of Great Britain.

The following letter from a correspondent in Wigan, England, contains timely reference to this subject which will doubtless, before long, be agitated generally:

At Seaton Delaval, Northumberland, a scheme has been instituted under which the earnings of pick miners are pooled and equally divided. This experiment has a bearing on the agitation for a minimum wage. In this district some of the places are of unusual hardness, and other difficulties prevail with the result that some miners cannot earn a dollar a day, while others more favorably circumstanced are earning from three to four dollars.

Under the pooling arrangement referred to, it is claimed that one of the greatest hindrances to harmonious working will be removed, in so far as each man will receive the average wage of the mine. The further argument is advanced that under prevailing conditions this scheme which is now being tried will at once give the "minimum" the miners in Northumberland have applied for, namely 30 per cent. advance on the 1879 basis, always providing that the general body of the men work as hard under the scheme as they have done under the old system.

Of course, pooling has its disadvantages, the chief one being that while part of the men receive a substantial advance, the rest voluntarily suffer a proportionate reduction. Nevertheless, if the colliery companies cannot be prevailed upon to make some award or bonus to balance the "abnormal places" drawback, it really would appear that in the widespread adoption of pooling, the colliery communities of Great Britain will find the readiest and simplest solution of a vexing problem.

Wigan, Eng. B. A. W.

Essentials for Successful Management

It would be a mistake to assume that the office of mine manager is a sinecure. It is a life of perils escaped and victories won, with more or less contention with disasters and labor upheavals in the form of strikes. A mind almost encyclopedic in character is essential to secure the necessary acquaintance with all the sciences that may be applied by the mine manager; the foibles and idiosyncrasies of man himself have to be observed with the utmost tact; trivial causes that may be productive of much friction with the miners' union have to be avoided with the skill of a general; troubles and peculiarities of the strata have to be studied and overcome; while the contending forces of labor and capital have to be mollified—the one ever seeking higher pay for the work accomplished, and the other constant in demand for increasing dividends on capital sunk.

On the social side, of course, the manager is pretty much what he makes himself. As Henry Davies aptly puts it, he may be "the most abused man in the colliery village, because he assumes the rôle of petty tyrant, or one who by fair judgment, urbanity, and conscientious discharge of a difficult task, wins the respect of his workmen and the confidence of his neighbors. His power for good in molding the character of the men in his charge is incalculable. By means of the music hall, concert room, gymnasium, society building or lecture hall, he has channels through which he may support all progressive movements calculated to benefit the workmen, and inculcate habits of thrift and temperance." The latter is more necessary for the safety of the entire pit force than is sometimes realized.

Thus it is seen that while the position and life of the mine manager have their serious responsibilities, they also carry compensations and advantages that the humanity in man ever craves for. In coal mining the greater liberty and play this humanity is allowed, the easier the task, and the lighter the responsibility. In illustration of this and the pleasures to be derived, the story may be recounted of how William Bumpstead managed the Treeton House Colliery in Yorkshire, during the period when he raised the daily coal output from some 270 to 3000 tons. As to the condition of the mine under Mr. Bumpstead, after his last inspection H. M. Inspector of Mines said, "The Pit is in excellent condition, and one of the best in South Yorkshire."

How was all this accomplished? The reasons may be stated briefly:

(1) Mr. Bumpstead believes it is the duty of the man in authority to get to know his men, and make firm friends of them.

(2) He believes in giving a man a dollar for a dollar's worth of work, and urges all not to try to get a dollar's worth for 75 cents. He has never been asked or expected to pick workmen's pockets.

(3) He has been tolerant, and thereby invited tolerance, the best medicine when trouble is about.

(4) He has never been in too big a hurry to improve upon the management of his predecessors, having made it his duty first to find out the peculiarities of the pit.

(5) At no time has he imposed hardships on those under him for personal aggrandizement.

(6) Finding himself surrounded by a capable set of officials—civil, energetic, painstaking men—he made them feel that they were managers in their own particular districts.

(7) He encouraged coöperation with his under officials, and if at any time something went wrong a "confab" was sufficient to get matters right. From experience he finds that is the way to work. A comfortable set of men means better work, greater output and peace. Thus at Treeton they improved the outlook for the company, and in so doing the men shared in the benefits.

The foregoing may seem small things, almost too trivial to command a second thought, but they represented success in capital letters at Treeton. If your own colliery isn't the success you would like it to be, just run over the points again and ask yourself a question or two. It may pay you in the end.

Manchester, England. R. O. E.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

Furnace Ventilation

Expecting to open a shaft mine for the development of a 5-ft. seam of good coal, it is desired to ascertain: (a) What ventilating pressure may be expected in the use of a furnace in this mine? The seam is practically level and the depth of the furnace shaft will be about 150 yd., including the stack. (b) What volume of air will this pressure produce when the mine is ventilated in two equal, separate splits starting from the bottom of the shaft? The size of all airways and entries is 6x10 ft., and the total length of airways, including return, may be estimated as 12,000 ft.

Pittsburg, Penn. A. C. M.

(*a*) Knowing the depth of the furnace shaft, the ventilating pressure that is possible to be developed in the mine, under usual conditions, may be calculated by the formula

$$p = 0.11 \sqrt[5]{D^4},$$

which gives, in this case

$$p = 0.11 \sqrt[5]{450^4} = 14.6 \textit{ lb. per sq.ft.}$$

(b) The entire rubbing surface in the mine is $2\ (6 + 10) \times 12{,}000 = 384{,}000$ sq.ft. The quantity of air circulated by the pressure just found, assuming two equal splits of the air-current, which makes the sectional area $2\ (6 \times 10) = 120$ sq.ft., is

$$q = 120 \sqrt{\frac{14.6 \times 120}{0.00000002 \times 384{,}000}} = 57{,}300 \textit{ cu.ft. per min.}$$

Sulphur in Coal

We have, in our mine, a considerable quantity of sulphur that occurs in round chunks and is separate and apart from the coal. This could be handled easily if it has any commercial value. Will you kindly inform me in regard to this? Can send a sample if necessary.

SUBSCRIBER.

Prestonsburg, Ky.

This deposit is the well known "sulphur balls," or iron pyrites, that occurs frequently in coal seams and the contiguous strata. Owing to the bright-yellow color, resembling gold, it has often deceived the miner, and has been styled "fool's gold."

Pyrites has a commercial value only where there is a demand for its use in the production of sulphuric acid or other sulphur products, and the cost of mining and transportation is not prohibitive. In general, it may be stated that the supply exceeds the demand, which fact makes only the best and clearest grades of pyrites marketable. The market value of pyrites carrying from 44 to 48 per cent. sulphur is about 9c. per unit, which means 9c. for each per cent. of sulphur in the ore as shipped, per ton. The value of the deposit must always depend on cost of transportation to the market, freedom from arsenic, and what disposition can be made of the associated or byproducts. In some localities, the existence of copper smelters, working on sulphide and producing sulphuric acid as a byproduct would destroy any possible market for the iron pyrites.

To Find Length of Sub-chord

Is there not a shorter method than that of proportion for ascertaining the proper deflection to be used in laying off sub-chords on a curve?

MINE SURVEYOR.

Yes. Multiply three-tenths of the sub-chord in feet, by the rate of curvature expressed in degrees and decimals of a degree; the product will be the proper deflection expressed in minutes. For example, the proper deflection for a chord of 15 ft. 9 in., on a 16 deg. 22 min. curve, is found thus; 15 ft. 9 in. = 15.75 ft., and 16 deg. 22 min. = 16.367 deg.; then, $0.3 \times 15.75 \times 16.367 = 77.33$ min. = 1 deg. 17 min. 20 sec. is the deflection for this chord, on the given curve.

Closing Force on Mine Door

A mine door measures 6x6 ft., and is made of inch oak boards doubled, and is hung with the upper and lower hinges 40 in. apart, the lower hinge being 5 in. out of plumb so that the door leans when closed, in the direction the air-current is moving; if the ventilating current be reversed, what water-gage will open the door?

FIREBOSS.

Area of door 6x6 ft. = 36 sq.ft.; thickness 2 in. = 1/6 of a foot; volume of door = 6 cu.ft.; weight of door with oak weighing 50 lb. per cu.ft. = $6 \times 50 =$ 300 lb. Now when the door is closed, it lies wholly in a plane inclined 5 in. in 40 in. or 1 in 8, to the vertical. A line at right angles to that plane is inclined, therefore, at 1 in 8, to the horizontal. This is the direction in which every point moves, for an instant of time, on opening the door, that is, at right angles to the plane in which the door lies or inclined at 1 in 8, to a horizontal plane.

The center of gravity of the door, which is the same point as the center of pressure of the air on the door, moves in that direction. As, therefore, the center of gravity moves momentarily up a grade of 1 in 8, the power required to move it, for that instant of time, is one-eighth of the weight of the door or 1/8 of 300 lb. = 37.5 lb. The area of the door being 36 sq.ft., the pressure per square foot must be $\frac{37.5}{36}$, or 1.0416 lb. per square foot.

The water gage required to open the door, after reversing the current, is, therefore, $1.0416 \div 5.2 = 0.2$ inch.

Estimating Quantity of Air

Is there any way by which we can ascertain the quantity of air flowing through an airway without using an anemometer to find the velocity of the air-current?

FOREMAN.

Yes. (1) The velocity can be found by observing the time, by the watch, that the smoke of a flash of powder takes to travel a certain measured distance, in a uniform section of the airway; then, multiply this velocity (feet per minute) by the area of this airway (square feet), and the product will be the required quantity of air (cubic feet per minute). Or, knowing how much air will circulate in this airway, under a certain water gage, the quantity of air for any other observed water-gage reading, in the same airway, can be found.

For example, if the water gage in this airway, yesterday, read 1.6 in., and you had measured the air then and found it to be 84,000 cu.ft., and today the water gage reads 2.2 in., assuming this increase of water gage is wholly due to an increase in the circulation, the quantity of air passing may be calculated by applying the principle that, for the same airway, the ventilating pressure and therefor the water-gage reading are proportional to the square of the quantity of air produced. Or, what is the same, the quantity of air produced is proportional to the square root of the water gage. Therefore, the quantity ratio is equal to the square root of the water-gage ratio. Now, calling the desired quantity of air x,

$$\frac{x}{84{,}000} = \sqrt{\frac{2.2}{1.6}} = \sqrt{1.375} = 1.1726$$

$$x = 84{,}000 \times 1.1726 = \textit{say } 98{,}500 \textit{ cu.ft. per min.}$$

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Interesting Questions

Strength of Crossbars or Collars

Ques.—(a) Explain as simply as possible the correct method of calculating the strength of a round or square crossbar or beam when the load on the beam is equally distributed along its length. (b) How does a center load compare with a load that is equally distributed, in its effect to break a beam or crossbar?

Ans.—Any beam or crossbar is considered as made up of a bundle of parallel fibers, each having a certain strength to resist a force of extension or compression—a pull or a push. In the case of a horizontal beam (Fig. 1) carrying a load, the weight of the load acts at right angles to or across the fibers. As the beam bends slightly the fibers in the lower portion are extended and those in the upper portion compressed. The strength of the fibers to resist this extension and compression determines the strength of the beam.

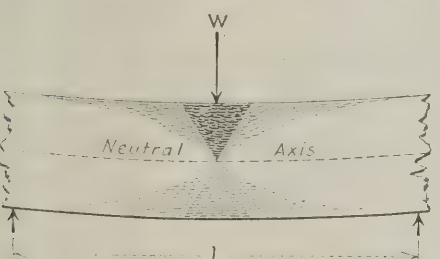


Fig. 1. Beam or Crossbar, Showing Graphically Effect of Bending

The force exerted to stretch or compress the fibers, per unit of section, is called the *fiber stress* and is estimated in pounds per square inch. The safe fiber stress is the safe load or stress, in pounds per square inch of section. For example, the safe fiber stress of different kinds of well-seasoned timber used in mining may be taken as follows, using a factor of safety of 6 for transverse loading:

Ash	1650	lb. per sq.in.
Yellow pine	1250	
Hickory	1100	
Oak, red cedar	1000	
Black walnut	800	
White pine, hemlock, spruce	750	
Poplar, birch	700	

(a) The center load w (Fig. 1) is supported one-half at each end of the beam. The reaction at each point of support $\left(\frac{w}{2}\right)$ acts with a lever arm of one-half the distance between supports $\left(\frac{l}{2}\right)$, giving a bending moment at center of beam $\left(\frac{wl}{4}\right)$ inch-pounds. This bending moment is resisted by and equal to the combined forces resisting extension and compression in the fibers, with respect to the neutral axis, which, for a beam of uniform section, is at the center of the beam. The combined effect of these resisting forces is found by multiplying the unit or fiber stress of the material by what is called the section modulus of the beam.

The section modulus is the moment of inertia of the beam's section divided by the distance from the neutral axis to the extreme fiber. For a round, square or rectangular beam the value of the section modulus is as given below, in Fig. 2.

To illustrate, the combined resistance of the fibers to extension and compression, in a round oak collar or crossbar 8 inches in diameter, which has a safe fiber stress of 1000 lb. per sq.in., and whose section modulus is $\frac{8^3}{10.186} = 50.265$, is $1000 \times 50.265 = 50,265$ in.-lb. To find what center load this crossbar would

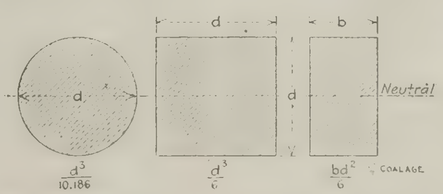


Fig. 2. Showing Value of Section Modulus for Circular, Square, or Rectangular Beam

carry safely, for a clear span of 10 ft. (120 in.), call this safe center load x; then,

$$\frac{x \times 120}{4} = 50,265$$
$$x = 1675+ \ lb.$$

(b) An equally distributed load is always double the center load producing the same bending moment.

In the use of this formula, it is both interesting and important to note that a crossbar will generally fail by shearing instead of bending, whenever the diameter of the beam is greater than 1/15 of the clear span, for a round beam (circular cross-section), and a uniformly distributed load; or 2/15 of the span, for the same section of beam, loaded at the center. For a rectangular cross-section, the beam will fail by shearing instead of bending, when the depth of the beam exceeds 1/20 of the clear span, for a uniformly distributed load; or 1/10 of the span, for a center load. In any of these cases, the safe load the beam will carry must be calculated by the formula for finding the shearing load; thus,

Round beams,

$$L = f_s (0.7854\ d^2).$$

Rectangular beams,

$$L = f_s (b\,d).$$

The safe unit shearing stress (f_s), or the shearing stress per square inch of section, for timber, may be taken as 1/15 of the values previously given for extension and compression of the fibers.

The practical application of the above is shown in the knowledge of the fact that an 8-in. round collar, uniformly loaded, will fail by shearing at the legs of the framing, on any span less than $\frac{8 \times 15}{12} = 10$ ft. The same collar will yield by bending on any span exceeding 10 ft. A 6x10-inch square beam uniformly loaded will likewise fail by shearing, on any span less than $\frac{10 \times 20}{12} = 16\frac{2}{3}$ ft., or 16 ft. 8 in.; and the same beam will bend before it will shear on spans exceeding this amount. The same rectangular beam, 6x10 inches, if loaded at the center, would shear before bending on spans less than $\frac{10 \times 10}{12} = 8$ ft. 4 in., and bend before shearing on spans exceeding this amount.

Ventilation—Circulation in Two Airways Compared

Ques.—Suppose two entries of the same length are ventilated by equal pressures, under like conditions; one entry is 8 ft. wide and 5 ft. high; the other is 10 ft. wide and 4 ft. high. Inasmuch as these entries have the same sectional area and equal lengths, why will they not pass equal quantities of air, for the same pressure?

Ans.—For any given ventilating pressure, the quantity of air in circulation in an airway is given by the formula

$$q = \sqrt{\frac{p\,a^3}{k\,l\,o}}.$$

Assuming that the pressures (p), areas (a), lengths (l) and the coefficient (k) are each constant, it is clear that the quantity of air (q) varies inversely as the square root of the perimeter (o). In other words, the quantity ratio is equal to the square root of the inverse perimeter ratio; or, since the perimeters of these two airways are $2(5 + 8) = 26$ ft., and $2(4 + 10) = 28$ ft., respectively,

$$\frac{q_2}{q_1} = \sqrt{\frac{o_1}{o_2}} = \sqrt{\frac{26}{28}} = \sqrt{0.92857} = 0.963.$$

That is to say for every 1000 cu.ft. of air that passes in the first airway there is 963 cu.ft. passing in the second airway.

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

Liquor Problem in Mining Communities

The Welfare Plan adopted by the Donahoe Coke Company, and discussed in my article last week, included more than the control of the liquor traffic—it comprehended the *secret* of that control which was, with the coöperation of the company, to place opportunity for better living conditions right in the hands of the employees.

Part of the main street and some of the yards were graded but not sodded. A few of the houses were wired for electric lights.

Families using the least liquor were given the best houses. Those whose beer record were not down to the minimum were given second-class houses, and the families that ordered the full amount of liquor allowed were given the "shacks."

The full allowance (except under special conditions) was five kegs per week to a family (including the boarders) if living in a "shack," three kegs if living in a second-class house and two kegs if living in a first-class house.

The rent was the same for all houses. Families with a low beer record could secure from the company, sod for their yards, lumber with which to construct sidewalks, fruit trees, flower seeds and things necessary in preparing and making gardens.

The Wife and the Beer Record

It was not long before "Mary" noticed the great change taking place in her neighbor's yard and house. "Mary" asked her neighbor how this change was made possible. She was told that if the family reduced the weekly beer record she could have a house on the graded street and secure the material with which to fix the yard and make a garden. "Mary" then talks with "John" and the boarders, and down goes the beer record.

Oh, yes, it hits a little hard at first, but "Mary" must keep up with her neighbor. How many men in our cities have purchased pianos and automobiles just because their "Mary" would "break her heart if she could not keep up with her neighbor, Mrs. Goldbanks." Yes, it goes a little hard with "John," but he also gets the "desire" as time goes on. As one miner (a Slav) at Crabtree said to me: "Yes, like to live in best house (and he pointed with pride to his house and garden), but three kegs of beer a week not much for five boarders, but, well, more money save, nice house and feel good." "But how about the superintendent, does he always keep his promises," I asked. "Oh, yes, Mr. Super alright. What he say he do it, he do. Boss alright."

What is the secret? A welfare plan that restricts the use of liquor, but makes the securing of all benefits that better the living conditions depend upon the initiative of the family—we say "family" as "Mary" is the "reformer in the house."

To give some of the beneficent results of the work of the Greenwald Committee: By September, 1911, so many families had graduated into the better-class houses that the company removed all but two of the shacks.

Houses Fenced and Streets Graded

The Last of the Old-time Shacks

A Back Yard As It Used to Be

One of the Back Yards Today

Company Encouraged to Extend Welfare Work

To keep pace with the social and moral advancement of the people of the community the Donahoe Coke Company has graded another part of the main street, put electric lights in 16 houses, a bath tub in one house, painted several of the first-class houses over, not with the regulation prison-house garb, company-house-red, but different houses with different colors, with five distinct colors to be exact. The yards have been

fenced and coal houses and garbage chutes built at the rear of each lot. A sanitary officer is employed and he has the teamster collect the garbage daily.

The company has arranged with a farmer to supply all families with good fresh milk daily at *five cents a quart.*

The Welfare Fund supplies each family with free ice. One hundred pounds is delivered to each house every Wednesday and Saturday and Mr. King states, "We are building a chicken house for each family and are preparing to establish a large fruit-, shrub- and shade-tree nursery from which we will supply each family with trees for the yard as fast as a definite desire to have and care for the trees is exhihited."

The company is also planning a complete sewerage system and a plot will be surveyed upon which will be built several blocks of single houses.

Play grounds for the children will be added later, when the community life has reached the point that the initiative of the people themselves will create the natural demand.

Applicable to Large and Small Communities

Some operators may say, "The plan may work at a small operation but it would fail in the larger mining towns." Mr. King says, "Our handicap is due to the small size of our plant and lack of sufficient houses. If we were employing a large number of miners we could work out our plans much better. The solution of many problems is to secure an atmosphere of home contentment and each workman and his family should be furnished with a home of such a type as will secure privacy and then they should have an opportunity to fix it up and feel that they are, at least, human.

"We have experimented enough to learn that the foreigner, like ourselves, desires something to call his own, some way by which he may express himself and feed and develop his own individuality. Permit him to construct his own walks, plant his own trees and flowers and he is much more contented than he would be if you were to do it for him.

"This plan works to the betterment of the men and their families and since it has been in operation *our tonnage has not been reduced one ton of coal through the use of liquor by employees."*

Of course the superintendent of a mine could not successfully promote a plan so comprehensive as that of the Greenwald Welfare Committee without the full sympathy and coöperation of the company. It goes without saying that Mr. King has had that coöperation. In fact, John P. Donahoe has personally interested himself in every detail of the work and a statement of his views should be instructive and of interest to all mining men who are giving attention to the liquor problem and the welfare of the mine employees.

The Company Approves Welfare Work

In a conversation recently Mr. Donahoe stated among other things that "To carry on a work such as that of the Greenwald Welfare Committee the men must first of all have implicit confidence in the word of the superintendent." "Do not keep the 'company' constantly before the eyes of the men. We use the name Greenwald Welfare Committee to avoid an undue reference to the Donahoe Coke Company."

"The plan to be successful must be one where initiative is required on the part of the men and their wives." "Our best temperance reformer is the woman in the home." "You would suppose our bosses live in those newly painted houses. Well, a Slav teamster lives in the first house and a miner lives next door.

First-grade Houses, Each Painted a Different Color

Two Side Yards, Showing Flowers and Shrubs

First Aid Hints

An improvised stretcher can be made of a couple of jackets, with sleeves reversed. The coats are laid tail to tail. Poles are passed through the reversed sleeves and the coats buttoned up.

A burn should not be exposed to the air a minute longer than is necessary. Interfere as little as you can with the surface of the burn before dressing. If you distinctly see foreign bodies on the surface, remove them before applying the dressing. But under no pretext drag or pull at anything adhering to the wound. Cut away clothing with scissors.

With extensive burns, uncover and dress a small portion of the burnt surface at a time, in order to reduce the pain of the operation as much as possible. Never pull the clothing off a burn; always cut it away. Cover all exposed burnt surface immediately.

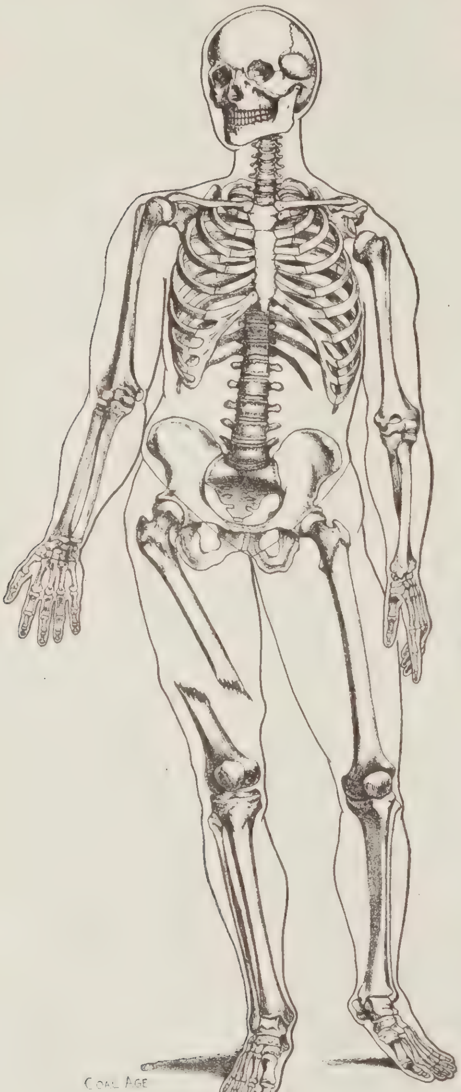
All first-aid supplies should be kept in a tightly closed receptacle in order to keep them free from dust. Never handle unless absolutely necessary. Packages of dressing should never be opened or the paper cover in any way broken until they are about to be used, as it takes only a slight touch to render them septic. Remember that water, though it seems pure, is not sterilized, unless rendered so by special treatment, and wounds washed with unsterilized water, or bandaged with bandages which have been handled, are apt to give trouble. Septic bandaging is worse than none at all.

In case of a fractured spine, which is of comparative frequency in mines, the first-aid man can render little assistance, except to insist that the patient be kept flat upon his back, as placing him upon his side or face for any length of time may kill him. If the spinal cord is not torn, one of the best things for the first-aid men to do is to make a cradle splint. This consists of four boards, two long and two short, 1 in. thick and 3 in. wide. The shorter splints should be about 18 in. long and the long splints from 4½ to 5 ft. long. Place the splints 3 in. apart, then nail or bandage them together as circumstances permit. Pad with anything which can be procured most quickly. With one motion turn the patient on his side, rest the splint on his back, lay him back again flat upon the ground, and bandage securely the shoulders, hip joints, knees and ankles. All work on patients suffering from spinal injuries should be most carefully done as additional jar to this great nerve center may mean immediate agony and death in the near future. A set or sets of the splints above described kept near the working faces would do much to relieve the pain of many an injured miner.

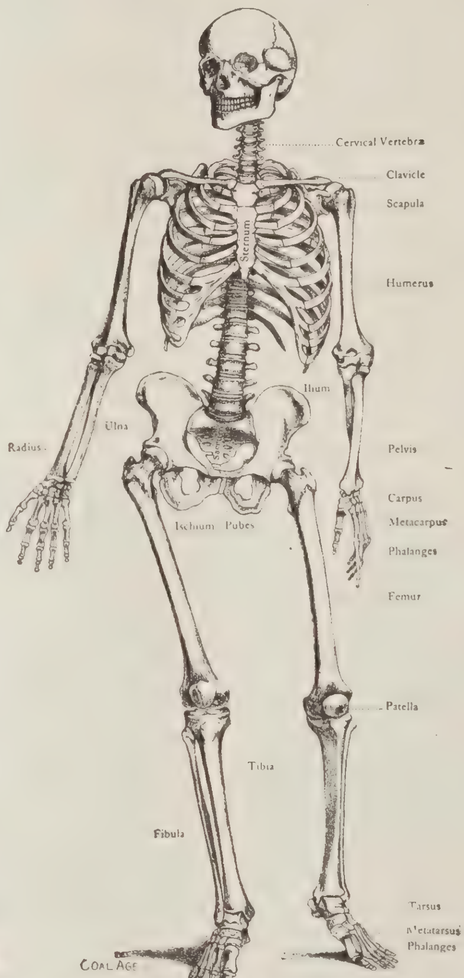
Physiology and First Aid

The illustrations below are the same as are exhibited in the Red Cross cars and published in the "First Aid Manual" of Lynch and Shields. The central figure shows the bony structure of the body with the names of the various parts. It is necessary for the first-aid man to know where the bones lie, but this is not that he may put them back into place. That is not his work. But it does give him an idea how he can keep in line the bones which have been fractured and not displaced. It is an unfortunate fact that the "subjects" on which first-aid men must practise, are men with limbs and trunk in perfect line. Fractures occurring from the misfortunes of industry, are frequently badly compounded. The *physical* training of first-aid men does not cover such fractures, and training by word of mouth does not persist in the memory like information entering the brain by the eye.

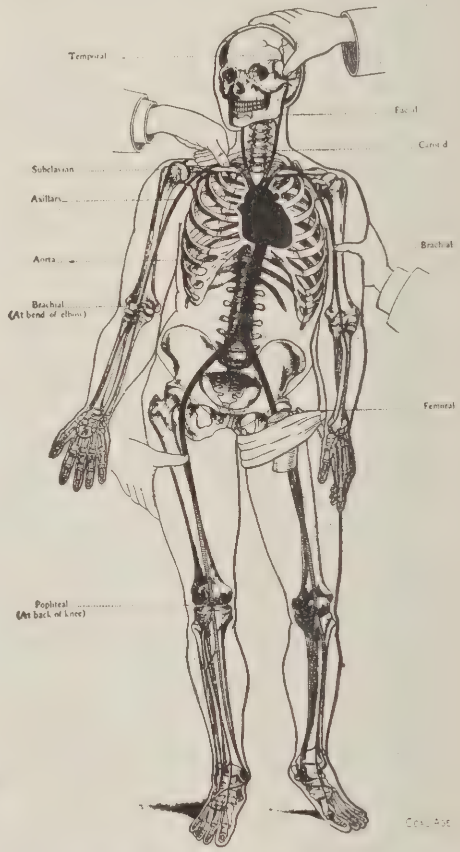
The following words from the manual mentioned, should be impressed on those who will act as aids to the absent physician. "If a sharp bone is buttonholed through the skin, as frequently happens, do not attempt to restore it to its place, but by padding the splint hold the bone in position *just as it is.*" Clearly should it be retained in mind that the fractures we shall dress in the mine are not the same as the imaginary fractures seen on the Forbes field and any fracture which does not leave the bone in place is particularly hard to correct. The returning of the section thus displaced by a lay worker will frequently lead to a severed artery and torn ligaments.



SHOWING DISLOCATION AND FRACTURE



SHOWING BONY STRUCTURE OF BODY



VIEW OF ARTERIES AND BONES

A Knowledge of the Location of All Arteries is Most Essential

The right-hand illustration shows arteries and bones in a single figure. At once is clear the value of a knowledge of the bony structure, because arteries cannot well be pinched and their blood flow controlled where there is no bone nearby to form the hard wall against which the pulsing artery can be deformed to such a degree that it cannot pass blood.

Very clearly with all reference to venous-blood passages omitted, the arteries are outlined, backed by the bones which protect them and against which they can be compressed and deformed. The hands of first-aid men are shown compressing these arteries at the appropriate places and this makes it easy to understand where the blood-flow can be controlled to the skull, the upper half of the arm, the forearm and the leg. In the latter case a compress is shown deforming the femoral artery against the femur of the left leg.

The other illustration here reproduced shows the dislocation of the left arm, the whole member being drawn down so that the upper joint of the scapula no longer turns in the socket of the clavicle. The upper right-leg bone or right femur is fractured and as the parts are separated the fracture is compound. It might be suggested, however, that the sketch of this fracture is not true to life and does not suggest the difficulties of treatment naturally arising out of such a violent break in a bone.

Mistaken First Aid

An incident may be noted here concerning a Japanese miner in one of the large Western mines who had his arm broken. His fellow countrymen immediately proceeded to load him up with two quarts of whisky, and on the mine-surgeon's arrival he was greeted by a most hilarious patient, proudly waving a bloody and dangling stump, and surrounded by an admiring throng of countrymen. It is needless to say the arm was lost and nearly the life as well.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

Taylor Vincent, of West Virginia, representing the United States Coal and Oil Company, of that State, as well as a considerable number of small coal producers, appeared, on Nov. 16, before the Senate Committee on Interstate Commerce, which is holding hearings with reference to anti-trust legislation, and on behalf of his clients recommended to the committee that it report a bill for the establishment of a body to be known as the United States Mining Commission. Mr. Vincent affirmed that the plan was approved by the industry as a whole.

This commission would be composed of five men skilled in the business of mining and selling coal, to be appointed by the President of the United States, with the advice and consent of the Senate. The powers which Mr. Vincent desires to have conferred upon the commission are set forth in a bill which he submitted. This provides in substance (Section 6) that the commission be authorized to sanction trade agreements between competitors engaged in interstate commerce, providing for a joint selling or purchasing agency, whenever, in the judgment of the commission, such trade agreements will not unreasonably restrict competition nor raise prices beyond a point justified by the supply and demand. The bill also provides (Section 7) that the commission be authorized to enforce regulations to secure the safety and health of the employees engaged in and about coal mines, and enforce regulations to prevent waste and conserve the unmined coal.

The Arguments Advanced

Mr. Vincent's argument for his proposition is that the existing state of affairs in the bituminous coal-mining industry is so unsatisfactory that some immediate remedy must be had. The remedy desired is the power to make agreements for the fixing of prices, subject to the general control of the Government. In describing the present condition of the industry he made the following statement: "The average sale price through the whole country for 1910 was \$1.11 per ton. The actual cost of producing this coal was \$1.07 per ton, excluding interest and depreciation for the coal mined and exhausted. The item of depreciation will amount to 4c. per ton, while the interest on the investment of \$585,000,000 is \$35,100,000, at 6 per cent. The selling price of coal has remained stationary for the last six years, being \$1.10 in 1904 and \$1.11 in 1910, with an extreme fluctuation of only 8c., while the cost of producing the coal has increased 9c. a ton during that period.

"The consumers of bituminous coal in the United States pay less for their fuel than in any other country in the world. The other branches of industry in this country have been profiting at the expense of the bituminous-coal business, and the only possible way that this industry can protect itself from ruin is by combination, and they dare not combine as long as the anti-trust law hangs over them with its threats to prosecute criminally and dissolve their organization if they do combine."

The Senate committee showed comparatively little sympathy. Some members objected to the substitution of an administrative commission for the courts, while others felt that the granting of permission to make trade agreements was not paralleled by sufficient power to prevent the pushing of the agreements to a point where they would be dangerous or disadvantageous to the community. There was also considerable criticism of the proposal to establish a system of compensation for mine accidents, inasmuch as it was felt that this matter was already under the jurisdiction of the employer's liability commission, acting jointly for the House and Senate.

The Pittsburg-Lake Coal Rate

During the past week, the Interstate Commerce Commission has been engaged in hearing argument in the so called Pittsburg coal-district case: "John W. Boileau in his own behalf and in behalf of shippers of Lake coal from the Pittsburg district against the Pittsburg and Lake Erie Railway Company and others."

Oral testimony was presented by Vice-president James E. Walsh, of the Pittsburg Coal Company and others. Mr. Walsh declares that the present 88c. per ton rate on coal is excessive and that the company makes no profit on coal mined for the Lake traffic. He said that his company was doing business at a loss and was holding on in the hope of relief in the future. His company, according to Mr. Walsh, has been crowded out of the markets by West Virginia coal, as to which, he alleged, there was discrimination in rates.

The other coal witnesses worked along much the same lines and presented more or less familiar facts. Probably the most significant development of the week has been the filing of elaborate exhibits in behalf of the Pittsburg Coal Company, wherein various methods of computing freight rates are set forth in detail and on the strength of the results a reduction from the existing rate is demanded.

Alabama

Birmingham—The Sloss-Sheffield Steel and Iron Company, and the Alabama Consolidated Coal and Iron Company, have withdrawn from the Alabama Coal Operators' Association. It is understood that these companies are dissatisfied with the action of the Tennessee Coal, Iron and Railroad Company and other members of the association in adopting semi-monthly in place of monthly pay-days at their coal and ore mines.

The plan for the merger of the Alabama Consolidated Coal Company and the Southern Iron and Steel Company, it has been stated, will be altered to include the offer made recently by President Hoadley, of the Alabama company, to the dissatisfied preferred stockholders of the Alabama Consolidated Coal and Iron Company, namely: 30 per cent on common stock, in addition to the 150 per cent. of preferred, which they were to receive under the merger plan as originally prepared by the committee.

California

San José—Suit was recently brought against the Monterey Coal Company by A. B. Campbell, who, as assignee of Campbell, Foster & Co., demands over \$331,000, as commissions on sale of the coal company's stock.

San Francisco—The Canadian Collieries Company, a British concern of great size, has announced the establishment in this city about Dec. 1 of sales offices and headquarters.

Colorado

Coalmont—A shaft has been sunk here 135 ft. by the Northern Colorado Coal Company and rooms are being turned off in the workings. The track of the Laramie, Hahn's Peak & Pacific railroad is within less than three miles of here, and it is expected that the mine will be ready to ship coal by the time the railroad is completed.

Denver—Labor troubles in the coal camps of northern Colorado, where a strike has been in progress for some time, have reached a stage where the advisability of calling for troops is being considered.

At Louisville the situation is regarded as particularly critical. The mines there are owned by a Wyoming corporation. President Brown, of the company, on Nov. 28 said unless conditions improved within the next two days he would ask Governor Shafroth for the protection of Federal troops, to which, he says, the company, as a nonresident property holder, is entitled.

Since Saturday, Nov. 25, it is reported, the union and nonunion miners have been in practically open warfare. Strikers and women sympathizers paraded the streets, flourishing revolvers and other weapons and making threats to strike breakers entering the camp.

Illinois

Marion—The closing of the lease of the Saline Valley Railway Company by the Big Four, gives the New York Central an entrance into the coal section west of Marion. The Saline Valley line is unbuilt as yet, but bonds to the amount of $3,000,000 have been issued. The line will be short, only 22 miles, but will open up valuable coal territory.

Centralia—Fire broke out in the Junction City mine, Nov. 18, imperiling the lives of many miners. The blaze was started while a shot was being fired, and gained strong headway. Several narrow escapes of miners were reported.

Springfield—The property of the Spaulding Coal Mining Company, at Spaulding, will be sold in the near future to satisfy a claim of $40,000, held by the Illinois National bank of this city. The Spaulding company is in the hands of a receiver.

Railroads in this district report a larger traffic than usual for this time of year. Mines throughout the region are working five days a week and a shortage of empty cars is felt at some points.

It is understood that an effort is being made by St. Louis operating companies with mines in Illinois to get some action by the Illinois operators on a proposition to ask the Senate Committee on Interstate Commerce to authorize trade agreements in the coal industry under the supervision of a national commission.

Du Quoin—With the idea of familiarizing miners with the latest methods and devices for fighting mine fires, J. C. Duncan, superintendent of the Illinois mine-rescue station at Benton, has arranged for a school of instruction in Du Quoin from Dec. 2 to 16.

Peoria—Miners at the Champion shaft east of town quit work recently, after a disagreement with the management over the shot-firing question. The men have been firing their own charges, but have insisted that shotfirers be employed by the mine operator, and after a conference decided to walk out. The management, it is understood, has decided to confer with other operators before coming to a conclusion.

Indiana

Indianapolis—The Equitable Mining Company, capitalized at $80,000, has filed articles of incorporation. The object of the new corporation is the mining of coal, lead, zinc, etc. The principal offices will be in Indianapolis.

Booneville—A sympathetic strike involving several hundred men is on at the Kapp's mine, west of here, in the Warrick County field. The reason advanced for the strike by the miners is that some of the men were laid off by the mine management in order, as they claimed, to make some repairs to the mining machinery. The work of making the repairs not going forward, the balance of the men were ordered to strike out of sympathy with the men laid off.

Kentucky

Louisville—The Pond Creek Coal Company has been organized by Hayden, Stone & Co., of Boston, Mass., with a capital stock of $2,000,000, to develop 30,000 acres of coal lands recently purchased in Pike county. The management of the new company will be identical with that of the Island Creek Coal Company. The property will require but little railroad building to give it excellent transportation facilities and immediate development is contemplated.

Henderson—The property of the Southern Coal and Transportation Company, at Robards, Ky., valued at about $200,000, is to be sold to satisfy creditors.

Pineville—Thos. Cairns, of Bell county, has purchased from the Louisville Property Company, which is allied with the Louisville & Nashville Railroad Company, its holdings in Bell and Whitley counties for a consideration of $1,800,000. The lands conveyed embrace a considerable portion of the Chenoa mining district. There are fourteen going coal mines on the Bell and Whitley county land. In addition there are also thousands of acres of timber lands. Mr. Cairns announces his intention to dispose of the property acquired, either by leasing or selling. He has been identified with the Louisville Property Company since 1886.

Barbourville—Work has been started on the extension of the Louisville & Nashville railroad's Wasioto and Black mountain line up Meador creek from Harlan to Agres creek, a distance of five miles.

This extension will pass through the boundary of 10,000 acres of coal land recently leased by Sneed, McGuire & Farmer. These lessees will sublease seven parcels of this boundary of coal and will operate one tract of 2500 acres themselves.

Morganfield—The Bell-Union Coal and Coke Company, at Curlew, Union county, has replaced the tipple recently destroyed by fire and is about to resume operations.

Minnesota

Duluth—Work will be commenced within a few days upon the building of a coal dock involving a capital expenditure of over $1,000,000. After negotiations extending over several months, the Island Creek Coal Company, the principal in the enterprise, has purchased a waterfront site containing about 30 acres. The price paid for this was in the neighborhood of $100,000.

The dock to be built will cover the entire property, and will have a storage capacity of 750,000 tons, or a coal handling capacity during the season of 1,500,000 tons. It will be equipped with steel bridges and the most modern type of machinery. Outside of the Pittsburgh Coal company's dock No. 7, the new dock will rank as the largest at the head of the lakes.

Missouri

St. Louis—It is reported that the Hawley-Erb syndicate has purchased the Novinger coalfields, Adair county, Mo., and that the proposed extension of the Iowa Central system to St. Louis will be through this district. Heretofore the Novinger fields have been local to the Quincy, Omaha & Kansas City, a Burlington subsidiary.

The Hawley interests have obtained permission from the Iowa Central executive council to issue $10,000,000 additional securities.

The Kolb Coal Company, of St. Louis, operating mines at Mascoutah, Ill., has placed a contract with the Ottumwa Box Car Loader Company, of Ottumwa, Ia., for a modern steel tipple. The tipple will be of the "A" frame design, and will be complete with self-dumping cages, weigh pan, reciprocating feeder, shaker screens and steel bins for diverting coal to the various cars.

The mine is located within 18 miles of St. Louis, and will, when completed, be one of the most modern operations in Illinois. The plant is expected to be completed and loading coal by Dec. 25.

Ohio

Crooksville—Work will be resumed at the Carding mine after 18 months' idleness. Two hundred and fifty men will be employed by the Elk Fork Coal Company of Wellston, which acquired the mine at receiver's sale. Plans and specifications have been adopted for the rebuilding of the tipple and the installation of uptodate mining machinery. Work on the improvements will be started immediately and will be completed by April, it is thought.

Bridgeport—The Jefferson Coal Company has abandoned its Piney Fork mine where the men have been on strike for two months and will open a mine abandoned years ago. Only those men from Piney Fork who were not implicated in calling the strike will be employed.

Cleveland—The Philips Coal and Coke Company, of Cleveland, has changed its name to the Equitable Coal and Coke Company.

Columbus — Plans for opening the sealed up portion of the Black Top mine, located near Cambridge, Guernsey county, in which one man lost his life recently and 11 others were overcome by a fire, are being made by the State mine inspector. Samples of gas have been collected from the portions of the mine which are sealed up and if the analysis proves satisfactory the mine will be reopened.

Oregon

Marshfield—The Millicoma mine on the east shore of Coos bay, which for the past two years has been developed by J. A. Ward, has been sold to the Millicoma Development Company, a new corporation. The development is practically completed and the new company will put the coal on the market. The company has 430 acres of land, under which it is claimed there are 10,000,000 tons of coal of high grade. The shaft has been sunk 275 ft. and it is possible to load the coal from bunkers directly onto vessels.

Pennsylvania

Bituminous

Connellsville—Idle since April 1, last, fires have been lighted at the Garwood plant of the Dunlap-Connellsville Coke Company, near Brownsville; the activity will continue at least until Feb. 1, and the management believes longer. Fifty-seven of the 119 ovens are in operation and the others are being put in use as rapidly as possible.

The Republic Iron and Steel Company is reported to be firing the 138 ovens at its Atchison plant near Cheat Haven.

Uniontown—It is understood that 80 additional ovens at the Connellsville Consolidated Coal and Coke Company's plant at Mt. Sterling will be fired as rapidly as the necessary mine labor can be secured.

Johnstown—The Smokeless Coal Company is opening a new mine near its present operation at Ferndale. This will probably double the present output from the local plant.

Strikes are in progress at the Amsbry mine of the Pennsylvania Coal and Coke Company and at the Nant-y-Glo Coal Company's mine. The grievance in the first case is reported to have arisen over the discharge of several motormen and in the second case because of an occasional lapse of three weeks between pay days.

Butler—The strike at the Sherwin coal mines at Karns City has been called off after six weeks' duration.

It is understood that construction of the Shawmut railroad will be resumed and that the line will be extended along the west bank of the Allegheny as far as Limestone Run near Kittanning. Work on the section of the road which runs down the Mahoning creek is progressing.

Anthracite

Scranton—The Delaware & Hudson Coal Company are dumping rock and slate on the hollow ground above the Delaware Breaker in preparation for laying additional tracks which will be used for empty cars. It is said a new breaker will be erected in the early spring.

The People's Coal Company recently acquired the rights and leases for 18 tracts of land in West Scranton from Mrs. H. A. Crawford.

Wilkes-Barre—The Exeter Machine Company in West Pittston is said to be going into the coal business on a small scale by erecting a washery near the old Exeter shaft. The company purposes using up the culm bank there for fuel at its plant.

Pottsville—Suit to recover $191,213 in royalties on coal mined has been brought against the Philadelphia and Reading Coal and Iron Company by administrators of the estate of Hugh Bellas.

The Philadelphia syndicate which has taken over the abandoned Lawrence, Bear Ridge and Stanton collieries near Girardville proposes to pump out the old workings and work the deep-lying veins which have never been mined. Pumping operations have been started but since it is estimated that more than two billion gallons of water will have to be removed, the work will probably take some months. It is said three slopes will be put down and modern breakers erected.

Washington

Spokane—Settlement of the coal miners' strike in the provinces of British Columbia and Alberta has greatly brightened the outlook for the mining industry in the Spokane country. By the agreement for a period of three and a half years from date the smelter and mine operators are given assurance of an ample fuel supply for that time.

One of the earliest results of the settlement will be the resumption of operations by the Granby company's mines and smelter. Six hundred men went to work on the properties in the Boundary district on Nov. 21 and 350 others will be employed as soon as coke is received from the Crow's Nest district. The company is finishing the No. 3 outlet to the Phœnix properties and is getting the bins and crusher in shape to handle a large tonnage, a number of men being put to work during the week to hurry the completion of the work.

Andrew Laidlaw, of Spokane, recently bought the license rights to 12 coal claims, each of 840 acres, on the Flathead river, in East Kootenai, 12 miles south of the Corbin Coal Company's property. These claims extend eight miles north and south along the course of the river, and are said to contain the same series of coal seams found to the north and immediately adjoining on the south. They also are reported to be heavily timbered.

West Virginia

Charleston—Among the new coal companies chartered here recently was the New River & Ohio Coal Company, of this city, to develop coal, iron and other mineral lands. The authorized capital is $100,000.

The American Coal Company of Pittsburg was recently granted a charter from this State. The concern is capitalized at $200,000.

The Horgart Coal and Coke Company, owning 2200 acres in Barbour county, has voted to develop the property.

Wyoming

Kemmerer—The Lincoln Coal Company has leased the properties of the Elk Coal Company and these are now being actively operated.

Canada

British Columbia—Coal from the mines at Lethbridge, Alberta, was placed on the market, Nov. 22, two days after the striking miners returned to work in this district. The agreement between miners and operators was signed at Hosmer, Nov. 17.

Coal mines at Fernie and Coal Creek, shut down since last April, resumed operations on Nov. 20. Mine and railway cars have been rushed in so there will be no delay in bringing out the coal. The miners apparently are well pleased to have their struggle over and be at work once more. Five hundred men are employed on two shifts, and these will be increased as rapidly as conditions permit.

The Columbia Coal and Coke Company is busily engaged in building two long railroad sidings on its property, at Coalmont. These will be ready to connect with the Great Northern by the time that company has its tracks laid into Coalmont.

Toronto—The British Columbia coal strike having been settled and work at the mines resumed, the Canadian government has reimposed the duty on coal imports into western Canada, which was temporarily remitted on July 31. The duty will be restored on Dec. 6.

Personals

James Richards, of La Salle, Ill., is appointed superintendent of the Spring Valley mine, at Dalzell.

J. R. Sharpe has resigned the position of resident superintendent of the Springhill Collieries, and has returned to his home in West Virginia.

Charles B. Spencer has been made general manager of the Pittsburg and Midway Coal Company, of Pittsburg, Ill., vice John N. Hodges, who has retired.

Richard Kirby, who has for the past three years been the mining engineer of the Dominion Coal Company, has resigned his position and returned to his home in Scotland.

C. A. Winehart, of Menominee, Mich., has been appointed northwestern manager of the Hutchinson Coal Company, Fairmont, W. Va., with headquarters at Green Bay, Wisconsin.

M. J. Caples has been appointed vice-president in charge of transportation on the Chesapeake & Ohio railway. Mr. Caples has a thorough knowledge of both the mining and transportation of coal.

George D. Evans, for the past six years engaged in the development of properties in West Virginia for the E. E. White Coal Company, has opened a general civil- and mining-engineering office in Pottsville, Penn.

Percy E. Wright, for the past ten years a sales engineer in connection with the home office of the Jeffrey Manufacturing Company, has been made manager of its newly established branch office in Seattle, Wash.

W. W. Taylor, for several years general superintendent of the St. Paul Coal Company, has been elected president of the company, with offices at Ottawa, Illinois. F. E. Fernekorn, former chief clerk, has been elected secretary.

E. B. Francis, who has been connected with coal and iron companies for a number of years, has been made treasurer of the Hocking Valley Products Company, which is a reorganization of the Hocking Coal and Iron Company.

Dr. J. A. Holmes, director of the U. S. Bureau of Mines, spent Nov. 18 in Birmingham, Alabama, inspecting the recently completed mine-rescue station. He was accompanied to Birmingham by Dr. Eugene A. Smith, State geologist of Alabama.

Señor Abraham Ferriz, the Mexican government engineer, accompanied by a party from the U. S. Bureau of Mines made an examination, Nov. 15, of the mine fire at the Pittsburg & Eastern Company's No. 2 mine at Cherry Valley. The party was in charge of O. H. Reinholt.

Societies and Technical Schools

The winter meeting of the West Virginia Coal Mining Institute will be held at the Masonic Temple, Fairmont, W. Va., Dec. 4, 5 and 6.

The Coal Mining Institute of America will hold a joint meeting with the Engineers' Society of Western Pennsylvania, at the headquarters of the latter in Pittsburg, Dec. 19 and 20. This is the regular winter meeting of the institute.

Coal and Coke Patents

United States

Coke-oven door; Louis Wilputte, Joliet, Ill., No. 1,006,036. This coke-oven closure comprises, briefly, an inner plug door having a firebrick insulation and an outer door furnished with means for sealing it against the jambs. Both doors are entirely detachable and may be removed bodily from the oven by means of lifting hooks.

Car for quenching coke; Hans Ries, Munich, Germany. No. 1,006,281.

Great Britain

Improvements in apparatus for the observation of gas caps and testing miners' safety lamps; O. Oldham, Denton, Manchester. No. 26,534 of 1910.

Coal cutters; W. L. Spence, Glasgow. No. 27,517 of 1910.

Improvements in magnetically locked miners' safety lamps; R. Cremer, Leeds. No. 1665 of 1911.

Improvements in relighting devices for miners' safety lamps; E. A. Hailwood, Morley, Yorks. No. 17,089 of 1911.

Industrial Items

The Vinton Colliery Company has established the headquarters of its management and sales at No. 1 Broadway, New York. The office formerly located in Philadelphia has been given up, but the company has salesmen calling on the trade in that vicinity. It finds that it is in a better position than ever to handle business in the Philadelphia territory.

The Jeffrey Manufacturing Company, of Columbus, Ohio, manufacturer of mining, elevating, conveying and power-transmission machinery and coal-mine equipment, has recently opened another branch office at 1201 American Bank building, Seattle, Wash., from which it will handle its business in the Northwest. This company is maintaining 13 branch offices in the United States, as well as nearly 100 agencies in the leading commercial centers all over the world.

The Wellman-Seaver-Morgan Company, Cleveland, O., has received an order from the Canadian Pacific Railroad for a $500,000 coal-handling plant to be erected at Fort William, Ont. The plant will include a bridge, two Hulett unloaders, coal conveyer cars and a trestle. Considerable electrical power equipment will also be required. An interesting fact in connection with this contract is that it is the first order that has been taken for Hulett unloaders for handling coal, as hitherto they have been used exclusively for handling ore.

The American Blower Company, of Detroit, Mich., with a factory also at Troy, N. Y., and numerous branch offices, has come to realize the importance of the Dominion of Canada, as evidenced by the application just filed for a charter for a company to be known as the Canadian Sirocco Company, Ltd., of Windsor, Ont. The Canadian Sirocco Company will hold exclusive patent rights for the manufacture in Canada of Sirocco fans and blowers and will also manufacture the full line of American Blower Company products, consisting of fans, blowers, heating, ventilating, drying apparatus, steam engines, steam traps, etc.

Trade Publications

Stromberg-Carlson Telephone Manufacturing Company, Rochester, N. Y.; Bulletin No. 1002 second edition, 7¾x10 in. 38 pp. descriptive of local battery telephones.

General Electric Company, Schenectady, N. Y.; Bulletin No. 4886, 8x10½ in. 59 pp. "Electricity in Coal Mines." A number of interesting installations are described and illustrated.

Roberts & Schaefer Company, Chicago, Ill., Bulletin No. 23, 6x9 in., 32 pp., descriptive of Holmen Locomotive Coaling Stations. Twenty-five plants are attractively pictured and described.

The Jeffrey Manufacturing Company, Columbus, Ohio, bulletin No. 18-B, 8x10 in., 8 pp., descriptive of the Jeffrey-O'Toole coal cutter, a machine built to cut a kerf at various hights, depending upon the thickness of the coal seam.

Jeffrey Manufacturing Company, Columbus, Ohio, Catalog No. 50, 6x9 in., 142 pp., "Power-Transmission Machinery," giving complete lists of Jeffrey products in this line, including shafting, sheaves, pulleys, gears, etc. Sizes, dimensions and prices are given, also convenient engineering formulas.

Link-Belt Company, Philadelphia and Chicago, book No. 111, 6x10 in., 88 pp. "The Handling and Preparation of Coal at the Mine." This pamphlet illustrates and describes installations of tipples, washeries and conveying machinery for coal mines; also the detailed equipment for such installations as furnished by the Link-Belt Company.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The predominating feature in the coal market during the past week has been the car supply; this is reported, almost without exception, as inadequate, and in some instances acutely so. Unusual strength has developed in steam-coal prices, which is credited to the heavy buying, incident to a general improvement in business conditions.

In the extreme East tonnage reports are higher than for the same period last year, despite which stocks are being seriously depleted and new arrivals are slow. Pittsburg reports bituminous as steady and improving, with some activity in coke resulting in the letting of several important contracts.

Lake shipments from all Eastern ports have been unusually heavy this season. This is believed to be due to meager supplies in the Canadian Northwest, because of the labor troubles in the Crow's Nest during the summer. There is no improvement in the car situation in Ohio, while in some districts to the south conditions are such that the railroads are absorbing entire outputs for their own use.

Lack of motive power and proper equipment has resulted in a slow movement in the Middle West. This, together with the heavy snows and lower temperatures, has tended to deplete supplies and increase consumption, with a consequent improvement in the market.

Mines in the Rocky Mountain States are hopelessly behind orders, and in many instances working half capacity because of poor car service. There is a marked increase in the Pacific Coast trade, and both rail and water shipments are slow.

Boston, Mass.

There is little change, except in some quarters the situation grows more acute. Marine freights are now strong at $1.10, Hampton Roads to Boston, on large tonnage, and the same rate has been paid on 2500-ton barges to Providence. The shortage on vessels continues, and more shippers are obliged to go into the market for bottoms to make up for the slow movement of transportation or to replace boats that are lost. On car prices, Mystic Wharf, Boston, and at Providence as well are therefore up to new figures, $3.90 to $4 for spot coal, and very little is to be had at that.

On Nov. 27, the Boston retailers advanced their price on soft coal to $4.50, net tons. All-rail bituminous is showing improvement. Prices on the Clearfields are from $1.00 to $1.15, and extra business is being had nearer tide-water than the summer range on Southern coals would permit.

The anthracite companies are swamped with orders so that the situation on stove and chestnut sizes is rapidly getting serious.

New York

Considerable improvement has been noted here in the market for soft coal during the past week. There has been a marked increase in the spot demand for high-grade steam coals and some betterment in the demand for inferior grades. Contract movement is quite heavy and at this season of the year the movement of coal from New York is at a high level, owing to the heavy shipments going to shoal-water points, where navigation will soon be closed.

Contract movement is being seriously interfered with by the shortage of boats and slow transportation on the Sound, due to unfavorable weather conditions. These seem to be the worst for a number of years and at some points along the Sound where consumers have not stocked up liberally, shortages are being experienced.

Gas-coal slack has shown a decided improvement the past week. The unexpected early closing of Lake shipments caused a shortage sufficient to advance the price more than 25c. a ton over what slack was freely offered at two weeks ago.

The prices of steam grades in the New York market are considerably firmer, and quotations at which shippers are offering coal show an advance of from 5 to 10c. a ton.

Buffalo, N. Y.

There are a good many evidences of a livelier condition of the bituminous trade. Dealers complain of slow movement by rail and there are sometimes vexatious blockades at junction and transfer points. Certain railroads are accused of allowing distributing centers to choke up so cars cannot be handled and then reported they had not arrived.

The demand for slack is heavy and as soon as the lake trade is ended, so that the making of three-quarter is down to a winter basis the prospects are for fair price. It does not appear that much surplus slack intended for the lakes will be left over, though the heavy storm of the middle of November has cut down lake shipments.

There is a slight stiffening of bituminous prices, but figures remain at $2.50 for Pittsburg three-quarter, $2.40 for mine-run and $2 for slack. Allegheny Valley prices are about 25c. lower. Coke is without feature, prices being weak at $4.25 for Connellsville foundry and $3.50 for stock coke.

Lake shipments cease for the season this week. The amount loaded here for the past week was 87,000 tons. Shippers are anxious to keep up the movement as long as possible, for the Northwestern demand promises to be very heavy during the winter.

Pittsburg

Bituminous—Manufacturing and domestic demand for coal continues good, taking up a large part of the slack made by the close of the Lake shipping season, and operations are fairly heavy. Prices are about as well maintained as formerly, and we quote as the average market level: Nut, $1@1.05; mine-run, $1.05@1.10; ¾-in., $1.15@1.20; 1¼-in., $1.25@1.30; slack, 40@50c. per ton at mine, Pittsburg district.

Connellsville Coke—Contracting for furnace coke for next year has commenced, four or five contracts having been put through, but buyers and sellers are endeavoring to keep the terms reached secret. It is understood that the Rainey interest has taken the Youngstown Sheet and Tube Company's contract as usual, about 35,000 tons a month being involved, and that the price was a flat one, about $1.65. This interest is believed to have made at least one other contract, while others have made two or three. A market level has thus been disclosed for next year's furnace coke contracts, which may be quoted at $1.60@1.65 for the first half and at $1.65@1.80 for the whole year, the higher prices being for special favorites.

There is no general buying as yet, since the majority of consumers prefer to hold off, while among producers also there is conservatism. The common course among consumers will be to wait until near the close of December, and then contract only for the first six months. Furnaces which buy for the year at this time will do so chiefly because they wish to assure themselves a supply from among a few favorite brands. Of course, a large part of the

merchant business for next year is already covered by term contracts still having one, two or more years to run.

Sales of 3000 to 4000 tons of prompt furnace coke have been made in the past week at the regular price of $1.50. We quote the market as follows: Prompt furnace, $1.50@1.55; contracts, first half, $1.60@1.65; year, $1.65@1.80; prompt foundry, $1.80@1.90; contract, $2@2.25.

The *Courier* reports production in the week ended Nov. 18 at 316,379 tons, a decrease of 7000 tons, and shipments at 3546 cars to Pittsburg, 4960 cars to points West and 906 cars to points East, a total of 9412 cars, which is a decrease of 150.

Philadelphia, Pa.

There has been no diminution in the retail demand for anthracite coal in this market. The continuance of coal-burning weather is in a measure responsible for this, although there has not been any particularly low temperature as yet, but it has been threatening, and, as a consequence, the dealers are flooded with orders.

In the wholesale market, the verdict is almost unanimous that there has never been such a demand in the early winter season. Stocks of all sizes are being depleted, and the individual operators have no difficulty in disposing of all of their product, whether good, bad or indifferent. It is reported that some of the individual concerns are asking and receiving 10 to 15c. premium for their output of certain sizes, and there is some talk of the large companies advancing the prices. Apparently there is no disposition as yet for even a lull in the demand.

Baltimore, Md.

A canvass of many of the large offices of coal men brought to light the fact that there has been no important change in market conditions during the week. Spot business is about the same as the week previous, and the movement under existing contracts continues as usual.

Those who are buying now are getting coal at low figures. During the past few days, the low grades of coal have been quoted at 70c. per ton. In the office of one of the large coal companies it was stated that some coal had been sold as low as 60c. per ton, but not a large quantity could be purchased at such a price. For the better grades, the prices ranged between $1.30 and $1.60 per ton. Because of the absence of any undue activity in market conditions, operators say that the present price level will continue in force for some time to come.

Columbus, Ohio

Improvement has been reported in practically every branch of the coal trade in Ohio during the past week. The colder weather which prevailed over all of the State had the effect of strengthening the domestic and steam departments.

A car shortage has developed which has the effect of still further stiffening the market. It is the worst on the Toledo & Ohio Central and the Zanesville & Western, while the Hocking Valley is close up to the limit. A feature recently brought out is the practice of the Chesapeake & Ohio in using Hocking Valley cars in West Virginia territory. Shipments are delayed from two days to almost a week.

The production from Ohio fields has been good despite the car shortage which curtailed outputs to a certain extent. In the Hocking Valley the production was about 85 per cent. capacity while in eastern Ohio it was about 80 per cent. In the Pomeroy Bend district the tonnage was large and the same is true of the Jackson and Cambridge fields.

Prices prevailing in Ohio are: Domestic lump in the Hocking valley, $1.50; domestic lump in Pomeroy Bend, $1.60@1.75; ¾-in., $1.35; nut, $1.15; mine-run in the Hocking valley, $1.05@1.15; mine-run in eastern Ohio, 95c.@$1.05; nut, pea and slack, 40@50c.; coarse slack, 35@45c.; fancy grades of domestic sizes, $1.75@2.25.

Cleveland, Ohio

The lake coal trade is in about the same shape as it has been for the past week. There are a large number of cargoes on the market and the tonnage is very scarce. With no boats in sight, the shippers are not bidding, but a few big carriers could be placed for the head of Lake Superior at 80 cents.

PREVAILING PRICES AT CLEVELAND

	Ohio No. 8	Middle District	Pocahontas
Mine-run	$0.95@1.00	$1.10@1.15	$1.05@1.15
¾-in.	1.05@1.10	1.25@1.35	1.15@1.20
1¼-in.	1.15@1.25	1.50@1.65	1.25@1.30
Slack	0.60@0.70	0.80@0.85	0.60@0.70
Lump	....	....	2.15@2.30
Youghiogheny nut	....	....	1.00@1.05

Shipments to retail coal yards and to manufacturing consumers increased slightly this week. Genuine winter weather appeared with a suddenness that has rarely been paralelled, the temperature dropping over 30 deg. in a few hours.

Cincinnati, Ohio

Local market conditions are much improved over three or even two weeks ago. The principal cause for this has been the weather, although credit is due the steadying influence of tightness in the car situation, particularly on the Chesapeake & Ohio and Norfolk & Western railroads. There has been increasing difficulty in getting a sufficient number and the desired type of cars on most of the roads in this territory for some time. On at least one road the situation has become acute within the last few days, and it has resulted in serious inconvenience to several of the operations.

This car shortage has resulted in considerable friction in several of the wholesale offices on account of the railroads' inability to furnish the buyer with the equipment ordered. The number of hopper cars, it would seem, has been increased more rapidly than have the facilities of country dealers for unloading that class of equipment.

The steam demand is increased sufficiently to justify the statement that there must be increased industrial activity. The increase is not large, nor is it confined to a limited territory, but is of such a character as to indicate that general business is improved over what it was some weeks ago. Of course it is natural that there should be some steam-coal increase because of the continued cold weather.

Louisville, Ky.

The local market remains firm, with good supplies and the demand continuing brisk. Prevailing low temperatures are responsible for the latter. Shipments from Pittsburg continue to arrive regularly and the same is true of Kentucky and Tennessee districts. The western Kentucky mines are working more regularly now than during the past month, due to the practical settlement of the Illinios Central strike trouble. One local dealer is advertising extensively a rate of $3.50 a ton, cash, for Pittsburg lump, on a 2000 lb. to the ton basis. The prevailing retail price, however, is $3.75 a ton for Pittsburg. Straight Creek is retailing at $4; Jellico coal, of the best grade, is bringing the same, and Wilton, $3.60.

Charleston, W. Va.

The closing of lake shipments has made a change in conditions in the Kanawha and New River districts, in that there has been a decrease in shipments. There has been a fairly good increase in domestic movement both east and west, but this has by no means made up for the loss caused by the discontinuance of the coal heretofore going to the lakes. This condition was predicted in these despatches and was not unexpected by the coal operators.

Reports from the Norfolk & Western territory state that conditions are good,

which is usual for that district. The increase there has been greater than in any other section of the State. The only temporary setback suffered in the Norfolk & Western territory was during a let-up at the United States Steel operations at Gary.

Memphis, Tenn.

The operators in western Kentucky have had several meetings, resulting in a decision to advance prices on domestic coal, beginning Dec. 1. These prices will be $1.50 for screened lump, $1.25 for nut, $1 for mine-run.

The mines located on the Illinois Central railroad are still in a bad way for equipment. They get few cars for loading, and occasionally the railroad takes the entire output of a day's run for its own use.

The retail prices for Memphis are: $4 for Kentucky lump coal, $4.25 for Alabama, $4.75 for Jellico, $5 for Piper or Cahaba, $3.50 for Kentucky nut and $4 for Illinois washed coal.

These are the highest prices Memphis has had during any portion of the winter.

Nashville, Tenn.

There has been little change in the coal situation in the West Kentucky fields, and the demand for domestic coal may be considered good, although it is a weather-market proposition entirely in this field.

On Dec. 1, the price of domestic lump coal will be raised by the operators to $1.50 per ton, which is a 25c. per ton advance over the prevailing price. A small increase will be asked also for the finer grades of coal.

Dealers in this section are still carrying a small stock and a bad spell of weather will find the majority of them with practically no coal in their yards.

There is a good deal of talk in this district relative to a strike on April 1, 1912, and the operators seem to think that this is inevitable.

Indianapolis

The coal market has shown some improvement but is not yet entirely satisfactory to the mine operators. The market has been stimulated by cold weather, but the movement of coal from the mines has been greatly delayed because of slow transportation.

Both operators and miners in the block-coal fields of Clay and Vigo counties are bitter in condemning the policy of the railroads, because of their inability to properly handle the coal. A revival in business has been experienced by the coal companies within the last last month, but owing to the scarcity of cars they have been able to fill only a comparatively small number of their orders.

Chicago

The general tone of the coal market is far better than it has been for several months. The demoralization which has affected smokeless mine-run coal for the past six months is past, and there has been a boost in price from $1 to $1.10 at the mines. This price is quoted everywhere.

Leading shippers are practically out of the market, so far as Southern Illinois and Hocking Valley coals are concerned. The demand for these grades has led to an overflow upon some of the cheaper classes of coal. The demand for anthracite is strong and Western and Eastern buyers are engaged in a vigorous contest to obtain what they can of this class of fuel. A marked improvement has been noted in the furnace- and foundry-coke market.

Coke—Prices asked for coke are: Connellsville, $4.50@4.65; Wise county, $4.50@4.65; byproduct egg and stove, $4.95; byproduct nut, $4.55@4.65; gas house, $4.85.

PREVAILING PRICES AT CHICAGO

	Pocahontas and New River	Sullivan County	Springfield	Clinton County
Screen lump	....	$2.10	....	....
Steam lump	....	....	$1.97@2.07	$2.00@2.20
Domestic lump	....	$2.50@2.60	2.27@2.47	2.17@2.37
Mine-run	$3.15	....	1.82@1.87	1.82@2.02
Egg	....	2.30@2.40	....	....
Lump and egg	$4.15@4.30	....	....	....
Screenings	....	1.47@1.52	1.42@1.52	1.42@1.52

St. Louis, Mo.

There is practically no change in the local market, with the exception that the smaller sizes in raw and washed coals have gone up from 10c. on raw screenings to 25c. a ton on washed No. 1. The car shortage has practically brought about this condition in the high-grade market, and, again, there is an extraordinary demand for screenings and steam sizes from the Northwest.

Lack of motive power on the Frisco has retarded shipments somewhat during the past week, and the Iron Mountain and Illinois Central are working their mines about two days a week. It is likely that prices of all high-grade coals will advance to something like $2 in the next 10 or 15 days; especially will this be so on Franklin county lump and egg.

PREVAILING PRICES AT ST. LOUIS

	Franklin County[1]	Williamson County[1]	Standard
6-in. lump	$1.75@1.85	$1.50@1.65	$1.10@1.20
2-in. lump	....	....	1.00@1.05
3x6-in. egg	1.75@1.85	1.40@1.55	0.90@0.95
No. 1 nut	1.75	1.20@1.35	0.75@0.85
No. 2 nut	1.40@1.50	1.10@1.20	0.65@0.70
No. 3 nut	1.25		
2-in. screenings	....	0.55@0.65	0.30@0.35
Mine-run	....	1.00@1.10	....

[1] Freight to St. Louis, 67c.

Minneapolis—St. Paul

The situation in the trade is unchanged, everybody enjoying a steady business. There has been fair sleighing for a week which has facilitated hauling and dealers have been able to keep up with orders.

The dock people have been more than busy filling orders, but have been able to meet the demands well. Stocks on the docks are heavy now at the close of navigation. Insurance expires Nov. 25, and the shipments of coal expected up after that date are only scattering cargoes.

The wholesale companies in the Twin Cities, handling all rail will show a fine month's business during November. Their mines are running every day and behind on orders. Some are much hampered by lack of cars at their mines.

For some reason or other, there seems to be an increased tonnage of smokeless coal for domestic use this season, and as a result a number of the docks are already running short on smokeless lump and egg. The Splint coals are also becoming popular, as well as those from the Kentucky-Tennesee fields.

Anthracite is quoted at: chestnut, $7.20; egg and stove, $6.95; grate, $6.70.

Gas-house coke is moving slowly at $4.65, St. Louis, and byproduct at $5.

Salt Lake City, Utah

There are just about ten orders on file for each car of coal mined by the Utah mines, and as the coal season does not really start until Dec. 1, the indications are that this proportion is liable to increase rather than diminish.

The coldest November weather in many years brought a demand from the outside towns which could not be denied if it were possible to supply it; but as the mines were already operating to their fullest extent with the limited car supply, the dealers received little satisfaction.

No more cars are in prospect and as operating is becoming more difficult as

the cold weather advances, the movements of those in service on the coal roads will become slower. Mines are still working about half time.

There has been no change in price, neither wholesale nor retail, on Utah coal.

Spokane, Wash.

There is no change in local prices, though the market is fairly active. The resumption of operations in the Crow's Nest mines means there will be sufficient supplies for all demands throughout the year, also that the smelting plants soon again will be running full blast.

Jay P. Graves, of Spokane, vice-president and general manager of the Granby Consolidated Mining, Smelting and Power Company, said that the furnaces at Grand Forks, B. C., will be blown in within three weeks, adding:

"It will take some time to get going again at full capacity; besides requiring an ample supply of fuel on hand, there will be difficulty in building up an adequate working force at the mines after such a long shutdown."

San Francisco

We have to record quite an increase in the sale of coal during the past week. Lower temperature has stimulated the retail trade. Domestic consumers are getting a foretaste of winter weather and are accordingly providing against the rainy days we are justified in expecting during the next four months.

There is a marked improvement in country business, as the effects of winter are felt sooner there. There is a brisk demand for carloads to the interior; such orders are not being filled with customary despatch, owing to the car shortage which still continues.

Shippers from Utah mines are particularly handicapped because of a lack of motive power by the railroads. As a consequence we are advised of an increase in price of 25c. and 50c. per ton, f.o.b. the mines at these points.

Altogether the situation looks good and is viewed by all parties to the trade as quite satisfactory. The wholesale prices, ex-bunker or at ship's side, are as follows, per short ton:

Wellington, clean	$8.00
Wellington, average	7.50
Australian, clean	8.00
Australian, average	7.50
Puget Sound, clean	6.50
Puget Sound, steam .... $5.00 and	5.50
Pennsylvania anthracite	15.00
Colorado anthracite	12.50
New Mexico anthracite	13.50
Anthracite briquets	10.00
Cumberland, smithing	12.50
Utah, Wyoming and New Mexico, clean (for domestic use only) .... $9.00 and	8.00

Production and Transportation Statistics

The Virginian Railway Company

Shipments over the Virginian Railway for the month of October amounted to 293,971 short tons.

Chesapeake & Ohio Railway

The following is a comparative statement of the coal and coke traffic over the Chesapeake & Ohio lines for the three months ending Sept. 30, 1911:

To	1911	Per Cent.	1910	Per Cent.
Coal				
Tidewater	982,627	22	1,110,098	26
East	483,866	11	396,548	9
West	2,947,198	65	2,616,225	63
Total	4,413,691		4,122,871	
Bituminous from connections	56,581	1	19,208	1
Anthracite from connections	9,579	1	3,841	1
Grand total	4,479,851	100	4,145,920	100
Coke				
Tidewater	1,020	2	13,641	14
East	31,684	57	54,530	54
West	16,755	30	24,899	25
Total	49,459		93,070	
From connections	6,060	11	7,624	7
Grand total	55,519	100	100,694	100

Norfolk & Western Railway Company

The following is the statement of coal and coke shipments, in net tons, over this company's lines for October and for the first 10 months of 1910 and 1911:

REPORT OF NORFOLK & WESTERN RAILWAY

Shipments	October 1910	October 1911	10 Months Ending October 31 1910	10 Months Ending October 31 1911
Tidewater foreign coal	37,054	68,022	913,665	806,893
Tidewater foreign coke	....	....	55,365	61,665
Tidewater coastwise coal	273,624	299,626	2,558,552	2,486,951
Other domestic coal	1,308,581	1,462,687	10,963,159	12,506,216
Other domestic coke	169,723	117,077	2,237,876	1,199,646
Total	1,788,982	1,947,412	16,728,617	17,061,371

Baltimore & Ohio Railroad Company

The coal and coke shipments over the lines of the Baltimore & Ohio Railroad Company for the month of October, 1911, and for the same month of the previous year, were as follows, in short tons:

	1910	1911
Coal	2,722,144	2,801,933
Coke	386.727	338,133
Total	3,108,871	3,140,066

Lehigh & Wilkes-Barre Coal Co.

The following is a comparative statement of shipments by this company for fiscal years ending June 30, 1910 and 1911:

	1910–11	1909–10
From company owned lands[1]	3,042,486	2,885,314
From company owned lands[2]	967,933	962,577
From leased lands[1]	1,104,545	994,789
From leased lands[2]	115,024	140,576
From washeries[1]	137,411	141,668
From washeries[2]	171,943	197,657
Total of all	5,539,345	5,322,583

[1] Coal shipped by company. [2] Coal shipped by tenants.

Coal Exports and Imports for 1910

The exports of coal from the United States during 1910, according to the United States Geological Survey, were 13,805,866 long tons, valued at $41,470,792. Of this quantity 3,021,627 long tons, valued at $14,785,387, was anthracite, and 10,784,239 long tons, valued at $26,685,405, was bituminous coal.

The imports of anthracite amounted in 1910 to only 8,195 long tons, valued at $42,244, and those of bituminous coal to 1,497,709 long tons, valued at $3,975,561.

Lake Shipments from Toledo

Shipments for Hocking Valley docks to Nov. 24 of present year amounted to 2,298,065 tons, which is much larger than for the same period last year.

Foreign Markets

Great Britain

Tonnage arrivals are more satisfactory, but the market has not been materially affected meantime, and prices still show some irregularity for immediate loading. For backward shipment, however, sellers are holding for firm figures for both large and small. The labor situation is regarded more hopefully in view of the decision of the National Miners' Conference not to force a national strike. At present quotations are as follows:

Best Welsh steam coal	$4.08
Seconds	3.90
Thirds	3.63
Best dry coals	3.96
Best Monmouthshire	3.66@3.69
Seconds	3.48
Best Cardiff small steam coal	1.92@1.98
Seconds	1.80@1.86

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½ per cent.

Nova Scotia

Exports of coal from Nova Scotia for the first 10 months of the present year were 4,436,907 long tons. During the same period last year the exports were 3,998,300 long tons, showing an increase for the present year of 438,607 long tons.

Russia

Coal production in the Donetz basin, the most important district in Russia, for seven months, ended July 30 was in metric tons: Anthracite, 1,528,835; bituminous, 9,403,641; total, 10,982,176 tons, an increase of 1,496,194 tons over last year.

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C A

COAL AGE

Devoted to Coal Mining and Coke Manufacture

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COAL AGE

Vol. 1 NEW YORK, DECEMBER 16, 1911 No. 10

THE achievements of every century are summed up according to the personal viewpoint of each observer. The architect looks upon present massive structures of stone and steel as typifying the progress of the age. To the merchant, the modern store with its multitude of departments and thousands of employees housed under one roof, represents best the growth of industry and intelligence. The philosopher regards the mind of the period as the symbol of its grandeur.

However, to the coal operator, whether his view is distant or near, at an angle or direct, the *Zeitgeist* of the 20th century is its "clean-up" tendencies. A failure to realize this truth is the surest way to grease the rungs of the ladder that leads up to successful mining.

Some operators have not caught on to the "Spirit of the Times" and are still worrying along with non-condensing engines, cylindrical boilers, isolated and disconnected power stations, beehive ovens and mule haulage, even on main roads.

Like the "oldest inhabitant," who cannot see the necessity in street cars and electric lights, they are governed by the wisdom of yesterday. The veriest approach of the *Zeitgeist* backs them up against the wall of their self-contentment, from which position national legislation, supported by the army, can hardly dislodge them.

If you suggest to them that many advantages result from the use of telephones in mines, the reply is that perhaps they are all right to order meat from the butcher, but when it comes to sending messages underground, the speaking tube or bell signal down the shaft answers very well.

You mention that three-phase electric current may, in some cases, have numerous advantages, and are told that sparks and shocks at the commutator have not so far done much damage.

When the subject of timbering is discussed and you state that actual tests in European mines extending over a score of years, have shown that one set of creosoted timbers will last as long as three sets of untreated oak, the answer is that the mine will not last forever, and it costs money to provide a plant to treat props.

This same operator will tell you that "our mines are not deep enough to make the question of sanitation underground worth consideration; we have plenty of coal, so what does it matter if we lose a little tonnage and spoil a few acres of surface." Anthracite operators sowed that seed a few years ago and the product of their planting is going to be a harvest of trouble for all except the engineers paid to provide a remedy.

The man who will win in coal mining as in all else is the one alive to the *Zeitgeist*. If the "Tendency of the Times" is to "clean-up," then begin at once, and after you have burned half the useless papers in and on your desk, tear out your antiquated machinery, concentrate your plants and start intensive mining.

Cut your butt-headings off with faces every 2000 ft. at least, and clean out the coal. To secure speed in haulage, you can afford to grade and condition a few main butt-entries, but not 10 more like them.

Of course, you want to keep up the appearance of your product, but the coal that is tarnished will not look any brighter next month or next year. Neither will your dip coal, nor any other tonnage that is hard to get, be easier to mine in the future. There are always a hundred handy reasons for not doing the things we do not want to do, but seldom is there a valid excuse for leaving developed coal.

Do not let the *Zeitgeist* knock in vain, and do not try to work the new mines of today by the old methods of yesterday. Remember that every suggested improvement will be demonstrated to be Utopian. A hundred eminent scientists proved the steam engine impossible and it was shown conclusively that aviation was a mere dream.

If it was not for the Rip Van Winkles that surround us, even General Sherman's vocabulary would not furnish a word to properly describe present-day competition. Some men strive to be above their age, but most of us may well be satisfied to be above our competitors.

Method of Mining in Southern W. Va.

By J. J. Marshall*

The Gas Seam No. 2 at Page, Fayette County, W. Va., is divided by a layer of slate. Where this layer is thinner than 24 in., the two coal-splits are mined conjointly. New workings of this mine are operated on the retreating system.

The financial success or failure of a coal mine, which is the real issue at stake, is due directly to cause and effect and owing to the "intimate connection of its several parts," it is imperative that in judging any one phase we should also keep in mind all other interdependent factors. The matter may be divided into three parts: The nature of the problems presented for solution, the general plan selected as solving these problems, and, last but not least, the manner in which the general plan is interpreted and executed by the operating department. The effect is automatically registered on the cost sheet, which latter is only a true index of success or failure when considered as an average for a term of years. The percentage of recovery is also due to cause and effect, for, given certain conditions and certain methods of mining, the result is inevitable.

In the not far distant past, coal lands were cheap and plentiful; the amount of capital necessary to develop and operate a mine was small, and it is not surprising that the question of percentage of recovery was considered merely an abstract proposition. Now, however, conditions have changed in many respects. Coal lands are rapidly increasing in value. What was formerly considered as reserve territory has been bought up by large corporations, and either developed or held for further increase in value. The amount of capital necessary to develop and operate a mine has become proportionately greater, and the question of percentage of recovery is now one of practical value.

Geological Considerations

The coal beds of West Virginia lying immediately above the Raleigh sandstone are classified as the upper Pottsville or Kanawha measures. The first of these beds is known as the "Eagle" or "Clarion," the second as the "Powellton." This latter is worked locally on Armstrong Creek in Fayette County, but to my knowledge is mined nowhere else. At that point it is 40 ft. below the third member of the Kanawha measures known as the No. 2 Gas bed. This latter bed, together with the Eagle, are worked by the Loup Creek Colliery Company.

No. 2 Gas bed, was at on time erroneously correlated with the Lower Kittanning bed of the Pennsylvania series. Along its eastern escarpment it is frequently divided into two or more benches by slate bands varying in thickness from a few inches to 50 ft., but this splitting of the coal by slates, thick or thin, does not affect the aggregate coal thickness which invariably totals, about 9 ft. In many places the entire bed can be worked as one, but as a rule the benches must be worked separately. This bed, in common with all those of this district, thins down to the westward as it approaches the Ohio River syncline and changes its character both structurally and chemically. Generally it is marked by well defined face and butt cleats, which lie so that the face headings follow the direction of maximum rise. This fact is used to advantage in mining, all face headings getting the full benefit of grade and drainage, as I shall explain later on.

In traveling westward on the Chesapeake & Ohio Ry., the No. 2 Gas bed makes its first appearance in the vicinity of Hawks Nest, in the Gauley and Cotton Hill mountains, at an elevation of about 900 ft. above the river, and has been worked extensively at Ansted since 1873, where it is known locally as the "Ansted seam." This bed passes under the railway grade at East Bank, 27 miles to the west. Numerous rivers and small streams drain this region, and erosion has carved the

Fig. 1. Surface Plant and Inclined Plane, Loup Creek Colliery Co., Page, W. Va.

*Mining engineer, Loup Creek Colliery Co., Page, W. Va.

Note—Abstract of paper read before the West Virginia Coal Mining Institute, Fairmont, W. Va., Dec. 5, 1911.

once continuous beds of coal into irregular and fantastic escarpments. The resulting long and broken outcrop lines offer many difficult problems in both outside and inside haulage. These disadvantages are, however, somewhat mitigated by the absence of explosive gases, which have escaped by the outcropping edges and are rarely found in dangerous quantities under such conditions. The drainage problem is also much simplified.

The report of the chief mine inspector, John Laing, for the year ending June 30, 1910, shows that 31 corporations operating 65 mines in the No. 2 Gas bed produced 5,600,000 tons of coal. To do justice to the methods and results in such a large territory would be an imposition on both your time and good nature, so I will confine myself to the mining operations of the Loup Creek Colliery Co., in the No. 2 Gas bed, and I submit, herewith, a map showing the plan and progress made to date in this mine.

Outside Haulage at Page

The mountains, around Page, rise to a height of 2700 ft. above sea level, or 1700 ft. above Loup Creek. No. 2 Gas bed is 700 ft. above the creek and dips N. 22° W. at the average rate of 100 ft. to the mile. Thus the cover over the coal varies from only a few feet at the outcrop to a maximum of 1000 ft. at the center of the mountain, the summits being capped by the Black Flint ledge. Beginning at the lower tipple (see map), with an elevation of spur track 1100 ft. above tide, a rise of 420 ft. is overcome by means of a double-track incline 1100 ft. long. This brings us to the bench formed at the outcrop of the Eagle bed. Here is located the upper tipple and drumhouse, and to it is brought the coal from both the Eagle and No. 2 Gas beds.

The remaining rise to the latter bed is overcome by means of a tramroad, with minimum curves of 150 ft. radius and maximum grades of 2.8 per cent. As the tramroad rises toward the dip of the coal, some relative elevation is gained from this cause also, so that the road reaches No. 7 drift mouth, at an elevation 1716 ft. above tide, the distance from the upper tipple being 8300 ft. From No. 7 northward to No. 2, the tramroad follows the outcrop of the coal on grades varying from 1.50 to 0.25 per cent., and with a minimum radius of curvature of 100 feet.

Split in No. 2 Gas Seam

A glance at the map will show that the No. 2 Gas bed, in this locality, is made up of two benches which are separated by a slate of variable thickness. This dividing slate may be compared to a finely tapered wedge. Beginning with a thickness of 10 in. at No. 2, it gradually thickens until 30 in. is reached near the mouth of the face entry. From this point southward the increase is rapid until a maximum of about 40 in. is finally reached. Twenty-four inches has been found to be the economical limit beyond which it is not practicable to remove this slate.

Fig. 2. Characteristic Roof Fall after Rib Has Been Drawn

At first, No. 7 was thought to be the last entry where both benches could be mined simultaneously, but later on, it was found that the slate was thinner under the center of the mountain than at the outcrop, and consequently both benches were worked together in No. 8 left. The aggregate thickness of the two benches averages about 9 ft., the upper bench ranging in thickness from 4 ft. 6 in. to 5 ft. 6 in. of clean coal, and the lower bench from 3 ft. 6 in. to 4 ft. of clean coal. Where it is impossible to mine both benches together, the upper bench only has been taken, and the lower bench is left intact for separate working in the future. Hereafter I will describe the coal where both benches are taken as the "high coal," and the seam where only the upper bench is taken as the "upper coal."

Manner of Attacking Coal

From No. 7 northward to the point of the ridge, the mountain, being narrow, is developed by pairs of butt entries, each of which is an independent drift opening, and has been worked as such. From No. 7 entry southward, the mountain widens out to a maximum width of over 6000 ft., and is split by a pair of face entries from which butt entries are turned right and left. In the high coal the entries are driven 10 ft. wide and 110 ft. apart from center to center, the rooms are 400 ft. long, and the barrier pillars 100 ft. wide. In the upper coal the entries are driven 10 ft. wide and 70 ft. apart from center to center, with rooms 350 ft. long, and barrier pillars 60 ft. wide. All rooms are on 60-ft. centers, the interval covering a 25-ft. room and 35-ft. pillar. All crosscuts are driven as prescribed by law, and are from 10 to 14 ft. wide. Except for a few "Pneumelectric" punchers which have recently been obtained, the coal has been mined by pick work, the mining seam being in the middle of the upper bench.

Clearance Height of Headings 54 to 60 Inches

The track gage is 44 in., the outside tramroad being laid with 65-lb., the entries with 35-lb., and the rooms with 16-lb. steel rail of standard sections. All turnouts, and track details in general, are standardized and factory made, thus avoiding duplication of parts and unnecessary confusion and delay in making repairs or replacements. A height of 5 ft. over the rail is maintained in the face entry. In the butt entries that clearance height is reduced to 4½ ft. Loose slate is promptly taken down and, except where it is impossible to avoid its use, no timbering is allowed in haulways. Permanent haulways are brought to a grade wherever this is necessary, and all haulways are kept in a clean, dry, safe and serviceable condition, experience having shown that, even where trip movement is not considered, it is cheaper to maintain a haulway in this manner than to keep a dirty and unsafe haulway in passable condition. Slate and track cleanings, from narrow work, are loaded into the mine cars and sent to the slate dump.

The mine cars are built by, or the materials obtained from, the Watt Mining Car Wheel Co., and are of wooden construction. The following are the dimensions and descriptive details: Height over rail, 3 ft.; 3-belt flared top; 16-in. loose wheel; end brake; weight, 2600 lb.; average load, 2.6 gross tons of coal; patent spring bumpers. From the time the coal leaves the face, until it is dumped into the railroad car, the object has been to make gravity do the work, and only on secondary haulways are there any grades

against the load, and even these exceptions are unimportant.

MULES, MOTOR AND STEAM LOCOMOTIVES

Haulage on the outside tramroad is effected by means of 25-ton steam locomotives, of which there are on hand three, one built by the Baldwin Locomotive Works, and two by the H. K. Porter Co. One steam locomotive can, and has, returned 60 empties up the grade, which makes the capacity 156 gross tons per round trip from the main assembling point at No. 7. The time required for a round trip being 45 min., it can readily be seen that outside haulage is amply provided for.

Up to June, 1909, mules were used to gather the cars from the face and deliver them to the steam locomotive on the outside tramroad. During that month a 500-volt d.c. electric haulage system was installed and, except in the high coal from No. 7 to No. 3, the mules have been replaced by 5-ton Westinghouse and General Electric gathering motors. As it stands now, the former method is still in use from No. 7 to No. 3, but in the territory served by the face entry, the gathering motor delivers the cars to the double parting at the mouth of the butt entry. A 10-ton General Electric motor gathers from these double partings and delivers to the steam locomotive, which in the meantime, has gathered from the mule hauls and is back at the main assembling point near No. 7. I may add here that the 10-ton parting motor is the primary unit of a 20-ton tandem, the secondary unit of which can be added at any time.

From No. 7 the trip is dropped down grade to the upper tipple, where the mine cars are dumped on a Phillips automatic cross-over dump, capacity three cars per min. into the chute which holds 75 tons. From this chute the coal is run into 8-ton capacity monitors which descend and dump automatically into the chute at the lower tipple, the time required for this entire operation being from 1½ to 2 minutes.

DISTRIBUTION OF ELECTRIC CURRENT

Having followed the coal on its journey from the face to the railroad car, we will now trace the electric current as it makes its circuit. Four 150-hp. Erie City return-tubular boilers furnish steam to a 500-hp. Nordberg-Corliss engine, which is belt-connected to a lineshaft. The lineshaft is in turn belt-connected to two General Electric generators rated at 160 kw. and 250 volts which, being connected in series, give 550 volts at the switchboard. The power line, consisting of three No. 0000 copper wires transmits the current to the mouth of the face entry at 520 volts. From that point the current is transmitted to the motors, pumps, etc., by one No. 0000 grooved trolley wire. The return is made through the rail, both rails being bonded with cross bonds every 500 ft. All electric wiring and bonding is kept in a constant state of repair, one man and a boy being detailed to take care of its erection and maintenance.

DRAINAGE.

Drainage presents, on the whole, no serious problems, and in many instances can be made to take care of itself in the natural manner; for instance, Nos. 8, 9, 10 and 11 Right are, and will continue to be, entirely drained by the openings shown on the outcrop. I may add here that $50 covered the entire cost of making the two openings to the dip of No. 10 Right. Siphons are used to unwater such dips as cannot be drained by ditching, yet are within, say, 1500 ft. of an outside opening. Where neither of the above methods is practicable, electric pumps are installed, or, if merely a few gallons have accumulated at a working face, the water box is made to do duty. The pumping equipment consists of 3 Blackmer rotary pumps, geared to 5-hp. motors, with a capacity of 50 gal. per min., and one Curtis rotary pump geared to a 10-hp. motor, capacity 100 gal. per min. The general direction of advance being toward the rise, the new work is not in any danger of being hampered by water from the old work.

FIG. 3. SHOWING EXCELLENT CONDITION OF RIB DUE TO RELEASE OF PRESSURE AFTER ROOF FALLS HAD EXTENDED TO SURFACE

VENTILATION SYSTEMS.

There has been no indication of explosive gas. The dust problem, also, owing to the natural conditions in the mine, offers no serious cause for apprehension. Nevertheless, this question is not overlooked and by keeping the roadways clean, regulating the air current, and, when necessary, using water on dry places, the possibility of a dust explosion is made still less likely. Let us assume that an explosion, or some other catastrophe, should occur. A glance at the map will show that it would, generally speaking, be local in its effect and the survivors would have at hand numerous avenues of escape.

The entries from No. 7 to No. 3, inclusive, are ventilated by means of the ordinary basket-grate furnace and wooden stack. The area of cross-section being large, and the distance the air travels being short, this method has proved sufficient. During June, 1909, the furnace at the mouth of the face airway was replaced by a 60-in., double inlet, Sirocco fan which was guaranteed to deliver 100,000 cu.ft. of air per min. at a 2-in. water gage. This guarantee called for two 35-hp. motors, but only one was installed and it has not been found necessary to install the second one—the fan fulfilling all present requirements and delivering with ease 80,000 cu.ft. of air per min. The fan is installed to either force or exhaust, but so far only the exhaust method has been used. The speed of the motor is varied by means of a field control rheostat, which is an invaluable feature.

EXCESSIVE VENTILATION AVOIDED.

When moisture is being precipitated on the roof of the mine, or when an excess of moisture is being carried away in the outgoing air, the speed of the fan can be easily regulated to deliver, at the working face, only enough air to fulfill actual requirements. By applying "the rule of reason" we will see that, under these conditions, to supply to the miner more air than he actually requires is to unnecessarily increase the risk of his being killed by a slate fall or by a dust explosion. The numerous openings on the outcrop facilitate ventilation, as well as drainage and timber supply, and, by using them as intakes, the speed of the fresh-air currents is kept uniformly low.

The main return, with the aid of an auxiliary air-way from No. 10 Right

to No. 8 Right, is also well provided for. No. 8 Right is aired from the opening which shows just to the right of the fan. No. 10 and No. 11 Right are aired from an opening at No. 6 dip room on No. 10 airway. No. 10 Left, No. 11 Left, No. 13 Left, the face heading and No. 13 Right are aired from the opening at the head of No. 10 Left. No. 8 Left and No. 9 Left are aired from the face entry intake. The head of No. 7 is aired from the opening which is shown to the dip of that entry. In short, this part of the mine is aired from five different intakes. The stoppings, in the face entry, are built of brick or stone, and in the butt entries of plank. Brattice cloth is used wherever it is necessary to deflect the current up into the rooms.

Mining Methods and Results.

Prior to September, 1905, the entries from No. 7 to No. 2 inclusive had been driven in far enough to include the first break-circuit crosscut, and a few thousand tons of coal had been shipped. Sept. 1, 1905, is, however, taken as the date on which the mine was put into operation. The above-mentioned method made it possible to produce a large tonnage from the very first, in fact, the question of output has, within reasonable limits, been regulated by market or transportation conditions. I may add here that the Deepwater Ry., now the Virginia Ry., was then in course of construction and was not in position to furnish the necessary car supply until Sept. 1, 1905. Also, that until the early part of 1909, the road being then declared open for Eastern shipments, the only outlet, available to this mine, was via Deepwater (on the Kanawha River) and the Chesapeake & Ohio Railway.

You will note that, beginning with the ordinary method of driving rooms and drawing pillars on the advance, the mine is now in condition to work the butt entries on the retreating system. This reversal in general method has been accomplished without lessening the output or adding materially to the cost of production. It will be readily understood that, with such an irregular boundary, no cut-and-dried method could be followed, so the object has been to fit the method to the place.

All entries and rooms are driven on centers, the sights for which are put in with a transit. This is a hard and fast rule, and the straight lines drawn on the map represent actual conditions. The time and labor required to put up these sights is small, the miner can check up the course of his place in a few minutes, and the advantages gained are too numerous and too apparent to require enumeration. The pillars are drawn in steps, and Fig. 5 shows the details of the method used.

Roof and Floor of Mine.

The roof of the mine varies considerably in both action and composition. It is of blue slate, sand slate or sandstone

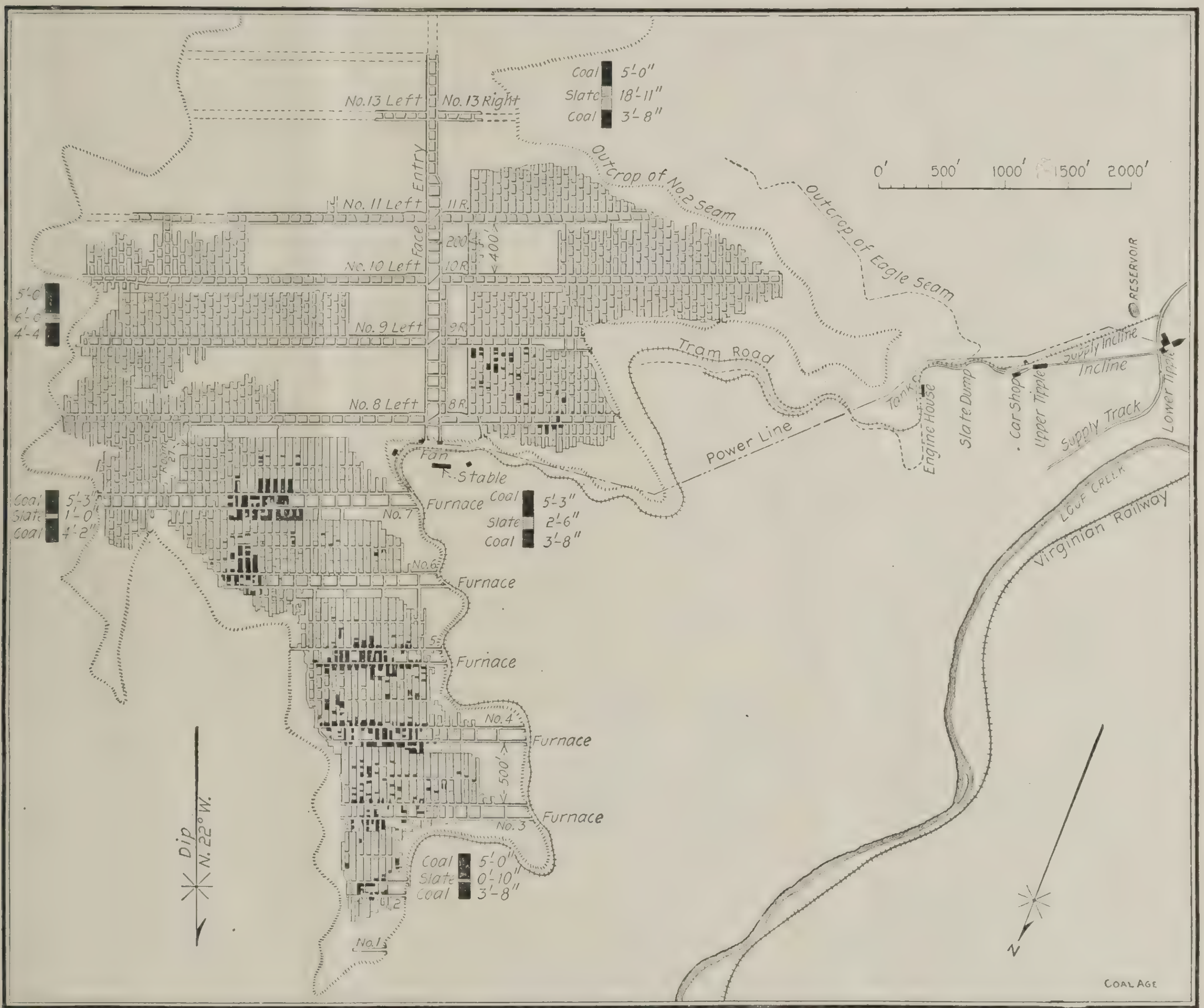

Fig. 4. Map of No. 2 Gas Mine, Loup Creek Colliery Co., Page, W. Va.

and slate mixed. It is usually stratified for a height of from 75 to 100 ft. Above this a massive sandstone ledge is reached, and this latter is hard to break.

In the high coal, the floor of the mine may be classed as good and consists of 8 in. of slate surmounted by sandstone. In the upper coal the floor, which is the previously mentioned dividing slate, is good in solid work and usually reliable in pillar work. In the latter case it has only given trouble when thin and in contact with water. Under such circumstances it may slake and creep. In the entries from No. 7 to No. 2 inclusive the rooms were worked on the advance and were turned as soon as available. The general method of pillar drawing, in this section, has been to draw the room pillar to within 100 ft. of the entry on the advance, and then draw the barrier pillar, chain pillar and room stump on the retreat.

The general grade of No. 6 entry is nearly level, but there are several depressions which, due to the pillars being drawn to the rise, catch a considerable volume of water during the rainy season, and for this reason the retreat has been seriously interfered with.

Loss From Squeeze.

In April, 1910, the pillar drawing in No. 7 entry was advancing in strict accordance with the general method, and all indications were that the roof was breaking as soon as the coal was removed. During that month a squeeze came on and it was only by hard work that the entry, from room No. 12 to room No. 20, could be kept open. This made a change in method imperative, so room No. 27 was turned into a haulway, and the coal from beyond the affected area was hauled that way to No. 8 Left. An attempt was then made to start in the center of the affected area and to retreat in both directions, but it was found impossible to get enough open space to insure a good fall.

The men were all withdrawn and the roof allowed to settle until this past August, and by working only one place on each side, a good start has been made toward getting a fall that will break the top far enough up to relieve the pressure. The only reason I can assign as the cause of this trouble is, that the previously mentioned sandstone ledge had not been broken, or that the roof was subjected to strains about which we, at present, know practically nothing. This occurrence is a concrete example of the advisability of working on the retreating system, and had it not been for the outlet through No. 8 Left, the coal beyond the affected area would either have been lost or the profit therefrom eaten up by the cost of maintaining an outlet.

The face entry was started in July, 1906, and, together with the right and left butt entries, was advanced as fast as circumstances would permit. No rooms were turned in this section until June, 1909, and the object has been to draw the pillars on the retreating system. The pillars in No. 9 Right were drawn retreating and the line of retreat continued down into No. 8 Right. Thus in No. 9 entry a recovery of practically 100 per cent. was obtained.

When the line of retreat coincided with the center line of the overlying spur, a period of wet weather occurring at the same time, a creep caused the loss of coal shown at that point, but this was overcome and a normal recovery was again obtained. The pillars in No. 11 Right are being drawn both on the advance and the retreating system. Those to the dip of No. 10 Right are being drawn on the advance, though four have been left to protect the air intake and drainage outlet. But pillar work is just being started on the head of the entry and hereafter the pillars will be drawn on the retreating system.

No. 12 entry was not turned because it would have come on the top of a small anticlinal fold, and the territory which would have been served by it can be served just as well by rooms from No. 13 airway. Nos. 10 and 11 Left are extended so that both rooms and pillars can be worked on the retreating system. In No. 9 Left the pillars are being drawn, both right and left, on the retreating system. The pillars in the upper end of No. 7 and No. 8 Left will be drawn on the retreating system with No. 8 Left as an outlet for both.

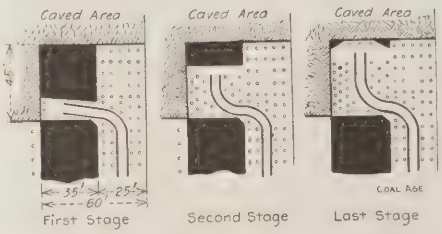

Fig. 5. Illustrating Method of Drawing Pillars

Success of Foregoing Methods.

Generally speaking, these methods have necessitated only a minimum amount of deadwork, of mine timber, and of track work and track materials. Also the large blocks of coal, which are at present left intact, should prevent the general extension of any trouble which may be brought about by the removal of pillar coal. In Fig. 3 is shown the condition of the rib of No. 10 Right airway between the face entry and the first room to the dip. This excellent condition is attributed to the fact that the entire removal of coal in No. 9 Right caused the roof falls to extend to the surface, 500 ft. above, and thus relieved the pressure.

In cost of production, the aim has been to secure a *minimum average*, rather than to let each month stand for itself alone. The cost of labor and material per gross ton of coal mined, was less for the year 1910 than for the year 1906, and for the five inclusive years the difference between maximum and minimum was less than three cents.

On June 30, 1911, the percentage of recovery stood as follows:

PERCENTAGE RECOVERY OF COAL

	Total Area From Which the Coal Has Been Extracted, Acres	Total Area in Which the Coal Has Been Lost Acres	Total, Acres	Percentage of Recovery
High coal (both benches)	77.75	6.86	84.61	91.8
Upper coal (upper bench only)	67.00	0.87	67.87	98.7
	144.75	7.73	152.48	94.9

Our Foreign Trade

British Correspondence

There is not much occasion for surprise in the report that several transatlantic lines are proposing to make use of American coal instead of British and other products. The reason for such a step is doubtless the same as that which has prompted the Egyptian State Ry. to ask for tenders for American fuel, namely, high prices and the fear of a widespread checking of supplies following upon a general strike in England. Already it is said, the White Star line has been coaling its vessels at New York taking aboard sufficient to last for the round trip.

Leaving the best Welsh out of the question as being in a class by itself, there is probably little difference between American coal and the high-grade British of similar description. In any case, if, as is alleged, supplies can be obtained at a substantially lower rate and without difficulty, steamship companies are acting wisely in developing a new source of supply. They learned a severe lesson at the time of the recent strikes at Liverpool and Southampton, and they are not likely to be caught napping should a national strike of the British miners take place.

Experience has shown that although moisture weakens some roofs it is usually alternate wetting and drying that does the greater part of the damage, especially where the roof is clay stone.

The Explosion at Briceville, Tenn.

Editorial Correspondence

This most recent disaster occurred in the Cross-Mountain mine No. 1, of the Knoxville Iron Co., and is thought to have killed 84 men. There is a disposition to regard the fireboss as negligent.

[*The following report was received by telegraph from a* COAL AGE *editor who is at Briceville making a personal investigation. Further details, with views of the ill-fated mine, will be published next week.*—EDITOR.]

A violent and disastrous explosion occurred at 7:20, the morning of Dec. 9, in the Cross Mountain mines of the Knoxville Iron Co., at Briceville, Tenn. It is thought that 84 men were killed. The bodies of 31 have been found. Five men were taken out alive, Monday night, Dec. 11.

The Cross Mountain mine No. 1 is located on a branch of the Southern R.R., four miles from Coal Creek, in Anderson County, Tenn. It is a drift mine developed along the room-and-pillar system, with butt-headings and airways right and left. The Coal Creek seam is mined, having a thickness of from 3 to 4½ ft. The bed lies about 35 ft. above Coal Creek at the drift mouth and at an elevation of 1006 ft. above sea level.

The coal is clean and shiny, and much dust collects on the roads. The mine is classified by the Tennessee State Mining Department as one which is dry and dusty to such an extent as to render it dangerous from dust explosions. State inspection is required every 60 days. The roads were occasionally watered, but no steam or water sprays were installed. Open lights were used. The coal was undercut by machines to some extent and also mined by hand pick. Black blasting powder was used for the coal and dynamite for the rock. Clay was supplied for tamping and its use ordered. No shot firers were employed.

The drift enters the mountain on an average grade of 1½ per cent. for 3100 ft. to a summit, and then descends on the same grade. No. 28 is the last butt-heading to have been turned off on the right and No. 26 the last on the left. The crossheadings are practically worked out as far as No. 15 Right and No. 17 Left which are the first headings still working. These headings, for the most part, are driven wide and the waste rock gobbed on one side.

Brick stoppings are used between the main face entry and its air-course, while the stoppings on the butt entries are mostly built of stone.

Electric-motor haulage is installed on the main entry for 6600 ft. The mine cars have no end-gates, but merely a latched crossbar, and the rear end of the car is low, both of which facts cause a great deal of coal to be dropped on the roads. Direct current of 250 volts was used for the motor haulage and also for driving the ventilating fan. The men push the cars in and out of the rooms and they are hauled by mules to a side-track in the main entry.

The Cross Mountain mine is said to have been worked for the past 20 years. No previous explosion of any consequence has been recorded, but gas has been found in small pockets, and has been lighted in bore holes. Sometimes dust has increased the force of these ignitions. In 1902 the neighboring Fraterville mine exploded, killing 200 men.

Ventilation was secured by means of a 7-ft. diam. Capell fan, rated to operate at 300 r.p.m. and installed at the foot of an airshaft, at the summit, 3100 ft. from the drift mouth. This fan was operated as an exhauster, the air entering at the drift mouth. It was driven by a 250-volt direct-current motor. The fan was destroyed by the force of the blast and the attendant killed.

It is claimed that the fireboss, J. F. Hatmaker, of Briceville, had recently inspected the mine and found no traces of gas. It is also said that the state mine inspector and the agent of a casualty insurance company had made a recent inspection. Rumor has it that Fireboss Frank Hatmaker may have been negligent in the performance of his duties.

The morning of Dec. 9 at Briceville was dry and warm. As stated, the explosion occurred about 7:20. Three men are reported to have been entering the mine at the time of the blast and to have escaped. It was several hours before organized rescue work could be attempted. A special train was sent out from Knoxville, in charge of T. I. Stephenson, president of the mining company, carrying members of the local mine-rescue corps with their rescue equipment.

In the mine, heavy falls of rock were encountered. The roof is of slate and bad for 4000 ft. from the mouth of the drift. Owing to roof falls, the headings here vary from 8 to 14 ft. in height and are heavily timbered. The timbers were disturbed clear up to the mouth of the drift and other evidences of the violence of the explosion were manifest. The gob from No. 23 Left was blown into the face entry, and the rails of the haulage road were bent. Attempts were made to restore ventilation by building a fire in the airshaft. Later a 10-ft. diameter blowing fan was secured from the Black Diamond mine and erected at an old opening to aid the rescue work. The air was forced along the passages where it had previously been pulled, but the direction of the usual current was not reversed. Brattices were built, but little progress could be made on account of the extensive cavings.

Sunday, the men were divided into gangs of 50 each, working a 2-hour shift. The débris was hauled by mules to the mouth of the drift and by 9 o'clock in the evening, after nearly 36 hours of continuous toil, the rescue parties had penetrated practically to the head of the main entry, and eight bodies had been removed to the surface. Of these, three were found sitting in a mine car and the balance discovered lying on the ground. All bore evidence of having been killed by gas, burning or by the violence of the explosion.

At daylight, Monday morning, efforts were directed toward penetrating the cross entries and a number of these were explored during the day. A second rescue car arrived, making three crews of helmet men on the scene. By night a total of 22 bodies had been taken out. At 11 o'clock, Monday night, five men were discovered alive in cross entry No. 19, seemingly little worse for their experience. Immediately after the explosion they had built themselves in with stone brattices. Two others, originally of the party, crept out and cannot now be found, although the indications are that they still live. The other five were able to walk to fresh air after being immured for 60 hours. One of the number was badly burned.

President Stephenson had all along maintained that many of the men would be found alive in their working places if they could but be reached in time. The discovery of the five living men, of course, lent renewed impetus to the work of the rescuers.

Mine-rescue cars from several sections of the country were immediately dispatched to Briceville as soon as word of the explosion had been received. Dr. J. A. Holmes and Messrs. Paul, Rutledge, Ryan and Burke are in charge of the rescue work. Every miner in the vicinity is reported to have offered his services. The local industry is practically suspended until the work of rescue shall have been completed. So far, 31 dead have been found, and 5 recovered alive; and it is estimated that between 50 and 60

are still entombed in the workings. The dead bodies all bear evidence of violence or burning.

The seat of the explosion has not yet been determined, but it is thought to lie on the left of the main entry. All indications seem to point to the fact that, however it may have originated, this was a dust explosion of great severity and strength.

Forestry for Mining Companies

Richard C. Eggleston*

The underlying idea of forestry is not *saving* but *use*—not alone present use, nor future use, but *continual* use. The object of forestry is to secure the closest, cheapest and most profitable utilization of the present forest products, and at the same time provide for a continual forest production. Hence, the forester regards and treats the forest as a growing crop, which must be cut when ripe and replaced when cut.

It cannot be argued that forestry would be a profitable investment to all private timber owners. However, with good markets, reasonable taxation and security from forest fires at a reasonable cost, a profit from forestry can be assured.

It is undoubtedly a function of the state to protect private and corporation owners of forest lands from fire, trespass and unreasonable taxation. But in most states, such encouragement, especially as regards the question of taxation, has been limited. Notwithstanding this condition of affairs, many private owners are making good profits by the practice of forestry.

Mining Forestry Encourages Use of Small Timber

Too much stress cannot be put on the importance of markets in the profitable practice of forestry. Good markets are the basis of intensive forestry; and coal-mining companies are particularly well situated in this matter; for they create markets not only for ordinary lumber, but for small forest products as well, such as room, mine and motor-track ties, mine props and poles. Hence, mining companies should be ardent advocates of forestry. It would be a good investment even for those whose dependence on a local timber supply was less binding. But mining companies are very intimately concerned with timber, if the enormous quantities used per annum have any significance.

Concerning the question of waste, Mr. Zon, of the United States Forest Service, says:

"In logging for mining timbers under present methods fully 40 per cent. of the timber handled is wasted. The chief items of waste are high stumps, tops, partially used bolts and even whole trees which are felled and rejected because slightly twisted in grain. The greatest mining demand upon the forest is for props, which are 3 or 4 in. square and from 4 to 9 ft. in length. Another large demand is for tram ties. Under such conditions clean logging and the fullest utilization of the tops down to a diameter of 4 in. should present no difficulty if proper supervision is given to logging operations. To secure a close utilization of timber it would be best to saw into the required sizes the rougher material from the tops as well as the entire stems of those species which are difficult to split, instead of following the present practice of splitting the timber into props and rejecting all logs that will not split readily. If mining timber is cut into bolts of the required lengths in the woods, it can be sawed at the mines to the required sizes at a great saving over the present wasteful methods of manufacture by splitting."

Mining companies are dependent on the local timber supply and the time is not far distant when the adoption of a sound forest policy will become a necessity. Already forestry has found a place in railroad management, and railroad companies with their hard economics are not much given to fads.

Correct Forestry Principles

A forest policy for mining companies should be developed along the following general lines:

(1) Protection from fire.

(2) Working the woods properly, so as to secure the greatest economy in the utilization of the timber.

(3) The employment of a trained forester for the organizing and supervising of the forest work.

In general, the system of fire protection will include: (a) the rigid enforcement of the fire and stock laws of the region and the securing of the state's coöperation, both in the matter of taxation and fire patrol; (b) the education of the local public as to the damage done to the community by fires, and the securing of their good will; (c) the establishing of an efficient fire patrol during the dry season; and (d) the piling and burning of brush when the weather conditions are suitable.

In order to have the woods worked properly, the following rules should be enforced:

(1) Stumps should not be higher than 18 in., and lower when possible.

(2) All felling should be done with the saw.

(3) All merchantable material in the tops down to a diameter of 4 in. should be utilized. Smaller material should be used if possible.

(4) All cut or fallen trees should be prepared for use.

(5) No bolts should be left in the woods.

(6) When possible, trees should be felled up-hill, thus lessening the danger of breaking.

The services of a trained forester are needed, temporarily or permanently, depending upon the duration of the forest work to be performed. He is needed not merely to supervise the cutting and disposition of the timber, but also in silviculture, which is the art of establishing, developing and reproducing forests. For in developing a forest policy, the selection of the correct system of silviculture to be used is a factor of great importance.

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NOTE—Abstract of paper read before the West Virginia Coal Mining Institute, Fairmount, W. Va., Dec. 5, 1911.

Tamping Explosive Charges

Special Correspondence

Thomas Johnson, of Dudley, Worcester, England, has introduced a new device for tamping or stemming explosive charges. The form of the device is that of a cylindrical plug made of an argillaceous composition and of an identical shape with the familiar charge of compressed gunpowder. The first plug to be introduced into the hole following the charge, called the "primer" plug, is immersed in water for a few seconds. Its nature is so readily absorbent, and several perforations running through its entire length render such assistance as to cause it to take up almost half its weight of moisture without any exudation whatever; from this fact it is obvious that a quantity of moisture introduced on the top of a charge must considerably minimize the danger in gaseous mines.

In a personal communication, the inventor says that if the plugs are properly stemmed with a copper-ended rammer, a blownout shot is impossible, the stemming becoming as hard as the coal it is intended to blast. As time savers, the plugs are a great asset, a hole being stemmed in less than one-tenth the time usually taken. No detonator wires can be cut or damaged as the material is of a smooth or velvety nature. It is added that as much as 33⅓ per cent. of explosive has been saved by their use, and it follows that through the stemming being vastly superior to clay and other similar materials, the efficiency of the explosive is greatly increased.

An Actual Test

In the description of an experiment at the Oxcroft colliery belonging to Mr. Markham, M. P. for Mansfield, England, it is stated that the first hole in the coal was 4 ft. 6 in. deep, charged with Bob-

binite. This was tamped with a damp primer and five dry plugs. The shot was fired, and on returning, the managers expressed themselves well satisfied with the report, which was instantaneous.

In the next hole, overlying the coal charged with Bobbinite, four solids and one primer were used, and the shot did its work equal to the first shot. Then it was suggested that only three solids should be used in a 4 ft. 6 in. hole in the coal, and after discussion is was decided to use only three solids 2¼ in. in length, that is 6¾ in. of tamping in a 4 ft. 6 in. hole. When this was done, the plugs resisted being blown out and held the explosive charge well up to its work, with the result that much bigger coal was got than with the old methods of tamping.

Somewhat similar experiments, with equally favorable results, were conducted at the Cannock & Rugeley company's chief pit. The shots were fired by electricity, and on returning it was found that the explosive and tamping had brought down excellent lumps of coal, thereby saving 25 per cent. In the third shot hole, 4 ft. deep, they charged up with 2¼-lb. cartridges instead of 3-lb., and tamped with four plugs. This was a saving of 33 per cent. in explosive, and the work was well done, the coal being got in massive lamps. "The experiments in the Cannock deep hard coal," it is added "clearly prove once and for all that with these plugs, the holes can be tamped in a half a minute—25 per cent. saving in explosives and bigger coal the result."

A Personal Opinion

In a communication in which he says his opinion generally of these plugs is high, and that their use is worthy of recommendation, Mr. Blunt, manager of the Oxcroft colliery, gives his reasons as follows:

(1) If these plugs are used it prevents the careless use of coal or dust.

(2) The cartridge-like form of the plug and the material from which it is made renders the aid of stemming a shot-hole easy, and at the same time perfect.

(3) No damage can be done to the wires of the detonators owing to the plug being free from any hard substance, thus preventing misfires; the cutting of the detonator wires is the most common cause of missed shots.

(4) Blownout shots will be prevented as the shot-hole will not be the line of least resistance. The dampening of the primer plug with water no doubt causes the plug to swell, and backed up with the solid plugs renders the shot-hole solid.

In the case of shot-holes being bored into a break in the coal or stone, as the case may be, these plugs can be fixed into the hole before the explosive, and they will no doubt thoroughly fill up such break. If such breaks or cracks should contain gas, the possibility of lighting the gas is rendered less liable. The length of stemming in the hole on the explosive can easily be known, as the shotfirer can count the number of plugs placed in, thus the danger of any hole not having sufficient length of stemming can be prevented.

(5) The efficiency of the explosive in doing its work is increased, because the primer plug removes all air bubbles from the shot-hole, and the heat generated by the explosive when fired causes a greater expansion of gases.

(6) Time is saved in firing the shots. The deputy or shotfirer who may have a good number of shots to fire on his rounds, knows that the stemming is ready and needs no examination for coal or coal-dust. The shot-hole can be stemmed in less than half the time that is consumed with the ordinary self-made pellets of clay.

Kentucky Mining Institute Meeting

The attendance was not large, owing to the inauguration of the governor and the fact that the mines are working full time. A number of interesting papers were read.

The winter meeting of the Kentucky Mining Institute, held in the College of Mines Building, of the Kentucky State University, in Lexington, Dec. 11, presented an unusual anomaly, a scanty attendance being coupled with papers of more than ordinary interest and value.

B. R. Hutchcroft, mining engineer, the appointee of the executive committee, in place of John Bond Atkinson, deceased, opened the meeting at 2 p.m. The appointed president of the meeting spoke with much evident feeling regarding the loss sustained by the institute in the death of Mr. Atkinson, whose sterling qualities had endeared him to all mining men in Kentucky.

The paper by C. R. Conner and W. H. Cunningham was the first read. Mr. Cunningham carried his arm in a sling as a result of a recent railway accident. His paper on "Boreholes for the Relieving of Accumulations of Gas" will be published at length in a following issue of this paper, together with the remarks of Prof. C. J. Norwood, which followed as discussion.

Other papers read were by J. E. Butler, superintendent of the Stearns Coal & Lumber Co., of Stearns, Ky., and Mr. Woodward, of the Carnegie Steel Co., who presented a paper on "Steel Mine Timbering"; both of these papers will be published in a later issue of Coal Age.

R. D. Quickel, of the fuel department of the Queen & Crescent R.R., read a paper on "A Few Factors Entering into the Purchase of Coal for Locomotives." One interesting point in this latter discourse was to the effect that the department of which Mr. Quickel is chief had found that 5-in. lump coal had 33½ per cent. greater efficiency than 2-in. lump.

F. J. Fohs read a paper on the "Importance of Statistics," in which he pointed out that statistics were prepared for no one more especially than the operator, and that mining men should assist more readily in their collection, and endeavor to make the statements of the statistician as correct as possible. This paper had but little reference to coal mining, and it is, therefore, not reproduced.

Prof. Norwood, who, as chief mine inspector of Kentucky, collects all the statistics of the mining industry, drew attention to the fact that though the state had a low fatality rating, and though the mines were as safe as any, the underwriters assessed the operators in Kentucky more for liability insurance than the operators in any state of the Union. Two insurance companies had refused to accept risks of that nature in the state. He said that operators returned all accidents, however small, without giving sufficient details to show whether they were serious or not. Some operators marked all accidents as not serious, and he was obliged to change their reports, knowing this defect; he added further that he was at a loss sometimes as to what changes to make, because they did not sufficiently indicate the nature of the injuries their operatives had suffered. He advised more careful reporting of accidents to the end that the underwriting of operations in the state might be made less burdensome to the operators.

H. H. Small, of the Goodman Manufacturing Co., then delivered an *ex tempore* address on mining conditions as he had found them in Europe.

The attendance at the meeting was much affected by the coming inauguration of the governor, at Frankfort, the following day; moreover, the mines are now working full time and the members found it hard to leave their mines.

The treasurer, M. L. Conley, was unable to be present, being at the hospital undergoing treatment for typhoid fever.

An Anthracite Plant, Hazleton, Penn.

Special Correspondence

The Andenried breaker of the Lehigh and Wilkes-Barre Coal Company is a successful modern installation of 1500 tons daily capacity. The method of preparation is typical of the Lehigh region.

The Audenried colliery of the Lehigh & Wilkes-Barre Coal Company is located at the town of that name, about 3½ miles from Hazleton, Penn. The operation is an old one, dating back some 40 or 50 years. The breaker erected in 1870, after good service for over 30 years, was destroyed by fire in 1904 and the present thoroughly modern plant was subsequently built. This has satisfactorily handled a daily output of 1500 tons, during the past four or five years.

A photograph showing the breaker and surroundings is given on the front cover of this issue. The structure, as will be noticed, is rectangular, compact and self-contained, unlike many of the older and frequently remodeled buildings in the vicinity. It is of timber construction throughout, with concrete foundations and a concrete floor under the loading pockets. Coal is brought to it from the mines by a slope rising on the side of the building opposite to that shown in the photograph. The hoisting-engine house for this slope may be seen in the foreground of the picture.

In this region, the eastern middle anthracite field, the coal is obtained almost entirely by pitch mining and a considerable amount of rock is necessarily brought out with it. Large quantities of water accumulate in the steeply pitching workings and most of the coal is wet as it comes from the mines. This fact makes it necessary to wash practically all the coal as it passes through the breaker in order to remove the fine material which adheres to the surface of the lumps. There is little or no dry preparation and incidentally the whole scheme is simplified on this account. The plan of preparation at the Audenried plant is shown in Fig. 1. A distinctive feature is the separation of flat coal from the balance of the stream as it leaves the screens and the treatment of this flat coal by means of spiral pickers.

Following the course of the coal through the breaker, it is seen to be first discharged from the dump chute onto a set of oscillating bars which remove the lump coal and allow steamboat and smaller to pass through to a hopper beneath. The lump coal passes from these bars to a moving picking band and here rock is removed from it by hand. It is then crushed and led to a revolving screen which takes off steamboat size. The oversize from this screen is passed through a set of No. 2 rolls and rejoins the undersize on its way to a double revolving screen which makes broken and egg size coal. The small coal from this screen is led below to two sets of shaking screens which make stove, nut and pea sizes. After careful examination, all sizes from broken to pea coal, are passed

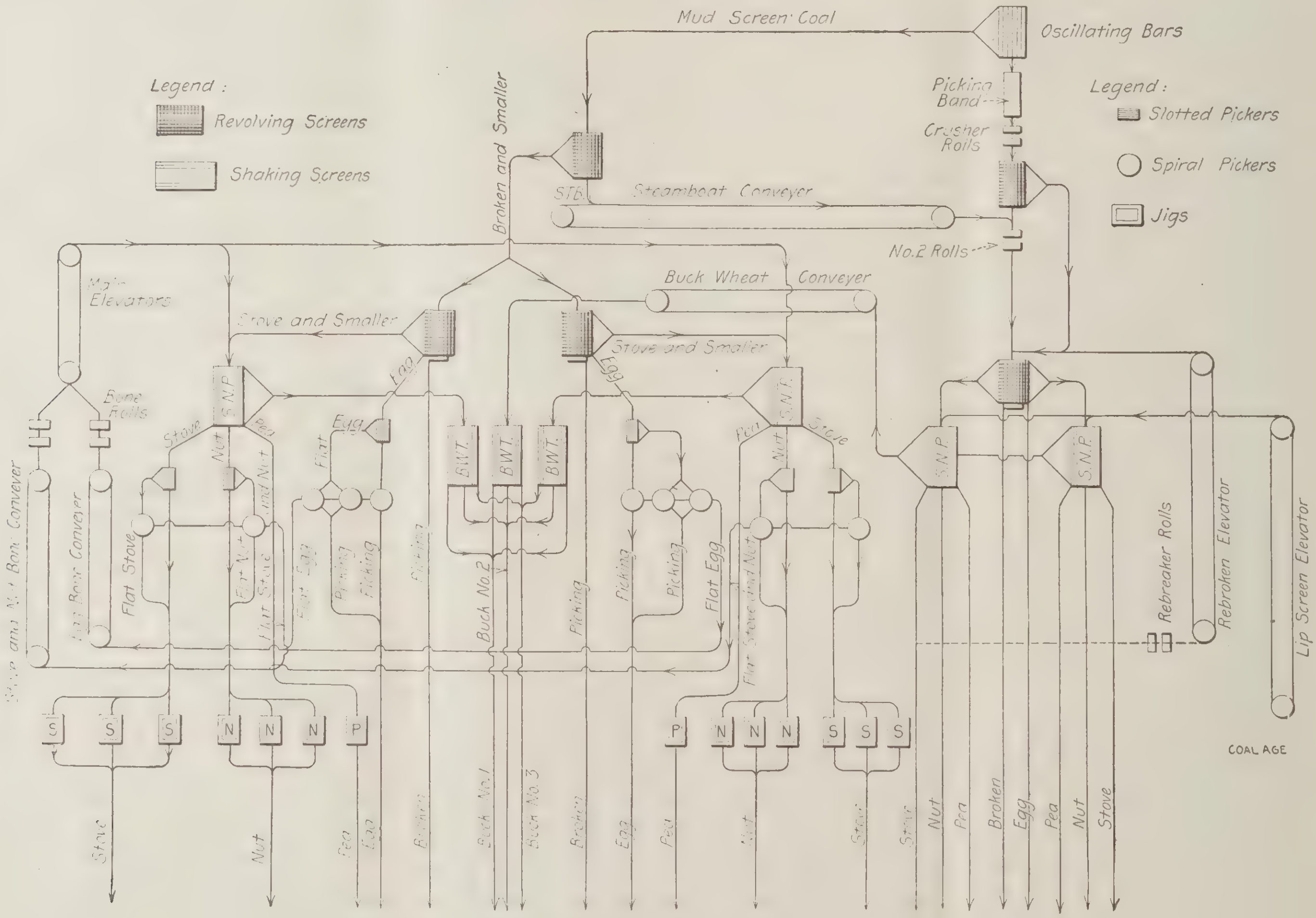

Fig. 1. Diagram of Preparation, Audenried Breaker

directly to the pocket. The fine coal passing through the pea-coal shaker, is conveyed to a set of buckwheat screens at the rear of the breaker, which makes three sizes of buckwheat; Nos. 1, 2 and 3.

Following next the mud-screen coal, which passes through the oscillating bars, this is led first into a revolving screen that takes off steamboat size, which is examined and then conveyed to the No. 2 rolls, mentioned before. The undersize from this screen divides and passes to two double revolving screens which make a separation of broken and egg coal. The broken coal formed here is hand picked and passed directly to the pockets; the egg coal is mechanically divided into flat and round material. The former portion is passed over two sets of spiral pickers, the latter over one picker. The cleaned egg coal is examined and sent to the pockets; the boney coal is collected and sent to the boney-coal conveyers.

Handling the Undersize

The undersize from each of the double revolving screens is led away to two sets of stove-, nut- and pea-coal shakers. The stove and nut coal from these screens is divided just as is the egg coal; that is, flat material is mechanically removed and passed over two sets of spiral pickers. The balance of the stream goes to the jigs. There are in all 14 jigs; six stove-, six nut- and two pea-coal jigs.

The undersize from the last mentioned batteries of shaking screens passes to two sets of shakers which make the three buckwheat sizes. Buckwheat coal is not jigged. The boney-coal refuse from the mechanical pickers is conveyed to rebreaking rolls where it is crushed; it then passes to the main elevator and is thus returned to the mud-coal stream for repreparation.

Provision is made for breaking down the larger sizes of coal and subsequently re-sizing same. There are two loading tracks and the usual elevator for lip screenings and condemned coal. An admirable feature of this plant is the rock pocket of ample capacity which extends across the full width of the breaker and discharges as required into rock cars, which are handled by small steam locomotives. The concrete floor already referred to as paving the space beneath the loading pockets is self draining and aids greatly in keeping this portion of the plant in a cleanly and presentable condition. The breaker is steam-heated throughout. This colliery is one of ten owned and operated by the Lehigh-Wilkes-Barre Coal Company in the Wyoming and Lehigh districts of the anthracite coalfield. C. F. Huber is vice-president and general manager.

Coaling Stations at Panama

A recent consular trade report states that the bunkering and equipping of the world's transportation lines which are expected to pass through the Panama canal should involve an immense sale for American fuel and ship stores. In this connection, the report goes on to say, the following interesting recommendation is made by Col. George W. Goethals, chairman and chief engineer of the Isthmian Canal Commission:

"The revenues of the canal should go to pay not only the operating expenses, but to repay the capital invested. Every legitimate means for increasing revenue should therefore be adopted. The Government should have coal and fuel oil on hand for its own vessels, and these commodities should be sold to other shipping which uses the canal. These should be supplied at an established rate and purchased after advertisment."

Coaling and Docking Facilities

"As the act of June 28, 1902, contemplates the construction of terminals for the canal, any addition to the docks should be such as to form a part of the final scheme, which should also include coaling facilities and a dry dock as necessary adjuncts to the canal. These facilities were to include the storing and furnishing of coal and other fuel for use both afloat and ashore. A coaling station is contemplated at each end of the canal and an arrangement of docks which will permit subsequent additions."

As the opening of the Panama canal to commerce is now expected to be as early as 1914, it would be well to look forward to prospects for the sale of coal and ship chandlery from the United States. The coal bunkering of vessels should develop into enormous proportions, as the canal will be the "halfway house" between the East and the West, and its location indicates that it should become the greatest coaling depot in the world. Some idea of the amount that will be needed at Panama may be gained from the fact that the coal bunkering at the Canaries now amounts to about $5,000,000 worth annually. England's coal exports aggregate about $200,000,000 a year, much of which is for coaling vessels in foreign parts, while in addition 2,000,000 tons are "shipped for the use of British steamers engaged in the foreign trade." It would not be too much to expect an annual coal and oil traffic of $10,000,000 to develop at Panama.

The Isthmian Canal Commission advises the Bureau of Manufactures that "if the supply depots are established it is thought that the supplies for same will probably be purchased in the same manner as supplies used in the construction of the canal are now secured, namely, by advertising for proposals, which method gives everyone an opportunity to bid.

Pacific Coal Industry and the Canal

Looking into the future, coal dealers are wondering what effect the opening of the Panama canal will have upon the coal trade here. It is believed it will depend largely upon what inducements are given American vessels to enter the coastwise trade, a question now being vigorously agitated in the press of the country. Owing to the expense of getting coal from the large fields, steamships in the coastwise trade are nearly all burning oil, and river steamers discarded wood and coal for oil several years ago. Low transportation charges through the canal, it is pointed out, may result in a return to coal.

A number of European steamship companies are turning their eyes on the Pacific coast with a view to establishing regular steamship lines between ports on the coast and Europe. With them fuel is an important question, and they are now seeking information on what may be expected along that line.

Portland is preparing for the increased steamship traffic that it is believed will follow the opening of the canal by building municipal docks equipped with the most modern coal bunkers and apparatus for coaling vessels, and the question where the coal is to come from is, therefore, a matter of conjecture. At present vessels for off-shore destinations usually take on enough coal here to carry them to Comox, B. C., to fill their bunkers.

Overwinding

Messrs. Pickering and Poole, in their paper on contrivances designed to prevent overwinding, presented the following conclusions for the discussion of the members of the British Institution of Mining Engineers:

(1) That the provision of automatic controllers makes enginemen more attentive and prevents slovenly and irregular winding.

(2) That the provision of automatic controllers, detaching hooks and similar appliances will prevent many accidents from overwinding and some from breakage of ropes and cage attachments.

(3) That it is desirable that all large winding engines should be fitted with such controllers.

(4) That detaching hooks are necessary, except in cases where the shafts are shallow and the winding speed slow.

(5) That at large, modern collieries, additional "keeps" should be fixed in the pit frames.

(6) That in many instances movable junctions might with advantage be fixed at the landings.

(7) That a revised method of determining the breaking strain of detaching hooks is desirable.

Gravity Planes with Monitors

Special Correspondence

Describes a system of gravity-plane haulage using monitors or gunboats. These planes are often highly inclined, causing an excessive waste of coal when using the ordinary mine car, which is avoided by the use of monitors.

The monitor system is a method of lowering coal, ores, etc., which has been in use for quite a number of years in some sections, but has never been introduced in the majority of mining communities. It, of course, has its drawbacks and its advantages but its good points are believed to be so far superior to its weak ones that only the former will be considered.

The monitor system, which is applicable on all grades of 5 per cent. and over, consists of a lowering device (either drums or sheaves, preferably the latter), two large wood or steel cars, termed monitors, of from 5 to 20 tons capacity, an adequate rope and the necessary rollers and track suitably arranged. All of the above, with the exception of the track arrangement and the monitor cars, are so well known that they need no description in this article.

The Monitor Car

The monitor car of the present time is usually of steel and has a large capacity. It has various shapes and sizes and many different means of operation. The most common form of monitor car is the cylindrical type, the diameter of which is usually fixed by the gage of track and outside conditions in general. This type of car is used where the grade is fairly heavy, and it is built up of a number of steel rings, usually 4 to 5 ft. in width, firmly riveted together.

The front or lower end of the cylindrical car is closed, the top half being riveted to the cylinder or body of the car, as shown in Fig. 1. The bottom half, or the door, is hinged to the top half, and the door fits into a chute, or what is commonly known as a "hog-snout." This chute is usually lap jointed to the body of the car.

The door is held closed by means of a latch or hook on either side of the chute, into which fits the locking bar. This in turn is fulcrumed at the center by means of a bolt, which runs through the center of the door. The locking bar is weighted at one end so as to insure the door locking each time the car starts up the hill, as will be explained in detail later. This bar is also held in place by a number of guards which prevents it falling or rising out of the required position. The bottom of the back or top end of the car is closed usually half the diameter of the cylinder, as shown in Fig. 2. The top of the rear end of the monitor is open and is provided with perpendicular sides, by means of which the material to be transported is directed into the car.

The illustrations, Figs. 1, 2 and 4, show a monitor which is capable of handling 6 tons of coal. The coal in this case is dumped directly from the mine cars into the monitor which is dropped to the bottom of the plane when loaded.

The illustration Fig. 2 shows the car dumping. It will be seen that the rear axle of the car is provided with four wheels. The larger two, or the inside ones, operate on the track of the plane, while the outer or smaller wheels operate only on the dumping track at the tipple. This dumping track begins about 35 or 40 ft. back from where the car dumps into the railroad car, or bin, as the case may be. It will be noticed by reference to this figure that the outer track takes a uniform rise above the grade of the tipple. The object of this is to elevate the rear end of the monitor so the coal will slide out freely when the door is opened.

Fig. 1. View of Dumping End

Fig. 2. Showing Monitor While Dumping

Method of Working

Referring again to illustration Fig. 1, which shows the latch bar and the two catches, it will be noticed that the latch bar works upward from one catch and downward from the other. It will also be seen that the latch bar extends about a foot over each side of the car. While

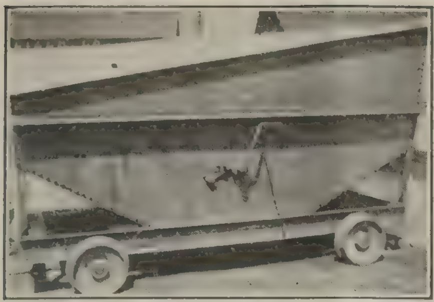

FIG. 3. BOTTOM DUMP MONITOR

the car is being elevated to its proper dumping position, as shown in the illustration Fig. 2, the ends of the latch bar are sliding upon two trip rails, one on each side. These rails are so arranged, in this case, as to depress the left end of the bar and raise the right, thus disengaging it from the latches and allowing the weight of the coal to force the door open ready for dumping.

When the car starts up the plane, and the rear end has again been lowered off the elevating track, the door automatically closes by its own weight, the chute and the latches being set far enough out of the perpendicular to insure the locking bar entering the latches and closing the door.

This type of monitor door is especially recommended, as it is purely automatic, the only attendant necessary on the lower tipple being the car shifter. Owing to the fact that the door opens and closes itself, the only laborer needed on the upper tipple is the man who dumps from the mine car into the monitor.

It is essential in installing a monitor system having this type of door, that the trip rail will have opened the door of the monitor just before the small wheels have reached the topmost point in the elevated track. Otherwise, the weight of the coal, combined with the slight jerk in bringing the cars to a stop, by applying the brakes of the lowering device, will cause the door to spring outward and spring the locking bar. This will cause leakage of the coal as the loaded cars come down the plane.

By referring again to illustration Fig. 2, it will be seen that this car is provided with three drawbars, one of which is on either side, attached to the one-inch chain. The third drawbar is on the bottom of the car, and is connected to the end of the rope. There is no strain on the rope between the clamp and the draw bar, this being merely in the nature of a safety attachment.

On some planes, where the grade on the bottom tipple will give the car sufficient pitch to assure the coal sliding out when the door is opened, the elevated tracks and the second set of wheels for such plane, can be eliminated. Or in some cases, they can be eliminated by making an abrupt change of grade at the point of dumping; however, this is not

FIG. 4. VIEW OF TIPPLE, SHOWING MONITOR DUMPING

FIG. 5. LOOKING UP PLANE AND SHOWING PARTING

FIG. 6. LOOKING DOWN TOWARD THE TIPPLE

often satisfactory as it causes a jerking or flying of the rope, due to the sudden stop when the trip runner lands the car.

Illustration Fig. 6 is a view looking down the plane, just below the point of passing, showing the monitor car dumped and ready to ascend the hill. Fig. 5 is a view taken at the same point, but looking up the incline, and showing the track arrangement.

Illustration Fig. 4 is a side view of the bottom tipple, which shows the two sets of rails with the car in position to ascend the plane. On some planes, where the grade is light, it is advisable to use open monitors. Owing to the fact that it would be impossible to load the closed monitors at the top tipple, these open ones can be made with the same kind of door arrangement as above described.

Bottom-dump Monitors

Illustration Fig. 3 shows an open-type monitor with a drop-bottom. This monitor has a capacity of 6 tons and is in operation on the plane of the Clearfield Colliery Company, of Clearfield, Penn. It has two doors in the middle of the hopper, which are 18 in. wide by 3 ft. long. This monitor is not automatic, the doors having to be opened and closed by means of the crank, as shown in the photograph. It is not advisable to use an attachment of this kind on planes where considerable capacity is lowered each day, unless a man is especially placed on top of the lower tipple to open and close the door.

If an automatic drop-bottom monitor is desired, they are constructed on the same plan as illustration Fig. 3, except the doors on the bottom of the hopper are extended about 10 in. beyond the roller bar of the hinge. On this extension is riveted enough weights to close the door after the coal is dumped. On the bottom of the hopper, just below the point where the doors meet, is the locking bar which is held in place by heavy guides. As the loaded car comes onto the lower tipple about 1 ft. above the dumping point, the locking bar, which extends about 12 in. over the car on both sides, strikes a trip rail which moves the locking bar beyond the edge of the upper door, allowing the coal to dump. At the same time, it raises a set of horns above the car, which strikes the locking bar and closes the hopper as the car goes up the plane. As these horns go down, they again raise the trips at the bottom which causes the bottom of the car to drop when it again comes down the plane.

Among the advantages of the monitor-car system are the following:

No mine cars are lowered down the plane, and consequently no coal spilling. They eliminate the labor of coupling a trip of cars. They require no special track as in case of "barney cars." If mine cars are run down the plane without a barney, there is a chance of a runaway with every coupling used. With the monitor car, there is one chance only of a break—the rope. However, the chief advantage of the monitor system is the saving of labor.

Track Arrangement

The arrangement of the track in any system of incline haulage is always a matter of considerable study and thought when installing a gravity system. The system shown in the photographs is adaptable to most any plane, and it will be noticed on the illustrations, Figs. 5 and 6, that below the passing point both cars go down a single track.

Referring to illustration, Fig. 5, it will be seen that the empty car will ascend the plane on the left-hand track, the loaded car coming down on the right-hand track having thrown the switch so as to return on the track it came down. This switch is provided with a weight which holds the points in the position desired.

Illustration, Fig. 1, shows the track arrangement at the top. The three-rail system, as shown on illustration, Fig. 5, becomes a four-rail system at a distance of 35 to 40 ft. from the loading chute. The two systems of tracking gradually come together until at the loading point the corresponding rails of both systems are but 4 to 6 in. apart.

Continuous Coking in Vertical Retorts

Special Correspondence

Describes a comparatively new departure in retort-oven practice, which is being successfully used in a number of plants. The continual exclusion of the atmosphere, eliminating the losses of heat, irregularities of carbonization, and insuring a maximum efficiency and recovery of byproducts is a unique feature.

The importance of coking processes in connection with colliery operations has received such acknowledgment within recent years that it is unnecessary to demonstrate the point here. The methods of coking, either at the colliery itself, or at the gas works which, although primarily occupied in the production of gas, also rely to a very large extent on the sale of the coke so obtained, have been so much improved within recent years, that some reference may be made to a type of vertical retort. Although only comparatively recently introduced, one oven of this variety has produced very excellent results. This is the Woodall-Duckham system of continuous carbonization, installed by Messrs. Duckham & Cloudsley, Ltd., of Westminster, London, in Great Britain, the United States, Switzerland and New South Wales.

Description of Retorts

The principle of this system is the regulated continuous descent of coal through a vertical retort suitably heated and constructed. The descent is regulated in speed by the coal which enters the top of the retort and is gradually carbonized in its downward passage until by the time it arrives at the bottom of the retort, it has been converted into coke. Both the amount of coal fed to the top of the retort, and the rate at which it passes downward, are regulated automatically by the rate at which the coke is extracted at the lower end of the retort.

The formation of this retort can be best understood by reference to Fig. 1 which shows the cross-sectional elevation of a single unit. The installation consists of four such units in each setting, together with the generator, regenerator and waste-gas flue common to each setting. The retorts are 25 ft. long, and have brick walls so tongued and grooved that leakage at the joints is impossible. Panels are formed in the back of the walls so that a large surface is presented to the heating flues which are vertical and the heat is readily transmitted through the walls to the charge in the retort. The gas from the producer and the secondary air are admitted at the top of the vertical flue in such a way that regulation of the amount of heat transmitted to the various portions of the retorts can be effected.

The generator, which is of ample size, is so constructed that the depth of coal from the fire bars to the point at which the gas is drawn off, is constant at all times; the regenerator is of the sandwich type, the walls between the waste-gas and secondary-air flue being formed of grooved on tongued paneled bricks similar to those used in the retort walls. The area of the regenerator is about 10 per cent. greater than that used with most horizontal settings of the same

capacity. In order to regulate the pull on each set, flue retort dampers are provided at the bottom of the retort, and in addition main dampers are fixed on the waste-gas outlet of the regenerator.

Method of Discharging

The regulator for determining the rate of discharge of the coke is fixed to the extractor, and has proved to be a very successful and efficient type. In such extractors it is necessary that they shall be quite free from the weight of the charge in the retort; that they should not cut or shear through the coke; that they shall have the same action on the coke at each point of their movement, thereby securing an even discharge; that they do not impede free access to the bottom of the retort, and that their method of drive is such that the speed variation is easily effected.

In order to fulfil these conditions the Woodall-Duckham extractor is situated along the bottom of a curved plate, forming the back of a cast-iron hopper fixed to the bottom of the retort. This curved plate, which takes the weight of the charge in the retort, is provided with manhole and inspection holes in order to give direct access to the retort. The extractor roller allows a definite amount of coke to pass over it into the lower receiving hopper without shearing the coke in any way, and hanging bars suspended from a shaft above the extractor prevent any coke from passing over unless regulated by the action of the extractor.

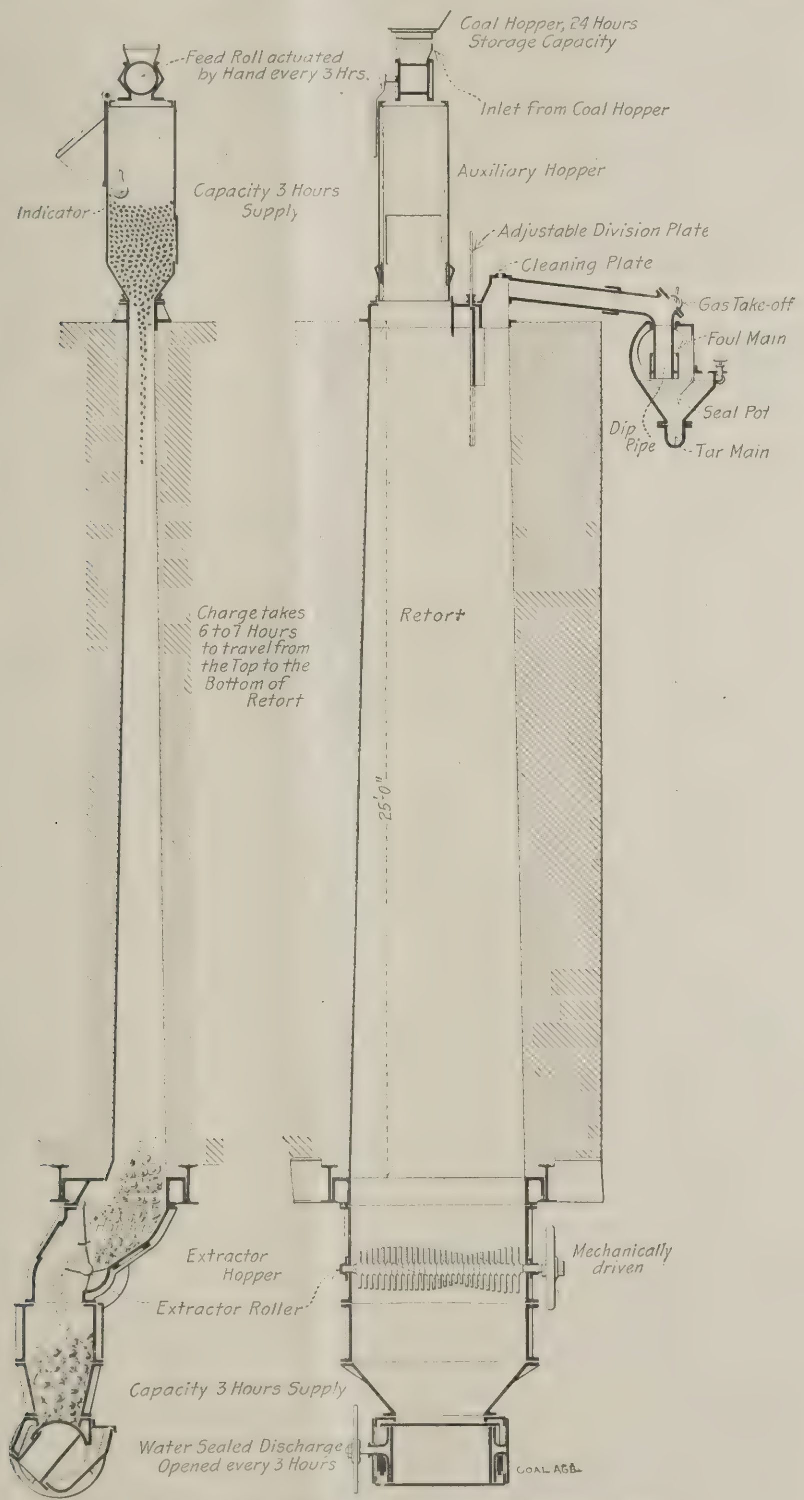

Fig. 1. Elevation in Section, Vertical Retort Oven

The actual extracting device consists of a series of short cast-iron cross pieces fixed on to a square shaft, so that each piece has a slight lead on its neighbor. In this way a roller of helical blades, is formed, producing a uniform regulating effect on the coke discharge throughout the whole of the revolution of the extractor and giving a constant travel of the charge down the retort. At the extension of the roller shaft is fitted a wheel with a V-shaped groove in which an eccentric wedge-shaped pawl is operated by a rocking arm. The travel of this pawl can be adjusted by the rocking arm, and these arms are in turn operated by means of connecting rods from a reciprocating bar running along a bench of settings; a variation of speed 20 per cent. faster or slower than the normal speed of rotation of the extractor (which is one revolution per hour or ninety minutes) can be obtained. The wear on the extractor owing to this slow speed is very small and the amount of horsepower consumed by it is quite low.

It will be seen by reference to the illustration that below the extracter roller there is a cast-iron receiving hopper which is designed to accommodate three hours' discharge of coke. The bottom of this hopper is closed by a water-sealed gas-tight door which presents a considerable improvement over some of the usual types employing tightening and clamping arrangements. It consists of two cast-iron boxes, one inside the other, the intervening space between being filled with water. In this space there is a segmental door plate mounted on a spindle and so counterbalanced that it can be operated for three hours by means of a wheel and spindle. When closed the door is immersed in four inches of water and is therefore gas tight and needs no clamping. Although the coke is not in contact with the water the castings are kept cool and any coke dust percolating into the water space can be easily cleaned out. The coke is quenched by means of a small spray of water in the storage hopper, and leaves the retort practically dry and at a temperature of about 130 deg. Fahrenheit.

Charging and Recovery of Byproducts

The top of the retort is closed by a cast-iron mouthpiece, to which is fixed the coal-feeding device, and the gas-out-

let pipe. The coal feed is effected by means of an auxiliary hopper fixed to the mouthpiece casing, and closed at its upper end by a circular valve. This hopper, which contains three hours' supply of coal, is filled in its turn from a main storage hopper above it. The circular valve, which is operated either by hand or mechanically, consists of a turned closed cylinder with two holes at its periphery on its diameter, giving a passage for the coal when these openings are opposite similar holes in a bored cast-iron casing in which the valve is rotated on a spindle. Each feeding hopper shows the rate of coal feed to the retort and the position of the coal in the hopper, by means of an indicator consisting of a weight resting on the top of the coal, which has a small wire attached to it passing through a gas-tight gland in the top of the hopper. The other end of this wire carries a pointer to the outside of the hopper and indicates upon a scale attached to it.

A gas off-take, 7 in. in diameter, is connected to an extension of the top mouthpiece and pipe, falling from the retort toward the foul main, forming a connection with this by means of a dip pipe and seal pot. The bottom of this pot is connected to the tar pipe, and in ordinary working the tar or liquid produced by the retort flows from the off-take pipe and foul main, direct to the tar pipe. When, however, it is desired to shut off the retort from the foul main the valve in the connecting tar pipe is closed and a 4-in. seal is formed in the seal pot, which effectually shuts off the retort.

Between the coal-inlet and the gas-outlet pipe there is fitted a division plate extending into the retort. This division plate is fitted with a sliding extension piece which can be lowered in the retort for the purpose of regulating the amount of free space in the retort through which the gas is to pass. It will be seen that this plate provides a free passage for the gas immediately above the zone of carbonization. and by the adjustable nature of the division the temperature of the gas leaving the retort is governed so that the maximum make can be obtained from coals of varying qualities by the fixation of hydrocarbon vapors which would otherwise be deposited with the tar.

A clear floor space in and around the retort setting is obtained by placing the whole construction on a rolled-steel floor joist carried by stantions. The buck staves are carried from the floor joists to the top of the setting and tied across these by steel joists. The main storage hopper for coal and coke, which holds 24 hours' storage of coal and 40 hours' storage of coke, is supported from the cross joists connecting the buck staves.

Summary of Advantages

This system has a considerable number of advantages as compared with some of the older forms, and these may be briefly summarized. Owing to the carbonizing process being automatic, easily regulated, and continuous, the characteristics of different qualities of coal can be met by variation of the conditions of carbonizing to insure a maximum production of gas and residuals. None of the coal is exposed to longer heating or greater temperature than other portions, and the coke made is of the same quality throughout. In some types of ovens and retorts it occasionally happens that the ejected matter contains a portion of coal which is only partially coked, but in this vertical continuous system such an occurrence is not possible.

Labor costs are reduced very considerably and local conditions are met by a simple regulation of the speed and temperature at which the process is conducted. An important point is that the coal descends gradually into an enlarging sectional area of the retort and free spaces are produced in the contents of the retort for the easy passage of the gas, and the greater proportion of such gas is given off long before the coal reaches the bottom of the retort, by which time the coal has been converted into coke. In this way the difference of gas pressure between the top and bottom of the retort is not more than one-tenth of an inch, and the free passage of gas considerably reduces the amount of carbon deposited on the walls of the retort as scurf. Moreover, the scraping action of the solid contents in descent minimizes such deposit. In practice it is found that the scurf only needs to be removed once in ten or twelve weeks, and this is the only time when the retort has to be opened to the atmosphere.

This system of carbonization, by securing that the retorts are always closed to the atmosphere and that the coke when discharged is already quenched, avoids the loss of heat or gas which is found in some of the intermittent coking systems, and hence the fuel consumed in the generators is very much reduced. This efficiency in working is further increased by the fact that by the flexibility of the feed which is given, the contents of the retort only remain there for sufficient time to complete the coking. In contrast to some other systems there is no emission of smoke, dust or steam during the working of the retorts, which leads to better conditions of working, and the reduction of attention required, to practically that of supervision. In congested areas the elimination of nuisance or damage to surrounding buildings is a most important advantage.

The even and regular temperature at which the retort setting is worked and the comparatively low value of this temperature as compared with that of some other systems, exercises a very beneficial effect on the maintenance. In addition to this there is the fact that the vertical retort system described above, economizes ground space in relation to the quantity of fuel carbonized in a given time, while it is very easy to arrange coal- and coke-conveying apparatus on a simple system of feed in large installations of such settings. As the whole of the working parts of the installation are above ground level, the advantages of easy access, good ventilation, and adequate lighting are secured, and for these reasons the Woodall-Duckham system is finding very considerable favor in the undertakings where it has been tried.

Safety Lamps

The "Mines and Quarries General Report with Statistics for 1910" (England) contains interesting data relative to safety-lamp practice in Great Britain.

The total number of miners' electric hand lamps in use during the year 1910, was 2055, or 0.28 per cent. of the total, as compared with 2155, or 0.32 per cent. of the total in use during the preceding year. A great majority of the lamps are used in Durham—namely, 1797—and their use is practically restricted to one colliery.

The number of the various kinds of safety lamps in use comprises 219,990 Marsaut, 107,958 Ackroyd & Best, 82,968 Protector, 72,707 Clanny, 66,483 Cambrian, 26,196 Muesler, 24,830 Deflector, 19,943 Patterson, 13,301 Byfold, 11,774 Wolf, 11,047 Thorneberry, 10,453 Baxendale, 7785 Donald, 7465 Davis, 5165 Park Lane, 4355 Davy, 3825 Routledge & Johnson, 2055 electric, 7182 other kinds and not stated.

The total number of safety lamps in use in Great Britain is 705,482, of which 381,596 have single gauzes, 321,408 two gauzes and 407, three gauzes. The number of shielded lamps is 670,307 as against 32,705 unshielded. Head-rivet locks are used on 408,593; magnetic on 208,267; screw on 72,352; others, 16,270. Colza oil as an illuminant is used for 508,805 lamps; petroleum for 67,134; volatile spirit for 88,153; electricity for 2055; other illuminants, 39,335. Number of lamps initially lighted by electricity is 310,457; by internal igniters, 11,197; by opening, 383,828.

A barometer and thermometer should be placed above ground in a conspicuous place near the entrance of the mine. Readings should be taken at the commencement of each shift and records kept of the same. A falling barometer shows a decrease in atmospheric pressure; a rising barometer shows an increase in pressure. A lessened pressure favors the formation of gas and falls of roof

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Contents

COAL AGE

Danger Periods in Mines

That it is possible to discover and, to a limited extent, to forecast the approach of what may properly be termed a "danger period" in mines, is growing more certain each year.

Attention has been called frequently to the fact that mine explosions often occur in groups. There will be times when for weeks and even months the public are horrified by the continued reports, in the press, of mine explosions occurring in rapid succession. At times, a longer or shorter period will follow when there is a cessation of these disasters. This period of immunity may be, and often is marred or broken by the occurrence of one or more erratic mine explosions—the result of someone's foolhardiness, neglect or carelessness. But such erratic happenings in no way disprove what is fast becoming an established and evident law, that there is some great underlying influence that operates quietly but powerfully to disturb the security of coal mines, and endanger the lives of workers therein.

So little is known of the hidden causes whose periodic effects are so manifest and terrible, that it would be presumption to attempt to predict how long any such periods of immunity or of danger might last. A danger period may gradually grow and increase in intensity during weeks; or the period may be ushered in by a violence that commands the profound recognition of all. Again, the termination of danger may be abrupt or gradual. There is no defining the law of longevity, in this regard, for the evident reason that no such law exists or can exist.

The periods, long or short, are the result of conditions buried in the mysterious depths of Mother Earth, or enveloping her in the unfathomable sea of air above. These conditions, it is needless to say, are beyond the extent of human ken; and, at the most, their effects are but feebly measured.

The fact remains, however, that, notwithstanding our ignorance of the causes, there is an undeniable periodicity in the ocurrence of mine explosions; and it is well to draw the attention of investigators to this fact. For a number of years it has been the opinion of many that there is a more or less synchronous or corresponding periodicity in seismic disturbances.

There is a recognized difficulty in the attempt to correlate such phenomena, because of the plain fact that a period of danger in mines may or may not be emphasized by the occurrence of mine explosions. On the other hand, the accumulation and ignition of gas may take place in a mine, at any time, owing to carelessness, neglect or the relaxation of vigilance. Because there is danger, it does not follow that accident will occur; and when accident does happen, it is not always a consequence of existing danger.

Many times the periods of severe seismic troubles have been accompanied by like disastrous periods in mines. The ever-memorable Mt. Pelée eruption, in the Island of Martinique, West Indies, May 20, 1902, costing 30,000 lives, was accompanied by the loss of nearly 600 lives in four mine explosions: Fraytervillе, Tenn., May 19, 184 lives; Coal Creek, Fernie, B. C., Can., May 23, 127 lives; Johnstown, Penn., July 10, 112 lives; Mt. Kembla, New South Wales, Aug. 1, 127 lives, and numerous other accidents, in which the loss of life was not so great.

Again, the great earthquake in the north of India, in 1905, killing 35,000 people, was signalized by no less than 13 mine explosions of record, in this country alone, which cost over 300 lives.

The terrible earthquake that destroyed thousands of lives, and property to the value of $45,000,000, in the Island of Formosa, Japan, Mar. 17, 1906, was marked by the Courrières mine explosion, France, Mar. 10, 1200 lives; Century mine, W. Va., Mar. 22, 21 lives; and Takashima mine, Kiushu, Japan, Mar. 28, 307 lives. A few days later, Apr. 3, Mt. Vesuvius again let go, destroying hundreds of lives and many towns and villages; while a repeated earthquake again destroyed the

town of Kagi and killed 109 persons in Formosa, Japan, Apr. 7, to be supplemented by the terrible San Francisco earthquake Apr. 18; and the mine explosion, near Trinidad, Colo., Apr. 20, costing 22 lives.

The present time is undoubtedly a period of danger. The trouble has been seemingly accumulating during the past 10 or 12 months, as told by the recorded earthquakes in Costa Rica, Mexico, Hungary, and the eruptions of Aetna, in Sicily; interspersed by serious explosions in the mines at Trinidad, Colo.; Tonopah, Nev.; Throop, Penn.; Littleton, Ala.; Elk Garden, W. Va.; DuBois and Punxsutawney, Penn., and now at Briceville, Tennessee.

It would be well for all mine foremen and firebosses, as well as all mine employees working underground, to exercise more than ordinary caution in respect to the gaseous condition in the mines in their charge. By so doing it may be possible to avoid an accident that, though unexpected, may be imminent. The old proverbs "Forewarned, forearmed," and "An ounce of prevention is worth a pound of cure," are particularly applicable here and now.

Much interest in the work of investigating the question of the possible relationship of seismic disturbances and the appearance of gas in mines, has recently been developed by an address given before the Board of Trade, Victoria, B. C., Can., by F. N. Denison, who has been conducting some special research work in that region. The address pointed out the particular fitness of Victoria, as being a suitable site for the establishment of an observatory, by the Dominion government, for conducting investigations of this character. It was argued that Victoria was in close proximity to one of the great seismic belts of the earth extending along the Pacific Coast from Alaska; another belt being the Japan belt, running through the Island of Formosa, Japan.

Compulsory Use of Safety Lamps

A solution of the question as to when the use of safety lamps should be made compulsory has been offered by our English brethren. It is extremely elementary in character, and provides in brief that protected lights shall be used in seams where a personal injury from an explosion of gas has occurred within 12 months.

As is pointed out, the merest "singeing of a man's whiskers" may, according to this rule, compel the adoption of safety lamps in a comparatively safe mine. On the other hand, the law embodies some of the features of locking the barn after the horse is stolen. A dangerous mine may be operated for some time on a semi-openlight basis with no minor casualties, and yet eventually be the scene of a fearful disaster.

It does appear that our English colleagues might solve their problems along more scientific lines.

The Sauve Qui Peut

How men hemmed in after an explosion should save themselves demands careful consideration and it does not seem that it has received the thought it deserves. It is true that W. E. Garforth has suggested some excellent rules for recovering mines after explosions and fires, but these rules do not apply to the workingman who is trapped behind an explosion or about to be overwhelmed by its advancing waste products. Not only should the best talent of the profession consider a code of rules, but these rules should be posted at all mines and be signed by the mine inspectors so that when the fierce *sauve qui peut* comes, the men may have some guide to follow, some definite idea of what is needed. The call for such judgment will become more marked as the dampening and ventilating of the mines become better developed, for then there will be little dry dust and little accumulated gas to make explosions mechanically destructive. Then the products of combustion will suffocate or poison more persons than they destroy by their violent expansion or the direct heat of their combustion.

No one cares to be first in posting such rules. The mine at which such posting took place would bear, as it were, the "scarlet letter" placed there by the managers of the operation. To some workingmen it would appear an ominous admonition to remove their tools; to others an acknowledgment on the part of the company that the mine was unsafe and the officials knew it and did not intend to take the requisite steps to safeguard its men.

Hence the rules of safety should be posted at all mines; the mine where the possibility of an explosion or a fire seems remote, and to some shallow thinkers almost impossible, as well as at the mine where the sad probability of its happening casts a heavy veil of gloom over the inhabitants of the mining village. And such a general posting of rules will doubtless result in a more general consideration of what those rules should cover and how they should read.

The simple rule "escape to the intake" will perhaps apply when the explosion lies further along the path of the air current than the entrapped man. But if the explosion is on the other side of him, his chances would be better if he took the return and strove by activity to outdistance the advancing column of stupefying gases or to get into another split of the intake or a diluted return. Or again, a better plan might be in that case for the miner to wall himself in the end of a heading or other *cul-de-sac*.

On consideration, does not the rule take the almost ridiculous form, "Run away from the explosion if you know or can ascertain where it occurred." It seems so simple, such a primal instinct, that to print it is to suggest a lack of humor; but as a matter of fact, at Vivian, the men who were safe where they were, and who, it would seem, must or could have had some inkling of the direction in which the explosion had taken place, plunged thoughtlessly into the gas and died; at Adrian and Sykesville it was the same story, the men breathed the foul current and fell dead.

But the point of origin of an explosion is so obscure, that even though the force be slight and the intervening time short, a safe deduction is rarely to be made. So perhaps a better rule would be, "Strive to escape speedily along airways where the air is good. When you come to foul air, go cautiously. If it gets worse you are probably approaching the explosion and should stop and seek another road. In any case walling oneself in a 'dead end' is to be preferred to a desperate flight through foul air."

What is needed is a cool head in time of an explosion. Nothing provides that cool head like continued aforethought. In this is found the chief value of drills; fire drills at schools, boat-lowering drills at sea and the formation drills in the army.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Interesting Questions Made Simple for Beginners

Diffusion of Gases

Ques.—(a) What is meant by the *diffusion of gases?* (b) State the law of the diffusion of gases, commonly known as "Graham's law." (c) Show the application of the law of the diffusion of gases, by finding the relative volumes of marsh gas (CH_4) and carbon dioxide (CO_2) in the mixture of these gases formed under such conditions that the undiluted gases diffuse into each other without becoming, first, mixed with air.

[*Note*—The condition (c), mentioned here, may and often has occurred when working a seam generating marsh gas and underlying an abandoned seam, a few feet above, in which much blackdamp has accumulated].

Ans.—(a) By the *diffusion of gases* is meant the intermixing of the molecules of the gases according to a fixed law, which gives, always, a mixture of exact proportions. Diffusion is different from simple mixing, because gases may mix in any proportions, but they diffuse only in proportions which are fixed and known.

In the mine, diffusion and mixing take place together, in most instances. It is only when two gases, or a gas and air, are separated by a porous stratum, or when an occluded gas issues from the pores of the strata into a confined space where the air is dead (not moving)—it is only under these conditions that diffusion alone takes place.

The Law of Diffusion of Gases—Graham's Law

(b) Graham found, by experiment, that when two gases of different densities are separated by a porous diaphragm, which prevents the gases mixing, diffusion takes place through the pores of the diaphragm, a certain portion of each gas passing into the space occupied by the other.

Law—The velocity with which gases diffuse into each other, or into air, varies inversely as the square root of the density of the gas referred to air as unity.

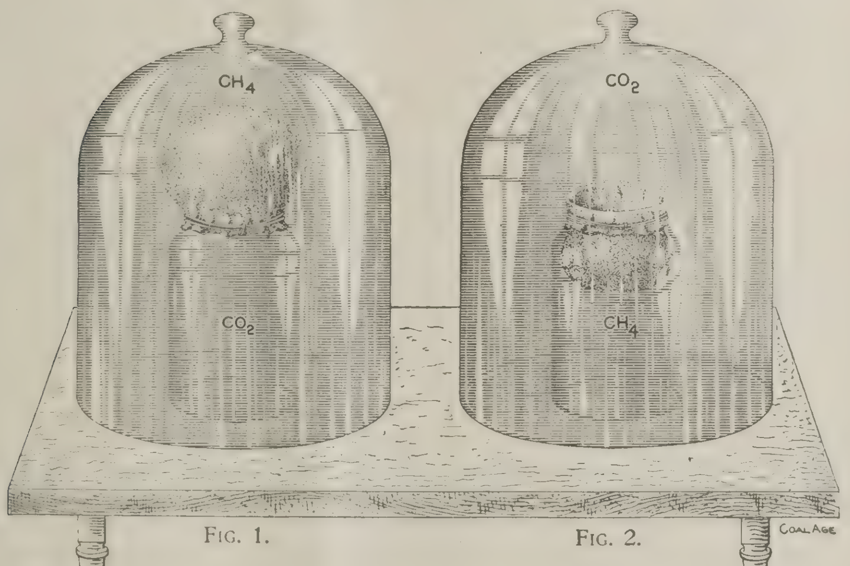


Fig. 1. Fig. 2.

Two Experiments, Showing the Diffusion of Marsh Gas Is More Rapid than that of Carbon Dioxide

The relative velocities of diffusion, for the important mine gases, calling that of air 1, are as follows:

TABLE GIVING SPECIFIC GRAVITY AND RELATIVE VELOCITY OF DIFFUSION OF MINE GASES
(*Air* = 1)

Gas	Specific Gravity	Relative Velocity of Diffusion
Marsh gas	0.5590	1.3375
Carbon monoxide	0.9670	1.0169
Nitrogen	0.9713	1.0147
Olefiant gas	0.9780	1.0112
Air	1.0000	1.0000
Oxygen	1.1056	0.9510
Hydrogen sulphide	1.1912	0.9163
Carbon dioxide	1.5290	0.8087

An Interesting Experiment

A very interesting and instructive experiment that can be performed to advantage, in mining-institute classes, is the following:

Fill a glass fruit jar, Fig. 1, with carbon dioxide (CO_2), and tie a bladder securely over the mouth of the jar. Place over this a large bell-jar that has been previously filled with marsh gas (CH_4), or hydrogen (H). Immediately diffusion of the gases begins, the gases passing through the bladder. But, as shown in the table above, the rate of diffusion for marsh gas is much more rapid than that for carbon dioxide; and, consequently, more marsh gas passes into the fruit jar than carbon dioxide passes out. As a result the bladder is expanded gradually, as shown in the figure, till it bursts under the pressure of the gas. If the fruit jar is filled with marsh gas and the bell-jar with carbon dioxide, the reverse of this takes place. More gas, then, passes out than into the fruit jar, and the bladder is depressed, as shown in Fig. 2.

(c) To properly answer this part of the question will require more space than is available this week. It will be answered fully in the next issue.

Blackdamp in Mines

Ques.—What relation has blackdamp to air in respect to specific gravity?

Ans.—Blackdamp, as commonly understood in mining language, consists chiefly of carbon dioxide (CO_2), which gas is about one and a half times as heavy as air at the same temperature and pressure. Hence, the specific gravity of blackdamp, referred to air as unity, is 1.529, which is the specific gravity of carbon dioxide.

Ques.—Where in a mine is blackdamp usually found?

Ans.—The presence of blackdamp, in mine workings, depends on the conditions that exist in the different parts of the mine. It often occurs where its presence was not suspected, working through the crevices of a broken roof, from the abandoned workings of an overlying seam. It occurs, commonly, in poorly ventilated places where combustion, in some form, is taking place, and the air-current is not sufficient to keep the place clear of the accumulating gases. Blackdamp accumulates in the lower portions of the mine, at the floor of chambers, and in dip workings, because of its great density, being half again as heavy as air.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

An Ingenious Arrangement

The company with which I am connected recently took over a mining property which had been worked for a number of years. A haulage road of this mine and three slopes, lying 600 to 800 ft. apart, are indicated in Fig. 2. Cars were drawn up each of the slopes by a small hoisting engine and delivered at the head of the plane to a steam locomotive, which traveled along the haulway.

The hoisting engines were run by compressed air, supplied from a compressor located about ¾ of a mile from the nearest engine. This arrangement required the services of three engineers, in addition to the locomotive crew and an attendant for the air compressor. The compressed-air installation was plainly inefficient; the locomotive and several hoisting engines lay idle a large part of the time, and, on the whole, an expense was involved out of all reasonable proportion to the output.

As I have stated, this is an old mine, and while still productive, was not considered sufficiently remunerative to justify any considerable investment for improvements. Our problem was, therefore, to find some means for reducing the excessive cost of coal from these slopes without making more than a nominal outlay of money.

The solution which was finally adopted consisted in doing away entirely with the air compressor and in supplying high-pressure steam to the hoisting engines from the steam locomotive by means of a swinging pipe connection, as pictured in Fig. 1. In operation, the locomotive is now run to each slope in turn and coupled up with the hoist. The cars are then hauled up the plane and the locomotive, after being uncoupled, takes them away.

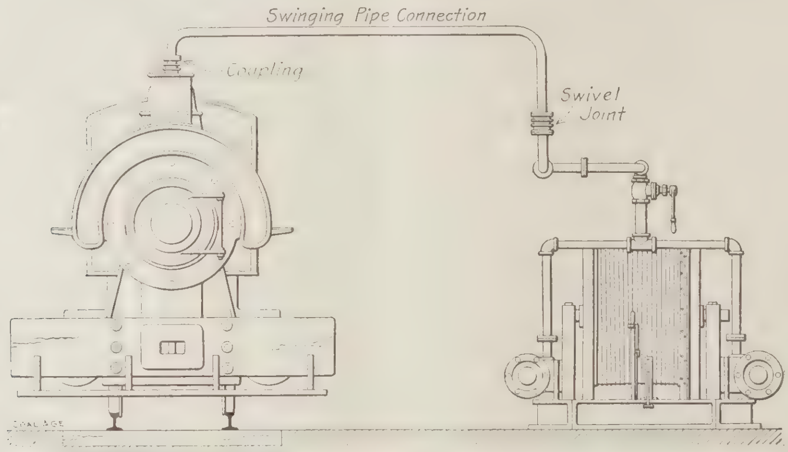


Fig. 1. Detachable Steam-pipe Connection

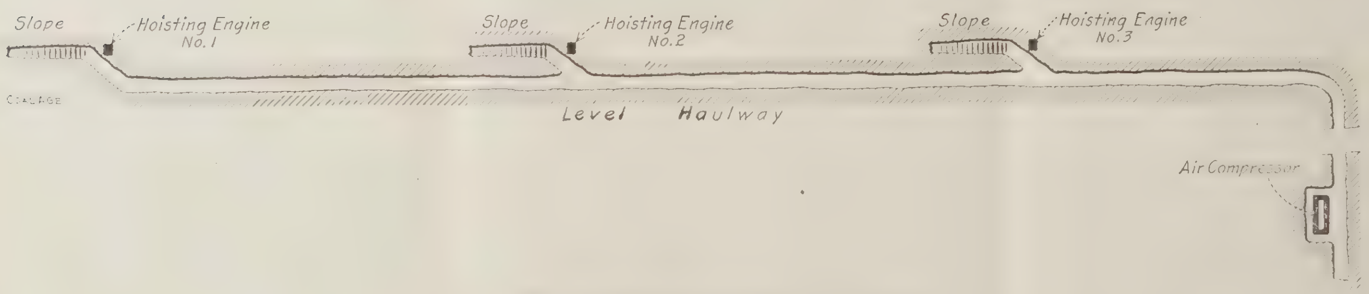


Fig. 2. Plan Showing Slopes and Haulway

The use of high-pressure steam in the hoisting engines enables them to do their work in a fraction of the time previously required, and thus makes it possible for the locomotive engineer to pass from one to the other without in any way reducing the amount of coal hoisted.

It is estimated that as much as $15 to $16 per day was saved by this method of operation. The device is, of course, nothing more than a clever makeshift applied to unusual conditions, but as such, has points of interest and possibly might be applied elsewhere with good results.

Pottsville, Penn. E. J. E.

A Cause of Explosions

I have just read the editorial relating to "Humidification" in the issue of Dec. 2. Everybody will admit that water is a good fire extinguisher and I have no objection whatever to its use in dry mines, but I shall continue to give well founded warning that the application of moisture cannot be depended on to stop an explosion when once under way; and I go further than that, it should not even be relied on to prevent the occurrence of a dust explosion. I agree with Taffanel that watering for a considerable distance in front of shots about to be fired lessens considerably the danger incident to blown-out shots, but it does not eliminate that danger entirely. It should be remembered that a mine is not a testing gallery, where conditions can be regulated to a nicety. At the Banner mine in Alabama nearly 100 sprays, spaced 100 ft. apart, constantly injected vaporized water into the mine air, but this complete and well arranged installation failed to prevent an explosion, which, notwithstanding these precautions, occurred at that mine.

I heartily agree with the editorial that "each operator should prove conclusively that humidification is either not needed, or harmful, etc." That is a fair proposition and will bring results which cannot be secured through forcing the sprinkling of mines by enactment of law.

I have stated repeatedly that the use of steam as an alleged preventive of dust is preferable to any system of

sprays or vaporizers, not because steam is a good humidifier, but because it raises the temperature of the ingoing air and therefore weakens the force of the strong natural draft along the mine floor during the colder months of the year when the explosion danger is most pronounced.

To show the difference in air-flow in mines at different seasons of the year, I submit some measurements that were taken in the same mine and at the same place, about ¼ mile from the downcast, the height of entry between collar and rail being 5 feet.

VELOCITIES OF DIFFERENT LAYERS OF AIR

August 5, 1908: Outside temperature, 88 deg. F. Inside temperature, 58 deg. F.

Distance Below Collar in Feet	Velocity of Air, Feet per Minute
1	178
2	178
3	140
4	120
5	73

March 19, 1908: Outside temperature, 20 deg. F. Inside temperature, 48 deg. F.

Distance Below Collar in Feet	Velocity of Air, Feet per Minute
0 (underside of collar)	140
2½	280
5 (top of rail)	235

Jan. 30, 1909: Outside temperature, —9 deg. F. Inside temperature, 40 deg. F.

Distance Below Collar in Feet	Velocity of Air, Feet per Minute
0 (underside of collar)	200
½	230
1	300
2½	400
4	400
4½	490
5 (bottom)	300

April 20, 1909: Temperature at bottom of downcast, 47 deg. F. Inside temperature, 49 deg. F.

Distance Below Collar in Feet	Velocity of Air, Feet per Minute
½	160
1	200
2	230
2½ (center)	250
3	230
4	210
4½	180

By comparing measurements of Aug. 5, 1908, and Jan. 30, 1909, and accepting Mr. Hall's view relating to the "advance," it will be readily seen how the manner of air-flow may be an influential factor in determining the "rate of advance." Time and further investigation will show that Mr. Hall is on the right track and that beyond a doubt "the rate of advance," or in other words, the intensity of draft rather than the amount of dust present determines the magnitude of a dust explosion.

Mr. Hall believes that the Adrian explosion was caused by a short-circuit. From the evidence available, it seems that his conclusion is probably correct. It has been shown, however, that a wire at white heat inserted into a dust cloud did not ignite the dust. It was further proved by Holtzwart and Meyer that lignite dust could not be ignited by a short-circuit when the dust was merely in suspension around it, but when the dust was puffed between the terminals by compressed air, ignition occurred. In view of this the logical explanation of the Adrian explosion seems to be that the wires were knocked down to the floor by a fall, a short-circuit resulted, and the draft along the bottom carried the dust and air with sufficient force and in sufficient quantity to the electric arc to cause a small explosion. The latter stirred up more dust and increased the draft ("rate of advance") toward the arc with subsequent disastrous results.

The main factor in the Delagua explosion was a draft. There is no question about that. It was so in the Starkville explosion which resulted from a short-circuit and, in my judgment, it is so in every explosion. The raise and disturbance resulting from a blown-out shot are spectacular, but it is the size and duration of flame, the draft facilities and the fuel carried by the draft which determine the extent of the danger.

I may be mistaken in my views, but I think there is at least foundation enough for them to have them put to a fair test. I have given much consideration to the dust-explosion problem during the last 20 years and I have given the results of my investigations with the hope that they may be of some benefit to the mining interests of this country.

Chariton, Iowa. JOHN VERNER.

The Firebosses' Problem

I would like to echo the suggestions made by "Fireboss, Western Pennsylvania," in COAL AGE, Nov. 18, 1911, page 190. The same conditions that exist, in this regard, in Pennsylvania, exist here in West Virginia. The fireboss who would make a true report of the condition of the mine or district in his charge dare not do so, because of the fear he entertains of losing his job. On the other hand, should he be found by the state inspector, to have made a false report, he would be liable to a fine or imprisonment, or both.

I venture to say that if all firebosses were employed by the state and under the supervision of the state mine inspector, instead of being in the employ of the mine operator, there would be less risk run, in numerous cases, and fewer accidents would occur. Why should the fireboss be forced to work under these conditions? As has been explained, he must be a man with quick, keen eyesight and hearing, and above all must be able to keep cool and not lose his head or his nerve. The safety of everyone working in or about the mines depends on the fireboss doing his work right. One little mistake on his part may cost hundreds of lives, and send the men whose lives are in his charge, without a moment's warning, from time into eternity. The same may occur as a result of the fireboss being compelled to assume risks that he would not be willing to take had he not been afraid of losing his job.

Mr. Superintendent, do not press your fireboss to allow a place to work that he considers dangerous. Mr. Mine Boss, do not go into the mine and throw aside your firebosses' danger boards until you have made a careful and thorough inspection of each place. The few tons of coal that you hope to gain for the company by so doing, would fail to recompense those who might be suddenly bereft of loved ones—in most cases, their breadwinners and sole support.

I hope COAL AGE will publish these few lines and that other firebosses will push this suggestion along and not let it die. I also hope, that state inspectors and state legislators will seriously consider the question whether it would not be the right thing for the state to enact a law making the fireboss a sub-mine inspector who would work under the supervision and control of the district mine inspector, who proceeds against him, legally, if there is trouble growing out of any failure on the part of the helpless fireboss to perform all the law requires. On the other hand, should the fireboss lose his job, because he refuses to accede to the plainly expressed wishes of his superiors in office, to declare a doubtful section of the mine in his charge, as *safe*, the law offers him no protection. He suffers alone, for his steadfastness in carrying out the law, and for his conscientious regard for the safeguarding of the lives of his fellows and the property of his employers.

A WEST VIRGINIA FIREBOSS.

Mr. Conner's Reply to Jos. Virgin

I note the communication from Jos. Virgin, of Plymouth, W. Va., which you have headed "Fair Play for the Mule." This letter comments on my article in the Nov. 18 issue of COAL AGE and I fully agree with Mr. Virgin, that in making comparisons between mechanical and animal transportation, underground, it would be unfair to the "mule," unless equally efficient rolling stock, and track arrangements are installed, for animal transportation, as for mechanical. In the comparison quoted in my article, however, I would say that the track arrangements where mules were used, were equally as good as where the gathering locomotives were installed.

It has been my observation that the cost of gathering mine cars with mules, where grades do not exceed 8 per cent., against the empty cars, and where the average haul does not exceed 1500 ft., is reasonably economical.

It must be understood, that in recommending electric gathering locomotives, no hard and fast rule can be laid down, as all of the local conditions affecting the efficiency of the motive power, must be carefully considered before determining upon the kind of power to adopt.

Philadelphia, Penn. ELI T. CONNER.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

The Flame Test

What is meant by the flame test?

A LAYMAN.

Knoxville, Tenn.

It is the test made to ascertain the possible presence of gas in air by observing the flame of a safety lamp. The favorite lamp for making this test is the Davy lamp.

Capacity and Speed of Belt Conveyers

Kindly give me your advice on the following proposition:

A 30-in. conveyer belt, running at a speed of about 200 ft. per minute, is handling 150 tons of fine crushed coal per hour, which is about the maximum capacity of the belt for this speed. It is desired to increase the tonnage from 150 to 250 tons per hour. Can the capacity of this belt be increased by increasing its speed, and to what extent may this be done?

I wish you would not only give the proper answer, but show how it is determined for my guidance in the future. Also, please show how the maximum desirable speed of driving any size of belt conveyer is ascertained.

I may say that I am interested in a proposition where a 30-in., 9-ply, special reinforced-rubber belt, 600 ft. long, will have to be renewed shortly. This belt runs over a 36-in. tail pulley to a 52-in. head pulley, rising at an angle of about 22 deg. The troughing rollers on the carrying side are 6 in. in diameter, and spaced about 5 ft. apart. The guide rollers on the return side are about 10 feet apart. The material is delivered easily to the belt by a chute. I would appreciate any suggestions from COAL AGE that would make this proposition more economical.

INQUIRER.

This is an interesting and important question in coal-mining practice, as belt conveyers are finding a rapidly increasing application in the handling of coal at the mine, and in loading and unloading large shipments at 'ifferent points. Belt conveyers operated by a small dynamo have been used successfully for transporting the coal along the face of longwall workings, in thin seams, where the mine cars cannot be taken.

In making the following reply to this question we are indebted to the Robins Conveying Belt Company, who have kindly furnished full information in regard to the speed and capacity of belts of varying widths. The Robins chart, reproduced on the opposite page, shows, almost at a glance, practically everything desired in reference to the speed, capacity and size of belt required for handling material, both sized and unsized, the lumps varying from 1½ to 14 in. in diameter.

Referring to the chart, it will be noticed the vertical lines represent cubic feet of material handled per hour, as read from left to right, at the top. The horizontal lines, reading up, at the left of the chart, represent the weight of material handled in tons per hour.

Crossing the chart are two series of diagonal lines; the upper one representing material of different density, varying from 20 to 150 pounds per cubic foot. The lower series of diagonals represents the required width of belt for any given capacity and speed.

On the right of the chart, reading up, is a scale giving the speed of the belt, for different widths and capacities. A close inspection of this portion of the chart shows that, for the same capacity, the speed of the belt varies inversely as the square of the width; or, for the same speed, the capacity of a belt varies with the square of its width.

In simple language, to deliver the same quantity (cubic feet per hour), a conveyer belt one-half as wide as another must be run at four times the speed. Or, running at the same speed, a belt one-half as wide as another will deliver only one-quarter the quantity of material.

For engineers who desire a formula, this relation of capacity (c), speed (v), and width (w) of conveyer belts is expressed as follows:

$$\frac{c_1}{c_2}=\frac{v_1}{v_2}\left(\frac{w_1}{w_2}\right)^2.$$

In comparing two conveyer belts operating under like conditions and handling the same material, the tonnage ratio is always equal to the product of the speed ratio and the square of the width ratio.

For example, suppose a 16-in. belt, running at a speed of 150 ft. per minute, delivers 60 tons of a certain material per hour, and it is desired to find the tonnage of a 40-in. belt, running at a speed of 80 ft. per minute. Call the required capacity of the 40-in. belt x; then, applying the above formula,

$$\frac{x}{60}=\frac{80}{150}\left(\frac{40}{16}\right)^2=\frac{8}{15}\left(\frac{5}{2}\right)^2$$

$$x=\frac{60\times 8\times 25}{15\times 4}=200 \textit{ tons per hour.}$$

The following directions are given by the Robins Conveying Belt Company for reading the chart. To find the width and speed of belt required to handle a given tonnage per hour of a given size and weight of material in pounds per cubic foot proceed thus: Enter the chart at left and follow the horizontal line marked by the given tonnage to its intersection with the diagonal line corresponding to the weight of the material per cubic foot. From this point drop down on the vertical line to its intersection with the diagonal line in the lower series, corresponding to any desired width of belt. From this point, again follow the horizontal line, to the scale of speed marked on the right of the chart.

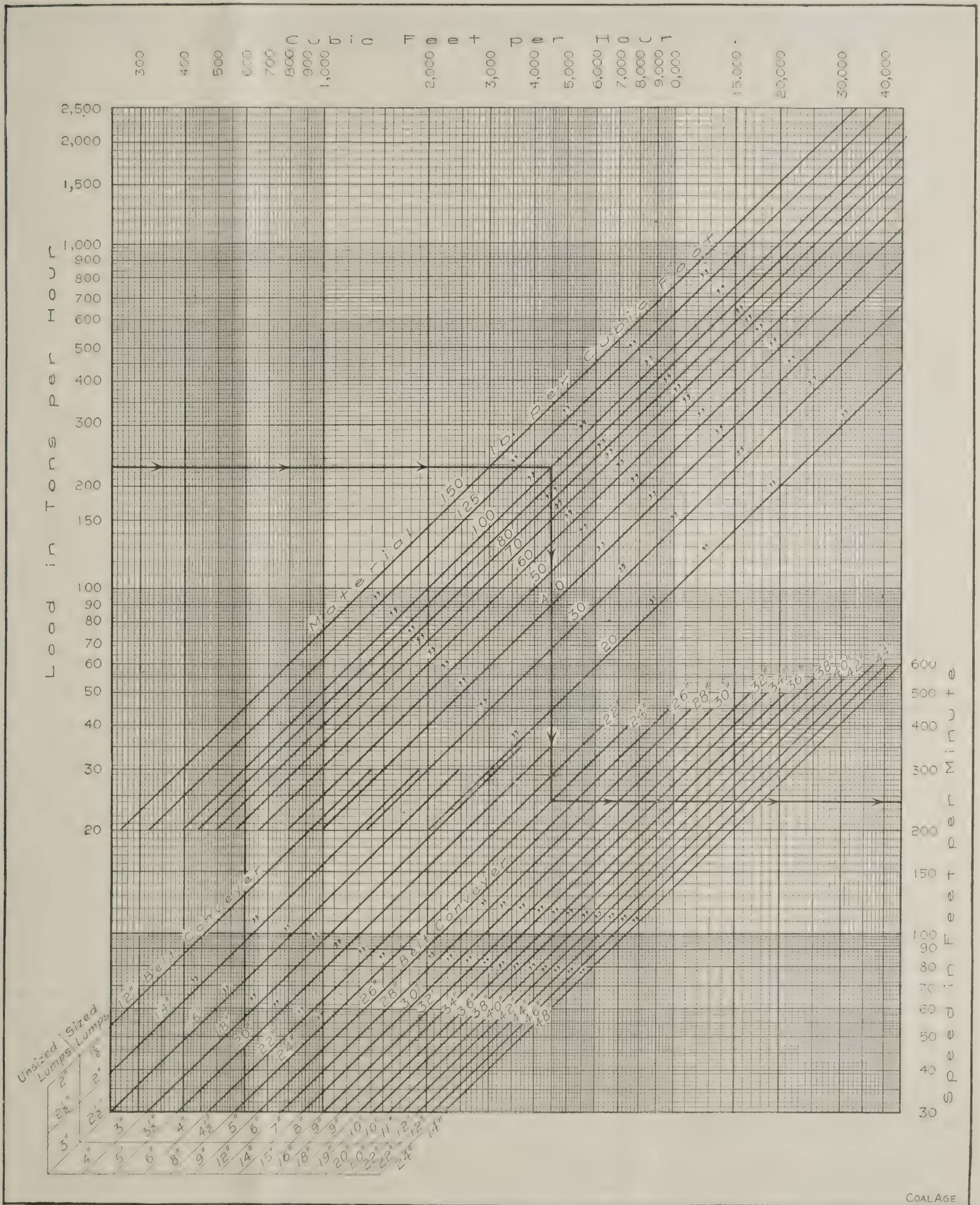
The heavy line crossing the chart shows that a 24-in. belt would have to be run at a speed of 240 ft. per minute, in order to handle a tonnage of 225 tons per hour of material weighing 100 lb. per cubic foot.

The two scales at the lower left-hand corner of the chart show what width of belt is preferable for handling different sizes of material, the inner scale being for lumps of a uniform size and the outer one for mixed material, the scale reading indicating the maximum size of lump. The heavy line just referred to is for a belt handling mixed material when the lumps do not exceed 8 in. With finer material when the lumps do not exceed, say 5 in., there would be required in the case cited above, a 20-in. belt running at a speed of 350 ft. per minute; or, for 14-in. lumps, a 30-in. belt, running at a speed of 155 ft. per minute.

Cubic feet per hour can be converted into tons per hour, for material of any given density (weight per cubic foot) by entering the chart at the top and following down the vertical line corresponding to the given cubical capacity, to its intersection with the diagonal corresponding to the given density or weight of material. From this point follow the horizontal line to the tonnage scale on the left. By reversing this process the cubic capacity corresponding to any given tonnage and material may be found.

In all cases the lower diagonals for different widths of belts are terminated

at the horizontal line marking the maximum desirable speed for the belt. In answer to our correspondent's question, "Can the speed of the 30-in. belt he has in use be increased so as to augment the tonnage from 150 to 250 tons per hour?" we reply, yes; the speed would have to be increased in the same ratio as the tonnage; or $\frac{250}{150} = \frac{5}{3}$, which would give a speed of $\frac{5}{3} \times 200 = 333$ ft. per min. The chart shows, however, that the maximum speed for a 30-in. belt is 450 ft. per minute.



Capacity and Speed Chart of Belt Conveyers

Courtesy Robins Conveying Belt Company

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

Governmental Inquiry into Liquor Consumption

The Immigration Commission has furnished some important information with reference to the liquor problem in mining communities as a result of careful investigations of the question which have been carried on with a view to tracing the effects of the use of alcoholic liquors and their relation to efficiency in the production of coal. The results of the inquiries show that there was a direct relationship between the consumption of liquor and the efficiency of the employees.

The consumption of alcoholic liquors among the immigrant employees is exceedingly large and has marked effects on their efficiency. One mine superintendent estimated that each of his foreign miners consume an average of two quarts of beer a day, in addition to the whisky they drink. Another superintendent stated that each week a carload of beer and a barrel of whisky were shipped into his town of 1800 people, two-thirds of whom are recent immigrants. The statement which follows shows the amount of beer and whisky ordered during one week from beer agents in three typical mining towns:

WEEKLY CONSUMPTION OF BEER AND WHISKY

Town	Quarts of Beer		Quarts of Whisky	
	Gross	Per Cap.	Gross	Per Cap.
A ...	5,400	4.5	100	0.08
B ...	5,000	4.7	300	0.28
C ..	7,200	4.8	400	0.27
	17,600	4.7	800	0.21

In all three towns some limitation on sales was imposed, and the above quantities are only the restricted orders of the beer agents. Additional amounts were consumed at neighboring saloons or were carried into the towns by the men themselves. When it is remembered that the greater portion of these intoxicants was consumed by the more recent immigrants, some general idea of the amount consumed by each workman can be reached. It must be remembered that drinking is particularly heavy immediately after pay day, so that during this time the most marked effects on efficiency are to be expected. The following table shows the total amount of beer and whisky ordered in one Pennsylvania town during a period of ten weeks:

CONSUMPTION OF INTOXICANTS IN PENNSYLVANIA TOWN

Race	Beer		Whisky	
	Quarts Ordered, 10 Weeks	Quarts per Cap. per Week	Total Quarts Ordered 10 Weeks	Quarts per Cap. per Week
American	100	0.30	3	0.006
English	0	0.00	4	0.050
Irish	48	0.69	0	0.000
Total	148	0.30	7	0.010
Bohemian	720	3.79	0	0.000
Italian	1,792	4.17	48	0.112
Polish	12,656	4.28	190	0.064
Slovak	6,272	2.88	184	0.084
Totals and averages	21,440	3.72	422	0.073
Negro	192	1.20	0	0.000
Grand total and averages	21,780	3.30	429	0.065

In this town sales are restricted and the figures given above are 40 per cent. less than the amount formerly ordered when no restriction was practised. Here again actual consumption is larger, since much is consumed in saloons outside the town and also carried into the town by the mine workers. The tables plainly indicate that consumption is much greater among more recent immigrants than among the Americans and the older immigrants, since the former group ordered per capita more than twelve times as much beer as the latter, and about seven times as much whisky. These results are somewhat influenced by the fact that the proportion of single men to women and children is higher in the second group than in the first, but it is also due in part to the fact that the women and children in the second group are much larger consumers than those of the first group.

Drink Whisky Instead of Light Wines

Figures of liquor consumption in towns where no restriction is exercised were not obtainable, but in view of the fact that in the average mining town numerous beer and whisky agents are constantly soliciting orders, some idea of the general consumption in such towns can be formed from the preceding tables. The recent immigrants have been accustomed to drinking beer or light wines abroad. In this country, however, they drink whisky in place of light wines, and they drink to excess. This is due to several causes: (1) They "treat" according to the American custom; (2) they have little opportunity for decent amusements or to buy homes or property with their surplus money, and there is a disposition to spend money freely. Excessive drinking, particularly among the foreign workmen, lowers their efficiency to an appreciable degree. As already stated, this is more marked in the days immediately after pay day, when the drinking is especially heavy. There is usually a decreased number of men at work and a consequent falling off in the output of coal and coke. The general manager of one large company says that for the half week following "Pay Saturday" production shows a loss of approximately 20 per cent. Formerly this was often larger, until the company somewhat restricted the sale of intoxicants in its village. The following reports from two mines give a fair idea of the effects of drinking on production during the period immediately following pay days:

DAILY PRODUCTION AT MINE NO. 1

	Cars of Coal Produced
Normal	550
Saturday (pay day)	not running
Sunday	not running
Monday	390
Tuesday	430
Wednesday	460
Thursday	550

Normal thereafter till pay day.

At mine No. 2 the output was also lowered by the fact that Tuesday after pay day was a church holiday.

Not only are fewer men in the mine immediately after pay day, with consequent loss of output, but the companies suffer additional loss through increased medical and hospital equipment, more numerous accidents and consequent medical and hospital bills, and through reckless and careless mining, with the loss of more or less coal and time and labor. The life of the town and of the workmen is demoralized, and the industry is rendered more unattractive to the better and more ambitious workmen and their children.

DAILY PRODUCTION AT MINE NO. 2

	No. of Men	Tons of Coal Produced
Normal	415	2,550
Saturday (pay day)	(not running)	
Sunday	(not running)	
Monday	320	1,934
Tuesday	202	1,672
Wednesday	384	2,402
Thursday	403	2,532
Friday	436	2,600
Saturday	412	2,200
Monday	414	2,566

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

A decision has been handed down by the Interstate Commerce Commission in the case of the Missouri & Illinois Coal Co. vs. The Illinois Central R.R. Co. This case grew out of an embargo established last winter by the Illinois Central against the movement of coal from mines on its line in Illinois to points in Missouri. The railroad's defense was that if it allowed its cars to go on to the lines of the railroads in Missouri they would confiscate them, and that the Illinois Central would not have sufficient cars to conduct its own local business.

Opinion of Commission

In the opinion of the commission, which was written by Commissioner Franklin K. Lane, it is said:

"The commerce of the country is regarded by the act to regulate commerce as national, not local, and the railroads are required to serve the routes which they have established without respect to the fact that this may carry their equipment beyond their own lines. The temporary confiscation by carriers of the cars of other railroads and the placing of embargoes against cars being sent off of the lines of the owners are alike unlawful. An embargo may be justifiable because of the physical inability of the carrier for some reason to deal with traffic which overwhelms it, but an embargo placed against connecting carriers because of their failure to promptly return cars is not consonant with the service which the carriers constituting the through route are required by law to give. By the act to regulate commerce the railroads are required to make reasonable rules and regulations with respect to the exchange, interchange and return of cars used upon through routes, and where they have failed in this respect the commission is empowered to determine the individual or joint regulation or practice that is just and reasonable."

Merits of the Case

Commissioner Lane further says: "Instead of an orderly system of car interchange carried out in good faith, we find in this case one road stealing the equipment of its connection by way of reprisal against similar thefts of which it is the victim. The result is that the coal company in Illinois, which has undertaken by contract to serve industries in Missouri, is cut off from its market by reason of the closing of the route which the law requires the Illinois Central and the Missouri Pacific to maintain and keep open.

"The complainant here was entitled at all times to send its coal to points upon the Missouri Pacific and through other connections at St. Louis to points upon their lines. It is not an adequate defense for the Illinois Central to say that this route was closed because of the dishonorable conduct of its connections. The burden rests upon these carriers to keep their highway between the mine in Illinois and the factory in Missouri open and to devise some method by which this can be done. The coal mine is entitled under the law to rely upon the carrier maintaining its route irrespective of the unfriendly relations that may exist between the carriers. The commerce of this country cannot be conducted under a system of railroad operation based upon such primitive practices of warfare as reprisal and embargo. Such methods are not the expression of civilization which leads to order, system and certainty, but are the loose and archaic methods of a disorganized industrial system."

Under this decision all of the car *per diem* and car-interchange rules of the American Railway Association become subject to the regulation of the Interstate Commerce Commission. This is the first time that the commission has taken this position which is based upon the Mann-Elkins Bill of 1910.

For Government Coal Mines

Representative Lafferty has offered a bill for extending the jurisdiction of the Interstate Commerce Commission over railroads in Alaska and for other purposes. The opening of the bill provides "that the Secretary of War, under the direction of the President, proceed to open and mine, at the best and most available point, coal of the best quality there to be obtained on the public lands of the United States, in what is commonly known as the Bering River coal fields in Alaska."

Sections 5 and 6 of the bill provide for the construction of a railroad and boat line to tap the fields and the disposal of the coal thus mined and transported to fill the various needs of the government.

Provision is also made for the sale of any surplus coal which may remain after governmental requirements are satisfied, as follows: "In addition to supplying the government needs coal shall be sold commercially to any persons desiring to buy the same from said government mines, and the price charged therefor shall not be in excess of the cost of mining the same and 4 per cent. per annum revenue on the sums expended therein by the government; that said boat line and railroad shall be open to all persons alike, as common carriers of freight and passengers, at charges therefor to be fixed by the Secretary of War, which shall not be in excess of the cost of operating and maintaining the same, and sufficient to yield a revenue of 4 per cent. per annum on the amount expended therein by the government."

Alabama

Birmingham—In a statement authorized by William H. Skaggs, of Chicago, it is said that the construction of the Gulf & Northwestern R.R. From Tuscaloosa, to Natural Bridge, Ala., will be started not later than Apr. 1, 1912. The purpose of this road is to develop about 40,000 acres of coal land in Tuscaloosa and Fayette Counties.

The Tennessee Coal, Iron & Railroad Co. will discontinue the working of state convicts in its coal mines, upon the expiration of its present contract with the state, Jan. 1, 1912.

Montgomery—The stockholders of the Sheffield Land, Iron & Coal Co. met Dec. 2, for the purpose of increasing the capital stock from $860,000 to $1,000,000.

California

Los Molinos—It is reported that a ledge of good coal has been discovered in Deer Creek Cañon, about 20 miles east of Vina. Indications are, however, that the seam is not more than 2 ft. thick.

Colorado

Denver—The strike situation in the northern Colorado coal field continues unrelieved, although no further violence has been reported. Governor Shafroth's efforts to effect an agreement have been unavailing and the prospect of a settlement is not near. Federal intervention is not expected. About 1000 union men are still on strike, although the mines are being operated and approximately 2000 men employed.

Fort Collins—It is reported that Larimer County will soon have a coal mine in full operation. The Fort Collins Coal Mining Co. has located a 5-ft. seam of bituminous coal at a depth of 350 ft. and a second seam 5½ ft. in thickness at a depth of 450 ft. The property lies near Wellington and the company feels assured of possessing two beds of coal a mile long and a half mile wide.

Title to thousands of acres of coal lands in Colorado, particularly in Routt County and in the vicinity of Walsenburg, may possibly be involved as the result of a decision just handed down by the United States district court in the case of the government against the Diamond Coal & Land Co., of Wyoming. The appellate court holds that title to coal lands may be proved by expert geological tests that coal deposits lie under the surface regardless of whether or not any outcroppings appear on the surface. The decision is likely to result in government suits to regain possession of several thousand acres of coal lands in this state.

Illinois

Frankfort—Official announcement has been made of the extension of the Burlington's southern Illinois coal line into the heart of the Franklin County coalfield. The extension will branch off from the main line, south of Christopher, and extend in a southeasterly direction for six miles to West Frankfort. Practically all the right of way has been secured and the work of construction will start early this month.

Chicago—Bituminous coal operators of nine States met at the Hotel La Salle, Dec. 4, and formed a temporary organization, the object of which is to prepare for the expiration of the present wage agreement so that the industry may be protected. Another meeting will be held Dec. 18, when the committee on organization will report and the new association be made permanent. The States represented are Illinois, Indiana, Iowa, Missouri, Kansas, Oklahoma, Arkansas, by delegates appointed by the operators' associations of those States, and Montana and Wyoming by individual operators.

The United Mine Workers of America, have issued a call for a joint meeting with operators of the competitive field—Indiana, Ohio, Pennsylvania and Illinois—to be held in Chicago. It is said, they wish to present to the operators, a demand for a new wage scale, probably 5c. a ton in excess of the present rate.

Indiana

Terre Haute—The Miami Coal Mining Co., with principal offices in Terre Haute, has filed a mortgage of $150,000 to cover all the mining property belonging to the company located in Vigo and Vermillion Counties.

Brazil—The Schlatter Coal Mining Co., operating in the block-coal district, about one mile south of Brazil, has purchased the Treager Coal Co.'s No. 2 mine, and has begun improving the property.

T. M. Honan, attorney-general for Indiana, has given an opinion to Frank I. Pearce, head of the mine-inspection department of the state bureau of inspection, in which he says members of a board of mine examiners cannot issue certificates pending the next regular meeting of the board. A miner failing to present himself for examination on the first Wednesday of any month shall not be permitted to work in a mine on a temporary permit until the next regular meeting of the board.

Iowa

Des Moines—The Rock Island Co. has commenced shaft sinking in the new coal field controlled by it and extending from a point 12 miles southeast of the city for a distance of eight miles. Two large shafts are being developed which will be ready about July 1, upon the completion of the southwest line. The mines will be electrically equipped and will give employment to about 1200 to 1400 miners. Des Moines will be the market town for these mines. An electric plant will be built at the Dallas shaft, which will not only generate sufficient power for the mine purposes, but a surplus for a couple of local industries and for lighting in Dallas. The intention now is to devote the entire output of the mines to the coaling of the Rock Island road and not to engage in the commercial trade.

Kansas

Pittsburg—It is stated that on Jan. 1, one-third of the Kansas coal mines will be shut down indefinitely. On that date the act of the last legislature goes into operation providing for workingmen's compensation. The mine operators are quoted as saying that "they cannot afford to take the risk of liability to injured employees necessitated by the law." Consequently a large number of the mines will suspend.

Kentucky

Whitesburg—The Kentucky River Consolidated Coal Co., composed of eastern capitalists, owning some 50,000 acres of choice coal and timber lands in southern Letcher and Perry counties, along the line of the Lexington & Eastern R.R., make the announcement that they will soon take steps looking to the development of their property. It will be necessary to build spurs out from the Lexington & Eastern R.R. to reach the property.

Owensboro—A voluntary petition in bankruptcy has been filed here by the Dovey Coal Co. of Mercer, Muhlenberg County, showing its liabilities to be $116,000 and its assets as aggregating $150,000. Among the assets are 825 acres of mineral land.

Winchester—The Lexington & Eastern engineers are locating a branch line of railroad from the mouth of Boone's Fork, up the Kentucky River to Moore's branch, in a rich coal and timber district, the property of the Mineral Development Co., a Philadelphia corporation. It is understood that the construction of this branch will be started within the next month or so. Another near-by branch is to be built up Potter's Fork of Boone, and still another up Yount's Fork of Boone.

Barbourville—The Brush Creek Coal and Manufacturing Company will be shipping coal within 30 days from its large mine at Jones Trestle, on the Cumberland railroad. The mine is in the famous Dean seam, which measures 7 ft. of clean coal and is considered the best domestic fuel in the field. The company is now considering a proposition from a Louisville concern, offering to take over the entire output of this mine for a period of years.

Michigan

Bay City—The Buena Vista Coal Co., of Saginaw County, has been thrown into bankruptcy by some of its creditors. It is represented that the mine is abandoned and partially filled with water, and the machinery, as well as the property in general, is going to waste.

Missouri

St. Louis—The Egyptian Coal Mining Co., composed mostly of business men of Marissa, Ill., has petitioned for articles of incorporation. The company has a capital stock of $65,000, of which $45,000 is paid up.

St. Joseph—A 2-ft. vein of coal which has been discovered 1½ miles southeast of Halls, bids fair to yield an abundance of coal equal to the Richmond variety. It contains practically no slate and gives an intense heat.

Ohio

Columbus—The Biwabik Mining Co., of Youngstown, was incorporated recently with a capitalization of $600,000.

It is practically certain that Ohio will not be represented in an association of coal operators of Ohio, Illinois, Indiana and western Pennsylvania, which was advocated by Pres. John P. White, of the United Mine Workers of America in a letter read before the Hocking Valley coal operators at a recent meeting. It is understood that Ohio and western Pennsylvania will attempt to fix a wage scale

next year, independent of the districts whose conditions are regarded as too nearly individual to conform with Eastern needs.

Dayton—The W. K. Steele Coal Co. has been incorporated with a capital stock of $50,000 to mine and sell coal.

Pennsylvania

Bituminous

Pittsburg—The Walton mine No. 2, of the Monongahela River Consolidated Coal & Coke Co., two miles south of Elizabeth, which has been idle for six months, has resumed operation. It is expected that the work will continue for some time. Recently the company extended the main heading into the 400 acres of adjacent coal land owned by the Hillside Coal Co., which was absorbed by the River combine at the time of its organization, and which adjoins the Walton mine. This is the coal to be extracted. The old mine will form a lead for the coal and will be used exclusively for river shipment. About 300 miners will be given employment.

The Merchants' Coal Company of Boswell, which is owned by the United Coal Company, of Pittsburg, is making preparations to place in operation its new fan, which has been constructed at considerable expense. The fan is part of projected and completed improvements there that will cost in the neighborhood of $180,000. When the improvements have been completed, the company expects to be in a position to double its output, which at present is from 2000 to 2500 tons per day.

The H. C. Frick Company is erecting a wash house for the use of the miners at its Collier works, Fairchance, Penn.

Connellsville—Among important trade developments is the recent placing of contracts for furnace coke, aggregating 1,400,000 tons, for delivery during 1912.

Altoona—The Kelso Smokeless Coal Co. has resumed shipping from its mines near Hogback, after a suspension of three years. The plant is one of the Huff-Keystone properties. About 500 men will be employed when the operation gets well underway.

The Pennsylvania Central Light and Power Company, of Altoona, is rushing to completion the construction work on a power line into northern Cambria county, where it expects to supply several operations of the Pennsylvania Coal and Coke Corporation, as well as a number of other mines.

Brownsville—A new concrete pump house is being built at the Naomi Coal Company's mine at Belle Vernon to replace the one destroyed by fire some time ago.

Reynoldsville—A force of men has been at work erecting new power buildings for the McKnight Coal Co. on its property here, and good progress is being made. The tipple has been remodeled and the new boilers are already on the ground.

Anthracite

Hazleton—After a year and a half of prospecting, the Penn Forest Coal Co., composed of Philadelphia capitalists, has discovered coal on the Penrose estate, between Hazleton and Weatherly, in a section where it was not thought anthracite would be found.

This news is confirmed by H. George Stimson, of Philadelphia, secretary of the corporation, who has charge of the work. The vein approximates 12 ft. thick, according to Mr. Stimson, and the tract contains about 10,000,000 tons of coal. The company has leased the entire 600 acres of the Penrose estate for 40 years, and is making preparations for the development of the basin. The tract is east of Hazleton, between the Beaver Meadow and Eckley basins.

The Penn Forest Coal Co. has sunk a shaft, and it is expected that a breaker will be constructed in time to mine and ship coal by Apr. 1, 1912.

Pottsville—Owing to the demand for washery sizes of anthracite, the Philadelphia & Reading Coal & Iron Co.'s officials gave orders, Dec. 6, that the Anchor washery, at Heckscherville, which was burned, probably by incendiary origin, entailing a loss of $10,000, is to be rebuilt. Work has been started and a sufficient force has been employed to guarantee that the new washery will be ready to resume within six weeks.

Scranton—James G. Shepherd has leased to the People's Coal Co., of this city, the right to mine the coal under six tracts in West Scranton. By the terms of the lease, the reorganized company is to pay Mr. Shepherd a royalty of 32c. per long ton on all coal above pea size; 16c. a long ton on pea coal, and 8c. a long ton on all sizes under pea coal.

Tennessee

Knoxville—An explosion took place in the Cross Mountain mines at Briceville, near here, in the morning of Dec. 9, shortly after the men had entered for work. According to newspaper reports about 100 men were entombed. Up until the night of Dec. 12, five men had been taken out alive and 31 bodies recovered. The mines belong to the Knoxville Iron Co., and no effort is being spared in the work of recovery. Several mine-rescue cars were immediately dispatched to Briceville.

It is reported that the extensive holdings of the King Mountain Coal Co. on the Clearfork extension of the Southern Ry. Co., west of Jellico, are about to be taken over by a party of Ohio capitalists. Should this deal be made, it will result in the development of the property involved and will mean much for the Jelico coal-mining section.

Washington

Spokane—The Western Fuel Dealers Association, which recently held a meeting here has joined with the National Federation of Retail Merchants. The decision to do this came at the third annual convention and banquet of the local association last week. The vote was taken after a speech by A. L. Porter, one of the organizers of the association, at Chicago, some weeks ago.

West Virginia

Fairmont—The West Virginia Mining Institute concluded its semi-annual session here Dec. 6, after electing the following officers: President, Frank Haas, Fairmont; vice-presidents, Neil Robinson, Charleston, George T. Watson, Fairmont, John Laing, Charleston, R. S. Ord, Maybury, J. F. Healy, Elkins; secretary-treasurer, E. B. Day, Pittsburg. The next meeting will be held in Charleston.

Williamson.—A coal deal has been completed here that involves the transfer of 665 acres of coal land on Gilbert's Creek, at an average price of $50 per acre. E. E. Musick and R. W. Buskirk disposed of the property to George Buskirk.

Wheeling.—It is reported that the Wheeling Coal and Coke Co. is endeavoring to secure control of the leasehold rights of the Panama Coal Co., a Marshall County concern which is now in the hands of a receiver.

Canada

British Columbia—The British Columbia Coal & Coke Co. is opening up a 15-ft. seam of coal on its property at Coalmont, B. C. The vein was cut by a tunnel 2200 ft. long. Overlying this seam are five others which will eventually be tapped by an extension of the same tunnel. The management expects to be shipping 500 tons daily by May 1. The railroad track has been extended to the mine and a tipple and other machinery will be installed forthwith.

The Brandon, Manitoba, board of trade has passed a resolution petitioning the minister of customs that the tariff of 50c. on United States soft coal, remitted in September, be not reimposed this winter, owing to the poor coal supply in Western Canada at present, due to the recent strike.

Col. Dennison, the United States consul, at Fernie, B. C., reports that the following mines have cleared shipments through the office at Fernie and most of the mines are increasing their output: Canadian Consolidated mines, at Frank; Hillcrest mines; Davenport Coal Co.; West Canadian collieries; Leitch collieries; Maple Leaf and McGilvray Creek mines, and the Corbin mines. The coke ovens are being charged and shipments to the smelters will commence soon.

Personals

W. H. McIntyre, formerly 4th vice-president, Equitable Life Assurance Society, is now 1st vice-president and general manager of Manning, Maxwell & Moore, Inc.

C. C. Bunton has been appointed manager of transportation of the Monongahela River Consolidated Coal & Coke Co., and will assume the duties of this office at once.

R. Y. Williams, government mining engineer, with headquarters in Urbana, Ill., delivered an interesting illustrated address on the work of the bureau of mines before the Science Club, Terre Haute, Dec. 7.

Edward T. Penrose, general manager for the Penn Central Light, Heat & Power Co., Altoona, Penn., has tendered his resignation to become general electrical engineer for the Pennsylvania Coal & Coke Co.

Charles H. Rowland has been elected president of the Moshannon Coal Mining Co., with operations in central Pennsylvania. Other officers are: Vice-president, John G. Anderson; and manager, A. S. Brown.

Monks & Johnson, architects and engineers, Boston, Mass., have associated themselves with Henry F. Keyes, architect, Boston, for the preparation of plans and specifications for certain large industrial developments.

C. H. Nesbitt, chief mine inspector for Alabama, has been instructed by Governor O'Neil to appoint a committee of three, with himself as chairman, to report on the contract between the state and the Pratt Consolidated Coal Co., covering the operation of the Banner mine with state convicts, and also to report on the matter of a proper cost for mining coal at that operation.

George W. Theiss, vice-president and a director of the Monongahela River Consolidated Coal & Coke Co., has tendered his resignation, to take effect Jan. 1, 1912. Mr. Theiss has been actively identified with the river coal trade for the past 22 years. W. H. Crump, master of transportation, and Capt. John Moren, manager of the freight department, a director and one of the company's organizers, have also resigned.

Walter B. Snow announces the recent addition to his staff of Sidney G. Koon, M. M. E., for four years editor of *International Marine Engineering*, and later metallurgist, Jones & Laughlin Steel Company; and also the addition some time since of John S. Nicholl, B. S., lately with the New York Edison Company, and formerly acting manager for F. W. Horne, importer American machinery, Yokohama, Japan. Both are members of the American Society of Mechanical Engineers.

Obituary

Amos H. Woodruff, 76 years old, retired mine operator and wholesale coal dealer of Chicago, died Dec. 3, of pneumonia while visiting friends in Seattle, Wash. Mr. Woodruff had lived in Chicago 35 years.

Capt. Winfield Scott Carr, aged 63, for many years official coal gauger at the river front and well known by river men from Pittsburg to New Orleans, died at his home in Cincinnati, Ohio, Dec. 4. The captain before he retired from active service about six years ago owned the steamer "Sentinel," which he used in his occupation as coal gauger.

James A. Milholland died at Glenover, Md., Dec. 7, aged 69 years. He was born and brought up at Reading, Penn., where his father was head of the mechanical department of the Philadelphia & Reading R.R., and the inventor of many improvements in the early days of the locomotive. Later he went to Cumberland, Md., where he passed the rest of his life. He was for a number of years vice-president of the Consolidation Coal Co. and president of the Georges Creek & Cumberland Railroad.

New Publications

Labor Legislation Enacted by the Forty-seventh General Assembly of Illinois. Boards, 142 pp., 6x8¾ in., Bureau of Labor Statistics, Springfield, Ill.

Topographic Maps and Folios and Geologic Folios. Index to about 2000 maps and folios which may be secured from the Director, U. S. Geological Survey, Washington, D. C. Paper, 112 pp., 6x9 inches.

Quarterly of the Colorado School of Mines for July and October, 1911. The latter number contains articles on the scope and progress of the mining industry in Colorado, prepared by the Colorado School of Mines. Paper, 6x9 inches.

The Twentieth Annual Report of the Mining Department, State of Tennessee. R. A. Shiflett, chief mine inspector. Boards, 155 pp., 6x9 in. This report is for the year 1910, and is the same in arrangement and scope as those previously published since 1903.

Trade Publications

H. K. Porter Co., Pittsburg, Penn. Steam, Compressed-air and Gasoline Locomotives. Four-page announcement, illustrated.

Robins Conveying Belt Co., New York, N. Y. Bulletin No. 47. Belt Conveyors and the Robins-Messiter Patented Ore-Bedding and Reclaiming System. Illustrated, 30 pp., 6x9 in.

Keystone Driller Co., Beaver Falls, Penn. Booklet, "The Rescue of Joseph Clarey from the White Oak Mine." 16 pp., illustrated. This publication deals with the use of cable drills in rescuing entombed miners from shaft and drift workings.

Industrial Notes

The Durham Coal & Iron Co., of Chattanooga, Tenn., contemplates increasing the capacity of its mines and is considering the installation of a byproduct coking plant. C. H. Smith is vice-president and general manager.

T. J. Asher, Wasioto, Ky., will make the purchases of machinery for the Southern Mining Co., Williamsburg, Ky., which recently organized for the purpose of developing coal lands in eastern Kentucky. Fifteen electric mine locomotives, 12 longwall machines, two coal washers and other special equipment will be needed.

The H. K. Porter Co., of Pittsburg, Penn., well known manufacturers of light locomotives which are extensively used in connection with mining work, announces that it has gone into the manufacture of large and heavy locomotives and gasoline locomotives in addition to the smaller types which have been built by it for the past 45 years. The gasoline locomotive is this company's latest specialty.

The Nellie Coal Co.'s mine at Argentine, Penn., has resumed work with a new tipple, boiler house and shop and a newly equipped engine room. Among other labor-saving devices in the tipple is a Phillips patent automatic dump. An innovation for this district is to be introduced at the Nellie operation in the form of a gas-driven locomotive for hauling coal in the mine. The company has contracted with the Milwaukee Locomotive Manufacturing Co. for one of these locomotives which from present appearances are going to become a popular form of mechanical haulage. The Grove City Machine & Supply Co. furnished the boilers, engines and other machinery.

For some time the Hyatt Roller Bearing Co. has made a practice of issuing bulletins covering in detail the ratings and capacities, indicated uses and actual application of its flexible roller bearings. Separate issues cover the different types such as the Long series for machine tools and similar work, and the Short series for shafting boxes and for special work in cars used in the transportation of passengers, freight and mine products. Forms for the entry of questions or specifications are also provided and with the carefully arranged tables in the bulletins make it easy to procure the proper bearing for the particular purpose. These bulletins are at the call of anyone interested and form a collection of special information worthy of a place in any engineering office.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

With a few exceptions, the general trend of the market during the past week has been backward. Indications that such would be the case were evident last week and the continued mild weather has brought the realization. This applies more particularly to domestic, steam and slack continuing strong.

On the Atlantic Coast, a perceptible falling off in trade, especially in anthracite, has given the dealers a welcome opportunity to catch up. This is particularly so in the retail trade, the effects of the weather not yet being felt by the wholesalers. Coastwise movements are much better and prices are variously reported as the same or lower, with the exception of slack, the demand for which is heavy.

Loading at lake ports, for storage over winter, still continues in Ohio and some shipments are being made without insurance. The weather has been mild and the condition of the retail trade is not satisfactory, although prices are steady. There appears to be a large over-production for which the strike scare or continued low temperatures are the only apparent remedy.

At Chicago and throughout the Middle West the weather and a large car supply has weakened the market appreciably. Prices are unusually low and trade is reported the worst for several months. As compared with previous seasons the market is said to be in the poorest condition for a number of years.

In the extreme West trade is reported active with prices firm and supplies good.

Boston, Mass.

The mild weather last week somewhat relieved the tension. The movement of tonnage is better, but rates are still at the high point reached a fortnight or so ago, and recovery from the shortage of bottoms is sure to be slow. Prices are practically unchanged, \$2.60 still being the firm figure, f.o.b., for Pocahontas and New River, and around \$4 continues to be the price on cars, Boston, for the same grades.

Georges Creek shipments are coming through with noticeable regularity, and the shippers of that variety are about the only ones in shape to sell spot cargoes. Their contract obligations are evidently well in hand, and there is not likely to be much shortage in that quarter.

Pennsylvania bituminous coals are cutting very little figure now. With the advanced freight rate from Philadelphia, the urgent request for anthracite and the shortage of barges, almost nothing is heard of any call for hatch-load shipment. It has sloped off considerably.

The anthracite market is still way behind on shipments. Orders filed five and six weeks ago are in some cases unfilled, egg and broken being the only sizes in supply, while the call is almost exclusively for stove, chestnut and pea. The falling off in retail trade for a few days will give the dealers breathing space.

Marine freights are still quoted on the basis of \$1.20@1.25 for large vessels, Hampton Roads to Boston.

New York

Additional improvement is noted in the bituminous market at New York. Contract demand is steady and in many instances shippers, especially those producing the fancy grades, are having all they can do to take care of regular business. Some new business is coming into the market and even the low-grade steam coals are now finding a better demand.

The snow storm early last week had an effect on railroad transportation, and at the New York piers winter conditions are beginning to prevail. The yards have been congested with heavy accumulations, and there has been more or less delay in loading. The general embargo that was placed on the South Amboy piers last week, to relieve congestion there, has been removed and shipments again resumed. Some of the shippers to this pier who had ready disposition for their stocks at the piers, and who were not responsible for any of the accumulation, now find themselves short of coal pending the arrival of shipments made since the resumption.

The weather has been a little more favorable this week for the movement of tows on the Sound, but marine freight rates are still firm and boats for the Eastern trade extremely scarce. Harbor boats are also short and the congestion and delay at the piers makes the shortage more pronounced.

Notwithstanding the steady condition of the demand, prices at which steam coals are being offered, f.o.b. New York, have shown but little tendency to advance although they are somewhat firmer. Quotations range about the same as previously reported.

Philadelphia, Penn.

The present week started in with unusually mild weather, and as a consequence there has been a perceptible falling off in the demand for retail coal. Egg is particularly slow in movement, while stove, chestnut and pea are fairly active, but the dealers declare it will require some good, cold weather to create an active market. However, the weather man has promised some colder weather, which should act as a spur to promote a better feeling in the anthracite trade.

The excitement incidental to the proposed advance in prices has disappeared, and the public have resigned themselves to pay whatever prices the coal dealer may ask. It is not believed, however, that many of the dealers are realizing the new prices. As one dealer sets forth in his advertisement: "Old prices for cash or C. O. D., book accounts 25c. additional." With the trade as stagnant as at present, they are probably willing to accept the old prices, cash or credit.

The wholesale market still enjoys its season of prosperity, the condition of the retail market not as yet having reached the producer. The tidewater business is splendid, although this applies more particularly to orders already accepted than on new business being received.

A prominent feature of the market is the call for vessels for Southern shipment, of which there does not seem to be a large supply. Freights are quoted anywhere from \$1.25 to \$1.59, where 90c. to \$1.25 was the case a month or six weeks ago. This is getting to be quite serious, as many inquiries are coming from the South, indicating a possible shortage in anthracite.

Pittsburg

Bituminous—Domestic demand continues good, and manufacturing is fair, with a good demand for slack, which continues to stiffen. Some of the mines which engaged largely in the lake trade accumulated large piles of slack in the summer, and this product has prevented an advance in slack to the full schedule price, which is assumed to be 75c. We quote prices unchanged, except slack, which is 10c. higher: Nut, \$1@1.05; mine-run, \$1.05@1.10; ¾-in., \$1.15@1.20; 1¼-in., \$1.25@1.30; slack 65@75c.; all prices per ton at mine, Pittsburg district.

Connellsville Coke—An interesting feature in the market is an advance of

10c. a ton in prompt furnace coke, to a minimum of $1.60, after the market had held at $1.50 for many weeks. An advance usually occurs about this time in prompt furnace, owing to furnaces calling for extra coke to guard against interruptions in shipments, both through weather conditions affecting the railroad movement and the holiday season at the ovens reducing production.

For a long time there has been only a very limited supply of prompt coke on the market, production being very closely adjusted to shipments on contracts, and it only required a slight extra demand to send prices upward. Last week we noted sales at both $1.50 and $1.55, and since then additional sales have been made at that price, while late last week sales of 50 to 75 cars were made at $1.60. Several contracts are understood to have been practically closed for next year since those reported a week ago, but details are not divulged.

The contract market is stiffer, nearly all the coke available at prices quoted being closed. As there is little more to be covered, the market is not quotably changed, and we repeat last week's quotations, except for the advance in spot furnace: Spot furnace, $1.60@1.65; contract furnace, first half, $1.60@1.65; year 1912, $1.65@1.75; prompt foundry, $1.80@1.90; contract foundry, $2@2.25.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Dec. 2 at 315,931 tons, a decrease of 15,000 tons, and shipments at 3551 cars to Pittsburg, 4969 cars to points west and 932 cars to points east, a total of 9452 cars, which is a decrease of 169.

Baltimore, Md.

There was no noticeable change in the Baltimore market during the past week, and the trade here is apparently marking time. One of the largest operating companies in Baltimore reported an increase in inquiries, and slightly heavier spot orders, but this improvement does not apply to the market as a whole. A majority of operators state that conditions are in about the same shape as during the week previous. Some little disappointment was expressed over the failure of the numerous inquiries, reported last week, to develop into actual business. Some did, but they were not sufficient to materially affect conditions.

Most of the coal moved out of this market during the week just ended was delivered under existing contracts. Spot business, for the most part, was entirely absent. The operators delivering under contract are confronted with higher vessel rates, which, if continued for any length of time, will prove rather serious.

The low grades of coal are being quoted at 75c. and 80c. per ton, while the better grades can be purchased around $1.10 and $1.25 per ton. Big Vein, Georges Creek coal, is quoted at $1.60 per ton.

From the latest reports received, car movements on all the railroads, moving coal shipped by Baltimore companies, were good during the week.

Buffalo, N. Y.

The general trade in coal was becoming good, with anthracite mostly rushing, when the weather turned warm and the market suffered severely. While the demand for anthracite is most affected by the weather, there is a decided falling off in bituminous.

But for the steady improvement of slack, which has not been entirely suspended by the warm spell, the handlers of bituminous would be in despair. Some of them are even now inclined to say that there is little encouragement offered on the part of the consumer and it may be as well to let matters take their own course till cold, or at least seasonable, weather returns.

The worst of it is there are reports of large offers at cut prices. One jobber states he was offered a lot of coal at such low prices that he felt obliged to take ten cars or go out of the business.

There is, otherwise, a better tone to the bituminous trade, if only on the report that pig iron is selling more actively than through the summer. Business men claim not to see why this is so, but if it continues there will soon be much less complaint of slow trade all along the line, for, of course, iron controls the situation.

The close of the lake trade has been quite reluctant on the part of all shippers. October and November were stormy and there has been much less business done by water than was planned, even though the weather has not been so cold as usual. The arrival of December found all branches of the lake trade away behind the estimates.

Bituminous prices remain at $2.50 for Pittsburg three-quarters, $2.40 for mine-run and $2 for slack, freight included, with Allegheny Valley about 20c. lower. Coke is a trifle firmer at $4.25 for Connellsville and $3.50 for stock, including freight. The anthracite trade has dropped off very decidedly since the warm weather set in, but the shippers were generally supplied with orders enough to keep them busy.

Cleveland, Ohio

A number of boats have been loaded in the past week for lake coal to be held over during the winter, and in consequence, slack has been plentiful with prices firm.

The domestic trade, owing to the mild weather in the past ten days, has not been as good as the week previous, and no change has taken place in the steam-trade condition. Taking all in consideration, the coal business in Cleveland is anything but satisfactory, excepting in slack coal, which seems to be in abundance and prices held firm.

There is a general impression among the coal men that things will improve after Jan. 1.

Columbus, Ohio

Warmer weather and the approach of the holiday season has had the effect of quieting the coal trade in Ohio fields during the past week. Prices have not suffered in the least and the consensus of opinion is that the lull is only temporary and that trade will improve after the first of the year.

One of the best features of the market is the tendency on the part of some of the railroad systems and larger manufacturing establishments to store in anticipation of a suspension at the expiration of the present wage agreement between the operators and miners, Apr. 1.

Prices have ruled firm during the past week, despite the unfavorable weather conditions. The steam grades are firm and the requisitions of larger users are about the same as usual. There is more strength shown in the fine-coal market, owing to the fact that the lake trade is a thing of the past.

Operations in Ohio fields have been quite active during the week, in spite of the weather conditions. In the Hocking Valley the output is estimated at 85 per cent. of the capacity and the same percentage maintains in the Jackson, Cambridge, Pomeroy Bend and Crooksville fields. In eastern Ohio the output was not quite so large, but still was satisfactory.

Retail trade has been a little slow, owing to the higher temperatures and the bad roads in the rural sections of the state. Then, again, the larger consumers have stocked up for the winter and second orders will not be the rule for some time. There is little or no trouble from a car shortage, and operators and jobbers are able to keep well up on orders. The closing of the lake season released a large number of cars, which are now used in the domestic trade. Deliveries in retail trade have been interfered with by the icy streets and the mud. Prices are firm at the figures prevailing for some time, which are as follows:

Fancy grades of domestic lump	$1.75@2.30
Domestic lump in the Hocking Valley	1.50
Domestic lump in Pomeroy Bend district	1.60@1.75
¾-in.	1.35
Nut	1.15
Mine-run in the Hocking Valley	1.05@1.15
Mine-run in eastern Ohio	0.95@1.00
Coarse slack	0.30@0.40
Nut, pea and slack	0.40@0.50

Cincinnati, Ohio

The demand for domestic fuel has fallen off because there have been several days of unseasonably warm weather.

The demand for steam fuel is about the same, with a slight increase noted in fine coal. This is encouraging and most fortunate as it gives this market an opportunity to get back to something like its former firmness. For several months it has been sagging and there has constantly been a large amount of coal on track on consignment. A part of this has been sent to northern markets, which are demanding an unusual amount of that fuel.

The lump demand has been good for several weeks but the first touch of continued warm weather resulted in every office receiving wire requests to hold back shipments. Nothing but weather can have any effect upon the market before the first of the year—excepting, of course, a complete tie-up of cars.

The question of new labor contracts is one that is causing discussion and much serious thought. Both sides are firm in their stand that neither can give anything more and each believes that the other must yield.

Charleston, W. Va.

It cannot be said that present conditions are favorable to the operators, but there will be some relief after the first of the year. Prices in some districts where competition is keen are so low that it is only a question of time when the mines will have to cease operation if they desire to make ends meet. The conditions are more serious in the Kanawha territory than in any other. There run-of-mine gas is bringing 73c.; splint run-of-mine, 85c., and lump from $1.05 to $1.25. In competition with the Kanawha field is the Kentucky district, as well as Ohio and Tennessee.

Conditions in the New River district and the Pocahontas are not so bad. In the former, run-of-mine is bringing $1.10 and egg and lump from $2.25 to $2.50. The price of tidewater at the mines is $1.10 gross, but there is a strong belief that this will be increased to $1.20 after the first of the year. There is a probability that Kanawha district coal will also receive a little increase—a thing that is absolutely necessary if operations are to continue. It is freely admitted that coal cannot be mined for 73c. a ton.

The output for the last half of the present calendar year will probably be almost double that of the first, showing that production has been good during the last five months. The indications are that the output for the state during the fiscal year ending next July will show an increase of a million or more tons above that for the same period last year, when the production was about 60,500,000 tons.

Louisville, Ky.

The coal situation in Louisville remains much the same as last week, with plenty of river coal, due to a good boating stage, and the Kentucky product being shipped in, in quantities sufficient to supply all demands. In fact, the operators are not selling as readily as they would like. This may be due to the weather conditions, a decided rise in temperature materially affecting the demand.

The prices for Pittsburg, Jellico, Miller's Creek and other leaders have fluctuated but little in the past two weeks. The chances are there will be little change before March, when the quotations will fall materially. At the offices of the wholesalers here the statement is made that the falling off in demand by the consumers is having a natural effect on the shipments from the mines. The dealers, both wholesalers and retailers, agree that business now, as compared with this season last year, shows a falling off.

Olive Hill lump is being quoted at retail at $4; Pittsburg at $3.50@3.75 for lump, and $3.25 for nut; Jellico at $3.60; Kentucky lump at $3.25; Straight Creek at $3.75; St. Bernard at $3.25; Pocahontas lump at $4.75, and Gem at $3.

Nashville, Tenn.

A week of warm weather has hurt the coal market in this field as it always does, and has not helped to maintain the price of $1.50 on lump coal which the operators are trying to get from now on.

There has been little life to our market in the west Kentucky field during this season. Prices have not been satisfactory, and though most of the operators have been fairly busy during the few cool spells which only lasted for a day or two, the warm weather finds most of them without business.

It is a recognized fact, and has been for sometime, that there is a vast over production of coal in the west Kentucky field on the Louisville & Nashville R.R., for the markets which this coal can enter.

Prices on screenings and steam coal have not advanced and business is quite dull in that line. The prices which are supposed to prevail at present are as follows per ton:

Lump	$1.50
Nut	1.10
Mine-run	1.00
Screenings	0.35

These are the prices which the operators are endeavoring to maintain, but unfortunately they are having a hard time in doing so.

Indianapolis

There is little doubt but this has been the poorest season the Indiana coal fields have seen for several years, and both the operators and the miners are affected by the lack of steady work in the mines. No reason can be assigned except that factories are not demanding as much coal as usual and the weather conditions have been adverse for an active domestic consumption.

A prominent block-coal operator in the Clay County field said that at this time last year he was forty cars behind in his orders and did not catch up until the first of January, when the bottom dropped out of the market and the demand has not since been reëstablished. At this time of the year, the operators say, the demand should be twice or three times what it is now.

Chicago

Warmer weather has had a weakening influence on prices in the Chicago coal market. The close of navigation and an increase in the car supply also have been factors in lessening the strong upward trend heretofore prevailing.

Some of the large dealers in smokeless are selling it at $1 flat, although $1.10 is being obtained in many cases. Smokeless lump and egg, as a rule, command $2, the $2.25 price prevailing only in a few instances. The market for screenings remains practically unchanged. There has been an increase in the car supply for handling anthracite shipments, but a decrease in the volume of buying has been noticeable. There is a good demand for coke and prices on the spot market remain firm.

Coke—Prices asked for coke are: Connellsville, $4.50@4.65; Wise County, $4.50@4.65; byproduct, egg and stove, $4.95; byproduct, nut, $4.55@4.65; gashouse, $4.85.

Prevailing prices at Chicago are as follows:

Sullivan County:	
Screen lump	$2.10@2.15
Domestic lump	2.50@2.60
Egg	2.30@2.40
Screenings	1.47@1.52
Springfield:	
Steam lump	$1.97@2.02
Domestic lump	2.27@2.47
Mine-run	1.82@1.87
Screenings	1.42@1.52
Clinton:	
Steam lump	$2.00@2.10
Domestic lump	2.17@2.37
Mine-run	1.82@2.02
Screenings	1.42@1.52
Pocahontas and New River:	
Mine-run	$3.15
Lump and egg	4.30

Minneapolis—St. Paul

The mild weather of the past two weeks has begun to tell on the wholesale trade and the demand has been less this week than at any time during the last three or four months. If the weather continues mild for another week it is doubtful if business will be good for the balance of the month, as most dealers in the country have plenty of coal on hand and in transit.

Car supply at the docks is good at present. Prices are stationary on all grades of dock coal except screenings, which still sell in the Twin Cities at less than circular. Most of the Illinois operations are holding out for their price on all-rail coal. Harrisburg and Franklin coals seem to have weakened a little.

The large volume of dock trade fell off when the duty was replaced on American coal, Dec. 5.

A comparatively new market has been made at the head of the lakes for anthracite dust. The zinc mines in southwestern Wisconsin have been buying all they can get, and a special rate has been recently made from the docks to this point. Formerly this was hard to dispose of at 15c. per ton. It is used for smelting zinc ore, and when mixed with the ore it has the effect of cleaning out foreign substances. These zinc companies have taken all the dust Chicago could furnish at a good price, and have made a proposition to Eastern anthracite shippers to take all they can furnish from Erie loading ports.

St. Louis, Mo.

Trade is worse, if anything, and has been since the latter part of last week, when prices on all grades simply went to pieces. Perhaps the market has recovered some from the demoralization it experienced Monday, when Standard went down to 90c. for 2-in. lump and $1 for 6-in.; all other coals followed in proportion.

A careful canvass of the steam plants in St. Louis shows supplies are small, and the retail companies are not stocking any beyond that they have contracted for and must take from the operators. This same situation applies to country trade, which means there will be a hand-to-mouth business until after the first of the year.

The prevailing prices are:

Franklin County:	
6-in. lump	$1.50@1.60
3x6-in. egg	1.50@1.60
No. 1 nut	1.35@1.45
No. 2 nut	1.20@1.25
No. 3 nut	1.10@1.15
2-in. screenings	0.65@0.70
Carterville:	
6-in. lump	$1.35@1.45
3x6-in. egg	1.35@1.45
No. 1 nut	1.20@1.30
No. 2 nut	1.00@1.10
No. 3 nut	0.90@1.00
2-in. screenings	0.60@0.65
Mine-run	1.00@1.05
No. 1 washed	1.50@1.60
No. 2 washed	1.20@1.30
No. 3 washed	1.15@1.25
No. 4 washed	0.90@1.00
No. 5 washed	0.50@0.60
Standard:	
6-in. lump	$0.95@1.05
2-in. lump	0.90@0.95
3x6-in. egg	0.80@0.85
No. 1 nut	0.70@0.75
No. 2 nut	0.60@0.65
Screenings	0.30@0.35
Mt. Olive:	
6-in. lump	$1.35
3-in. lump	1.25
3x6-in. egg	1.00
No. 1 nut	$0.85@0.90
No. 2 nut	0.75@0.80
2-in. screenings	0.35@0.40

The higher-grade coals from the inner district, such as the Trenton, and others, are holding good at $2, but the demand is falling off. There is very little coal moving in from the Springfield district and this also applies to the Saline County and Gallatin County fields as well. Big Muddy coal is still firm at $2.25 for 6-in. lump and $2 for 2-in. There has been a falling off in the demand for anthracite, and the size that is in greatest demand now is chestnut, at the current circular. There is a good demand for coke, both gas-house and byproduct at the same prices as have existed for the past three weeks.

Spokane, Wash.

The general conditions are favorable and at present, the supply seems to be almost greater than the demand, one company having said that they have enough coal on hand to supply the entire city for a week or ten days without effort. The mines in British Columbia have recently commenced shipping to this territory. The stocks are becoming rather low but shipments are good and supplies no doubt will be adequate.

A comparative statement of wholesale and retail prices for the months of November and December is as follows, in short tons:

Grade	December		November	
	Wholesale	Retail	Wholesale	Retail
Rock Springs	$7.20	$9.00	$7.20	$9.00
Owl Creek	7.20	9.00	7.20	9.00
Kirby	7.20	9.00	7.20	9.00
Carney	6.70	8.50	6.70	8.50
Bearcreek	6.35	8.25	6.35	8.25
Roslyn steam	5.25	6.25	5.25	6.25
Canadian steam	5.25	6.25	5.25	6.25

San Francisco

Owing to the fall in temperature during the past two weeks, there has been a brisk demand in the retail trade. Cool nights and mornings make the use of coal a necessity.

An arrival of British Columbia, Wellington coal, due here this week, will come to a market bare of that grade, none having arrived since Nov. 2.

The arrivals of Australian coal total 14,293 tons, a quantity equal to all present demands, and the quality making an acceptable temporary substitute for Wellington.

Other arrivals are 5670 tons steam coal from Comox, British Columbia, 6000 tons from Norfolk for the U. S. Navy and 3534 tons domestic from Puget Sound.

The state is now being visited with welcome rains which will give additional impetus to the trade. The wholesale prices, ex-bunker or at ship's side, are as follows per short ton:

Wellington, clean	$8.00
Wellington, average	7.50
Australian, clean	8.00
Australian, average	7.50
Puget Sound, clean	6.50
Puget Sound, steam ....$5.00 and	5.50
Pennsylvania anthracite	15.00
Colorado anthracite	12.50
New Mexico anthracite	13.50
Anthracite briquets	10.00
Cumberland, smithing	12.50
Utah, Wyoming and New Mexico, clean (for domestic use only)....$9.00 and	8.00

Production and Transportation Statistics

Anthracite

Anthracite shipments for the first 11 months of the present year, as compared with the same period last year, were as follows, in long tons:

ANTHRACITE SHIPMENTS

Companies	1910	1911
Philadelphia & Reading	11,181,353	12,027,031
Lehigh Valley	10,144,602	11,493,295
Jersey Central	7,673,016	8,397,839
Delaware, Lack. & West.	8,736,977	9,042,372
Delaware & Hudson	5,974,235	6,613,809
Pennsylvania	5,549,340	5,893,930
Erie	6,884,945	8,078,086
N. Y., Ontario & West.	2,529,740	2,292,510
Total	58,674,208	63,838,872

Lake Shipments from Toledo

Total shipments from the Hocking Valley docks for the season which is now closed amounted to 2,419,640 tons. During the season of 1910 shipments were 2,077,614 tons while for 1909 they were 1,273,921 tons.

Lake Trade

Comparative statement of coal passing through the Sault canals up to Nov. 1 for the years 1910 and 1911 is as follows in short tons:

	1910	1911
Anthracite	1,411,345	1,769,567
Bituminous	10,549,041	11,894,878
Total	11,960,386	13,664,445

Foreign Markets

Great Britain

Nearly all sellers are well booked for December, and the market is firm. Good second admiralties are relatively the strongest feature. Best smalls are in better demand and quotations are stiffening.

Approximate quotations are as follows:

Best Welsh steam coal	$4.20
Seconds	4.02
Thirds	3.72
Best dry coals	3.96
Best Monmouthshire	3.69
Seconds	3.48
Best Cardiff small steam coal	2.16
Seconds	1.92

The above prices for Cardiff coals are all f.o.b., Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b., Newport, both exclusive of wharfage and for cash in 30 days, less 2½ per cent. discount.

France

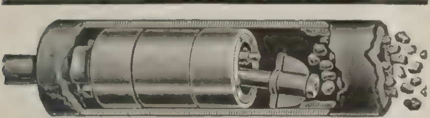
Comparative statement of production, first 6 months of this year as compared with the same period last year is as follows, in metric tons:

	1910	1911
Coal	18,611,086	19,153,543
Lignite	343,247	363,256
Total	18,954,333	19,516,799

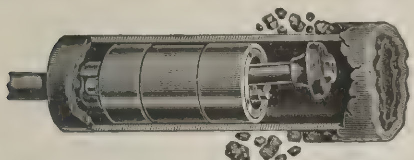
Alphabetical Index to Advertisers

Classified Index to Articles Advertised

THE Canedy-Otto Mfg. Co., of Chicago Heights, Ill., tried the **Dean Boiler Tube Cleaner** and removed 739 lbs. of scale from one boiler. They kept the cleaner, because "*From the first it plainly demonstrated that the boiler compounds do not keep the scale from forming upon the tubes, nor do they remove scale when same has formed.*"



The Dean removing scale from the tube of a water tube boiler.



The Dean removing scale from the tube of a return tubular boiler.

Would You Not Appreciate The Same Results In Your Mine, Mr. Superintendent?

In the coal mine as in any other industrial establishment, scale on the boiler tubes means lessened efficiency, greater expense, and eventually more shut-downs.

Are you fighting scale formation in your mine boiler plant? And if you are, are you sure that the method you use is keeping the boilers free from *all* scale?

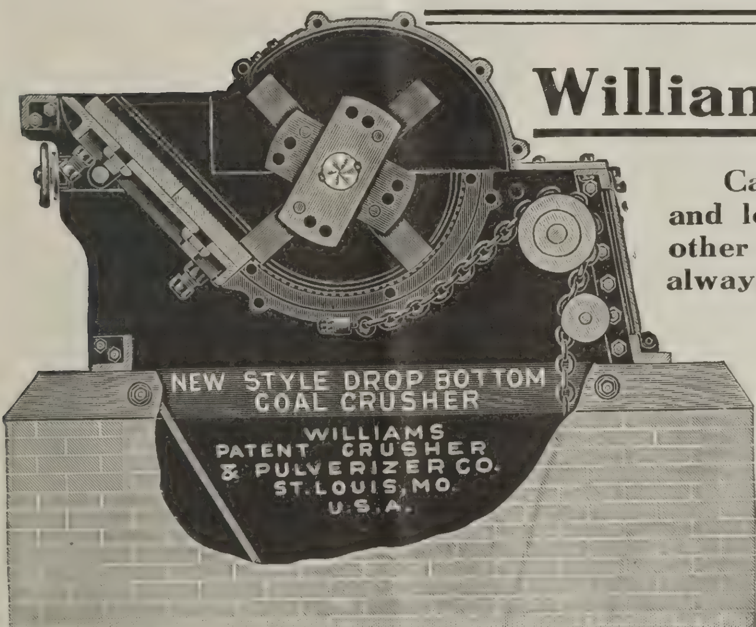
You can make sure without expense to yourself The Dean will be sent on trial and will probably open your eyes to conditions which you had not even suspected. *Why not try it?*

Trial Offer and Guarantee

We send the Dean Boiler Tube Cleaner for free trial on one boiler. The Mine Superintendent can see how it operates and prove to his own satisfaction that it removes all scale. We sell the Dean under a guarantee that it will pay for itself within six months or we will refund money. *Why not send today and see if* **your** *boilers are clean or pretty clean?*

The Wm. B. Pierce Company

335 Washington Street **Buffalo, N. Y.**



Williams Coal Crushers

Can crush more coal with less power and lower cost of maintenance than any other crusher on the market. Product is always uniform.

The remarkable success obtained by Williams Patent Hinged Hammer Coal Crushers is mainly due to the strong construction and the design which makes every part adjustable to itself, adjustable to every other part, and adjustable to wear.

Hammers adjustable to Breaker Plates and Cage. Breaker Plates adjustable to Hammers. Sectional Cages adjustable to Hammers, also adjustable fine or coarse.

By these features grinding diameter is maintained, product is kept uniform, life of grinding parts is prolonged, cost of maintenance is lessened, and horsepower per ton crushed is decreased.

Adjustable Cages, Automatic Dumping Cage and other specially valuable features. ***Write today for Catalog 5 with full particulars.***

Manufactured and licensed under 87 separate and distinct Patents. More than 2000 in daily use.

The Williams Pat. Crusher and Pulverizer Co.

Old Colony Building - Chicago

428 Monadnock Bldg., San Francisco, Cal.
Factory: 2701 No. Broadway, St. Louis.

The New Style Drop Bottom Cage

The breaker plates, hopper bottom, and cage all slide into one large, radial, independent frame (see illustration). This frame is hinged on heavy pivots at the front of machine near the top of hopper. Cage is held in working position by heavy chains at the back of machine which wind around special wheels to which are fastened on the outside of the machine, spur wheels, hand wheels, ratchet wheels, and a pawl for holding cage in working position.

To drop or lower cage when iron gets into machine, the operator simply releases pawl, and the cage drops of its own weight, discharging foreign material as well as partially crushed material into hopper below.

To adjust cage up to hammers when worn, the operator releases the pawl, turns hand wheel slightly, and the chain winds around special wheel and slowly raises cage toward hammers, until it has reached its proper position.

C A

COAL AGE

Devoted to Coal Mining and Coke Manufacture

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CA

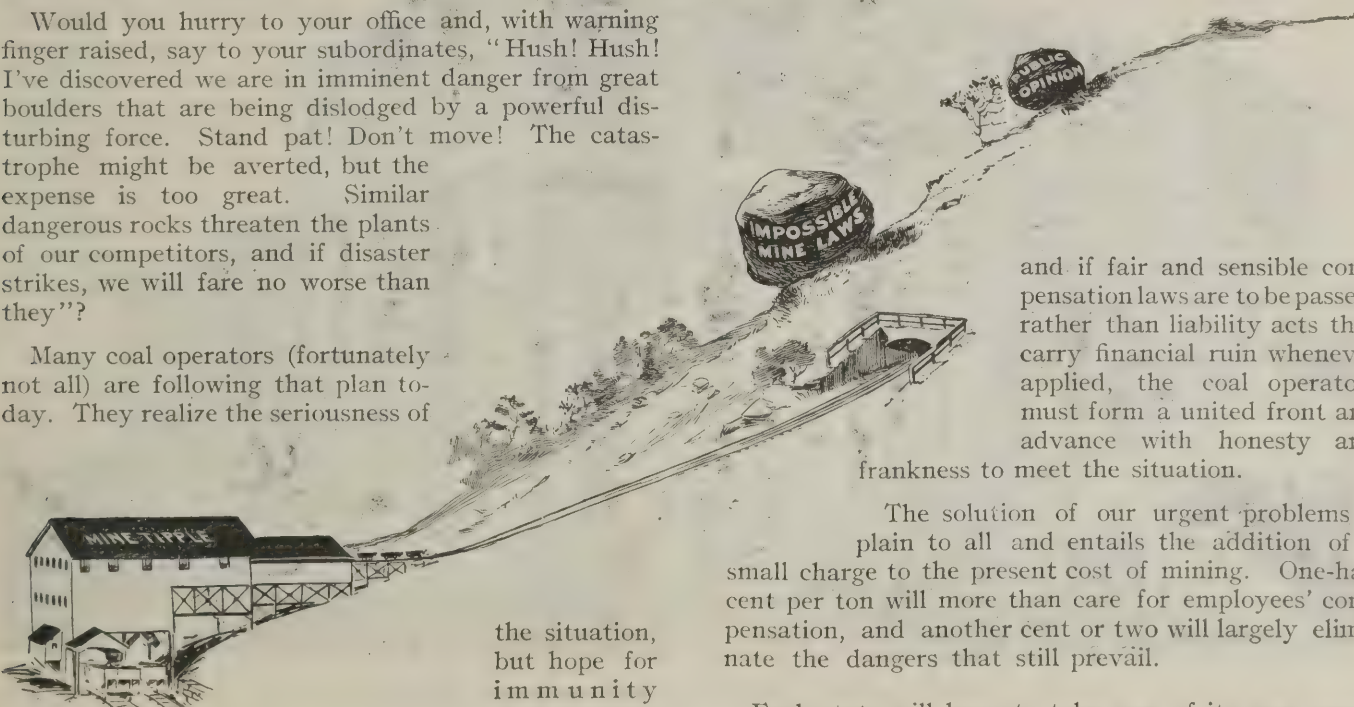
COAL AGE

Vol. 1 NEW YORK, DECEMBER 23, 1911 No. 11

Supposing two huge boulders were balanced on the side of a steep hill directly above your mine tipple. Imagine, for illustration, you pass that way and perceive how delicate is the balance of the rocks, and how near they are to crashing down on your mine buildings. Let's assume that on investigation you find a jarring force is acting at frequent intervals to displace these boulders, and that the smaller rock is about to be precipitated against the greater mass below.

Would you hurry to your office and, with warning finger raised, say to your subordinates, "Hush! Hush! I've discovered we are in imminent danger from great boulders that are being dislodged by a powerful disturbing force. Stand pat! Don't move! The catastrophe might be averted, but the expense is too great. Similar dangerous rocks threaten the plants of our competitors, and if disaster strikes, we will fare no worse than they"?

Many coal operators (fortunately not all) are following that plan today. They realize the seriousness of the situation, but hope for immunity they have not striven to secure. The destructive force, *mine explosions*, continues to shake the upper rock, *public opinion*, and before long it will be torn from its base, crash into the greater boulder, *impossible mine laws*, and the combined mass will bury coal operators and their financial investments so deep, even their miners won't be able to dig them out.



We all know there has been an advance in technical knowledge in recent years, but how can we say our mines are safe when actual count today shows that disasters are just as frequent and no less serious. Unless care is exercised, legislation forced by public opinion and enacted by people who are ignorant on the subject of coal mining, will prove a greater burden than the industry can bear.

The operation of a mine includes the assumption of obligations to employees and the public, that are not settled by handing out pay envelopes each fortnight. Efforts are already being made in several states to fix definitely the responsibility of mine owners, and if fair and sensible compensation laws are to be passed, rather than liability acts that carry financial ruin whenever applied, the coal operators must form a united front and advance with honesty and frankness to meet the situation.

The solution of our urgent problems is plain to all and entails the addition of a small charge to the present cost of mining. One-half cent per ton will more than care for employees' compensation, and another cent or two will largely eliminate the dangers that still prevail.

Each state will have to take care of its own operations, and if the larger producers lead the way, the less important coal states will have to follow or show cause in the court of public opinion. The advantage gained by delay will be short-lived and the profits inadequate. In the end, if the industry can't stand the additional costs, the consumer will have to do so, and he'll not complain if the situation is made clear to him.

The coal industry is in the fortunate position of having everything to gain and nothing to lose by laying its cards on the table face up. The man who doesn't try to get from under before the rocks fall, isn't worth digging for after the avalanche.

Taylor Breaker near Scranton, Penn.

By M. A. Walker

The new plant at Taylor is a breaker and washery combined. The building is of reënforced-concrete construction throughout. All machinery will be electrically operated by power supplied at high voltage from a central plant, 3 miles distant.

A reënforced-concrete breaker, equipped throughout with electrically driven machinery, has recently been erected at Taylor, Penn., about three miles southwest of Scranton, by the coal-mining department of the Delaware, Lackawanna & Western R.R. Co. A view of this structure, which is really a breaker and washery combined, is given on the front cover of this issue. The building is quite finished and completely equipped, but connection has not been made with the mines, pending the abandonment and removal of the present plant, and the breaker is therefore not yet in operation.

The new plant will be served by two openings, one a shaft located several hundred feet to the rear of the structure as viewed in the illustration, and the other a slope in the Surface vein. Coal from both openings will be discharged into an inclined conveyor, 250 ft. long, which will run from the surface to the head of the breaker. This conveyor will be of the scraper type with 4-ft. flights and Monobar chain, and will be supported on a steel bridge and trestle rising to a height of about 140 ft. at the head end.

The breaker is a massive structure, extending 107 ft. along the railroad, having a depth of 133 ft. and rising to a height of 149 ft. above the track level. Beneath it run two railroad tracks where cars will be loaded for shipment, and a wagon road for the accommodation of retail trade. The construction, from foundation to roof, is entirely of reënforced concrete; even the two stairways which give access from the ground to the main floor are concrete monoliths.

When viewed at close range the building gives an impression of great mass and strength. Some of the supporting columns at points of heaviest loading are as much as 38 in. square in section. Compared with the usual 12x12-in. yellow-pine posts of the familiar timber structure of this kind, these columns are apt to seem unduly large, but when it is recalled that concrete, while three times as heavy as timber, has only about one-half the allowable working stress of the latter, the necessity for such large sections is more readily understood, especially when considered in conjunction with the unusually great unsupported length of the columns beneath the Taylor breaker.

A view of the building while under construction is given in Fig. 1. At the time this photograph was taken, concrete work had been completed as far as the top of the loading pockets. Since the structure was finished, the exposed surface of the concrete has been painted with a black pitch-like material known as "Concrete Coating." This acts as a preservative and incidentally does thoroughly and at once what, in all probability, the dust from the breaker would eventually accomplish in any case. A noticeable feature of the construction is the provision made for housing the main elevators. These rise from a depth of 15 or 20 ft. below the ground to the top of the breaker through commodious con-

FIG. 1. VIEW DURING CONSTRUCTION, SHOWING FORMS FOR CONCRETE

crete-walled shafts of evident strength and permanence.

The coal beds of the Lackawanna Valley are in general level seams, lying at no great depth below the surface. Such rock as is removed with the coal is usually of a size that admits of its being easily handled, and since, as a rule, little or no difficulty is experienced in unwatering the mines, the coal comes to the surface comparatively clean and dry. The process of preparation does not, therefore, include washing or jigging of the coal except in connection with the smaller sizes and as a last resort in the case of a portion of the larger material which is beyond the scope of mechanical picking.

The scheme of preparation at the Taylor breaker is briefly as follows: Run-of-mine coal from the main conveyors is discharged onto a bank of three head-screen shakers. Lump and steamboat coal pass off the top screen, grate and egg sizes being made on the other two. The lump and steamboat coal from the top shaker is run into two picking chutes along the sides of which stand a number of men who remove the slate from the coal. The grate and egg sizes are each conducted over two spiral pickers and the stove and smaller sizes passing through the last head screen are led to two banks of mud-coal shakers. The bony coal from the grate and egg head-screen spirals is taken to a set of No. 2 pony rolls and crushed. There thus originate at the head of the breaker three distinct streams of coal which may be identified by the name of the screens over which they are subsequently sized: the main-screen coal, the mud-screen coal and the pony-screen coal.

The main-screen coal comes from the lump and steamboat, which is hand-cleaned at the head of the breaker. After passing through the crusher rolls it is led to a bank of two shakers which make grate and egg size. These sizes are each passed over two sets of Emery pickers and sent to the pockets. The undersize from the main-screen shakers passes to two banks of counter-main-screen shakers where stove, nut and pea coal sizes are made. The stove and nut sizes from these latter each pass over two sets of Emery pickers and thence go to the pockets. The pea coal is not subjected to further mechanical picking. Buckwheat and smaller go to the washery.

As previously noted, there are two banks of mud-coal shaking screens. These make stove, nut and pea sizes. The stove and nut are each passed over two sets of Emery pickers and the pea coal is led over four spiral pickers. The buckwheat and smaller sizes go to the washery.

Coal from the No. 2 pony rolls, together with that brought up by the lip-screen elevators, is handled over two banks of pony-coal shaking screens, which separate grate, egg, stove, nut and pea sizes. The egg, stove and nut sizes are each passed over two sets of Emery pickers. The pea coal is passed over four spiral pickers and the buckwheat and smaller sizes go to the washery.

The tailings from all the mechanical pickers are collected and elevated to a set of shaking screens at the top of the breaker which separates them into egg, stove and nut-coal sizes. Each of these several sizes is then passed over two sets of Emery pickers and four spiral pickers. The pea coal and smaller sizes from the tailings screens go to the washery. The rock which is removed from the coal during its passage through the breaker is run to a conveyor, which carries it to a pulverizer, and after being crushed is used for silting in the mines.

The washery handles the fine coal and bony coal from the breaker, as previously noted, and also such coal as may be condemned for excess of impurities. All this material is delivered to the washery screens by the main elevators, which have 20x28x15-in. gravity-discharge buckets. One bank of head-screens takes off grate and egg-coal sizes. Two banks of No. 2 screens make stove, nut and pea-coal sizes, and two banks of No. 3 screens make buckwheat, rice and No. 1 and No. 2 barley. The egg and stove-coal sizes are each jigged once. The nut, pea and buckwheat sizes are jigged and then rejigged. There are three sets of rolls in the washery arranged to feed into the main elevators. These rolls are used for breaking down boney coal, of stove, nut and pea-coal sizes, respectively.

Following is given a tabulated statement of machinery in both breaker and washery:

SHAKING SCREENS IN BREAKER

Head screens	
1 lump and steamboat	5×12 ft.
1 grate	6×12 ft.
1 egg	6×12 ft.
Main screens	
1 grate	5×15 ft.
1 egg	6×15 ft.
Counter main screens	
2 stove	5×21 ft.
2 nut	6×21 ft.
2 pea	6×21 ft.
Mud screens	
2 stove	5×18 ft.
2 nut	6×18 ft.
2 pea	6×18 ft.
Pony screens	
2 egg and grate	5×24 ft.
2 stove	5×21 ft.
2 nut	6×21 ft.
2 pea	6×21 ft.
Tailings screens	
1 egg	5×12 ft.
1 stove	6×12 ft.
1 nut	6×12 ft.

SHAKING SCREENS IN WASHERY

Head screens	
1 grate	5×12 ft.
1 egg	6×12 ft.
No. 2 screens	
2 stove	5×21 ft.
2 nut	6×21 ft
2 pea	6×21 ft
No. 3 screens	
2 buckwheat	5×30 ft.
2 rice	5×30 ft.
2 No. 1 barley	6×30 ft.
2 No. 2 barley	6×30 ft.

44 total

ROLLS

1 set main crusher rolls No. 1
1 set pony rolls No. 2.
1 set egg rebreaker rolls No. 3.
1 set stove rebreaker rolls No. 4.
1 set nut rebreaker rolls No. 5
1 set pea rebreaker rolls No. 6

6 total

EMERY PICKERS

2 on main-screen grate coal
2 on main-screen egg coal
2 on counter-main-screen stove coal
2 on counter-main-screen nut coal
2 on mud-screen stove coal
2 on mud-screen nut coal
2 on pony-screen egg coal
2 on pony-screen stove coal
2 on pony-screen nut coal
2 on tailings-screen egg coal
2 on tailings-screen stove coal
2 on tailings-screen nut coal

24 total

SPIRAL PICKERS

2 on head-screen grate coal
2 on head-screen egg coal
4 on mud-screen pea coal
4 on pony-screen pea coal
4 on tailings-screen egg coal
4 on tailings-screen stove coal
4 on tailings-screen nut coal

24 total

JIGS

2 on egg coal
2 on stove coal
4 on nut coal
4 on pea coal
4 on buckwheat coal

16 total

ELEVATORS AND CONVEYORS

Main elevators, 20×28×15-in. gravity discharge. Bottom lift, 67 ft. 6 in.; top lift, 58 ft. 6 in.
Lip-screen elevators, 11½×24×18½-in. buckets. Bottom lift, 51 ft.; top lift, 65 ft.
Tailings elevator, 11½×24×18½-in. buckets
Buckwheat elevators, 11×18½×18-in. buckets

Rock conveyor	10×20-in. flights
Bone conveyor	10×20-in. flights
Fine coal conveyor	10×20-in. flights
Tailings conveyor	10×20-in. flights
Cross conveyor	10×20-in, flights
Lip screen conveyor	5×12-in. flights

All machinery in the Taylor breaker will be electrically driven. Three-phase alternating current at 2200 volts will be brought from the Lackawanna company's Hampden plant in Scranton to a transformer house on the ground at the rear of the breaker. Three single-phase Westinghouse transformers are installed at this point and will deliver power at 440 volts for the use of the operating motors. These latter are of the Westinghouse squirrel-cage induction type, and are uniformly of 5, 10, 20, 30 or 50 hp. rated capacity. Friction clutches, inserted in the transmission gearing between the motor and the driven machines, provide both a necessary means for starting up under load and a safeguard against overloading, although the motors have a rated capacity considerably above the probable demand.

Following is a list of the motors in both the breaker and the washery sections:

MOTORS IN BREAKER

2—20 h.p. for lip screen elevator
1—20 h.p. for tailings elevator
1—10 h.p. for tailings conveyor
1—10 h.p. for cross conveyor
2— 5 h.p. for lip-screen conveyor
1—20 h.p. for head screens
1—20 h.p. for main screens
2—20 h.p. for counter main screens
2—20 h.p. for mud screens
2—30 h.p. for pony screens
1—20 h.p. for tailings
1—30 h.p. for main rolls
1—20 h.p. for pony rolls
1—20 h.p. for No. 3 rolls

MOTORS IN WASHERY

2—30 h.p. for main elevators
1—20 h.p. for buckwheat elevator
1—20 h.p. for rock conveyor
1—20 h.p. for head screens
1—30 h.p. for No. 2 screens
2—30 h.p. for No. 3 screens
2—50 h.p. for 16 jigs
3—20 h.p. for 3 sets of rolls

Wiring conduits were embedded in the concrete at the time of building and the power lines for both motor and lighting circuits are thus in general concealed and protected. An excellent feature of the installation is the main switchboard, centrally located on the principal floor of the breaker. The entire plant can be controlled from this point and incidentally terminals are provided for taking power measurements, so that the power requirements of any machine or group of machines may be determined at any time by merely connecting the meters at this switchboard.

The breaker will be heated throughout by exhaust steam, which will be conducted through a number of radiator coils variously located and distributed throughout the structure. By means of an exhaust fan and metal ducts which connect with all the screens, rolls, elevators, etc., dust will be collected and eliminated as far as possible from the breaker. This plant was designed by Mr. Samson, superintendent of construction, and H. M. Warren, electrical engineer, under the supervision of R. A. Phillips, general superintendent of the coal-mining department, Delaware, Lackawanna & Western R.R. Co. The reënforced-concrete work was designed and built by the Hennebique Construction Co., of New York City.

Coal Mining Institute of America

Editorial Correspondence

The winter meeting held in Pittsburg developed the most interesting discussions that have occurred before this body in several years. A. W. Calloway elected president.

The winter session of the Coal Mining Institute of America was called to order at 10 a.m., Tuesday, Dec. 19, in the auditorium of the Engineers' Society of Western Pennsylvania, by G. A. Taylor, the president of the institute.

Mr. Taylor refused to accept the presidency for the coming year because of his many other engagements. The election stood between A. W. Calloway, general superintendent Rochester & Pittsburg Coal Co., W. E. Fohl, consulting engineer, and I. G. Roby, state mine inspector. Mr. Roby declined to accept the position, and the choice of the institute fell on Mr. Calloway. J. K. Johnston, W. E. Fohl and Elias Phillips were elected vice-presidents. C. L. Fay was unanimously reëlected secretary-treasurer. Jas. Scurfield, Nicholas Evans, S. A. Taylor and Austin King were elected additional members of the executive board.

E. W. Parker, coal statistician of the U. S. Geol. Sur., spoke on his work in collecting figures relating to the coal industry. He remarked that it was an open question whether more coal had been produced in 1911 than in 1910.

The afternoon session was devoted to discussion, with Thomas K. Adams, mine inspector, in the chair. The first discussion was on the Employers' Liability Act vs. the Workmen's Compensation Act. Sion B. Smith, who has made a study of the subject in all its aspects, pointed out that the present liability provisions cast an uncertain burden on the operator. He stated that the mine owner did not know what he might be compelled to pay, and so long as such conditions exist, the operation of a small coal mine is in the nature of a gamble. An accident might load the owners of any mine with a crushing burden which might drive them out of business. The large operators could face the possibilities with more equanimity because of the multiplicity of their interests.

Employment of Boys in Mines

In answer to the question, "Is the act of June 15, 1911, regarding the employment of boys, advisable?" it was pointed out that boys could work outside the mines from 14 years of age upward, but in the mine the limit stood at 16 years. This was regarded by Mr. Cunningham as a restriction of the rights of the mining industry, tending to deplete it of its most promising material. The boy would enter some other form of employment at the formative age of 14 years, and later continue at his newly found line of work. It would not keep him any longer at school than till such time as he arrived at 14 years of age. After that, as he could not work in the mine, he would drift into some other industry or into unfortunate pursuits.

Mr. Crane admitted that certain forms of outside work were more desirable than mine work, but advocated the restriction preventing boys from entering the mines till 16 years of age.

It seemed, however, to be the general opinion that the period of exclusion between 14 and 16 years would not promote education, but would deplete the mining industry of native labor, which labor would be performed by foreigners, who need education to fit them for the work.

Falls of Roof

"How can the number of accidents from falls of roof be reduced?" was then discussed. Mr. Roby advocated the employment of rib-bosses, whose authority should be exercised over about 40 men, if all these men were working along one line of fracture. He thought one man could not control as many men if they were scattered at widely separated points, so that the bosses would have far to travel.

He urged that the assistant bosses should report to the mine foreman the names of all miners who are not properly posting the roof. Discipline was emphasized. Mr. Fay suggested that "the man higher up" should insist on discipline, and he felt that then a sense of its importance would filter down. Mr. Affelder said he knew of one operator who enforced the law rigidly relative to the prohibition of all men, but the motorman and brakeman, from riding on the motor. He said the superintendent had been ordered off the motor by the motorman, but that motorman finally failed in obeying instructions and permitted one man to ride—the mine inspector.

Mr. Hall recommended the Summary Jurisdiction Act of Great Britain to the attention of those present, urging that the justice of the peace should be empowered to adjudicate the smaller breaches of discipline. The Court of Quarter Session met too seldom; the cost of conducting a case before it was too costly and took too much of the inspector's time so that he frequently let offenses pass uncorrected to save the time needed for more considerable matters. He also called attention to the difficulty in subpœnaing witnesses, many of them foreigners who would decamp rather than appear in court.

Mr. Taylor said that such a law would fail, owing to the fact that the justice of the peace was elected and therefore subject to the overpowering vote of the miners in small mining towns. It seemed, however, the general consensus of opinion that discipline by suspension and discharge was preferable, and, at least in nonunion mines, was possible.

Jesse K. Johnston said that a prevalent cause for lack of discipline was the practice of the labor unions, these bodies assuming the miner was persecuted, not prosecuted. These unions were ready to pay not only attorney's fees, but the fines imposed on offenders.

[*A further account of the meeting with more discussion will be published next week. Mr. Burrell's interesting paper on "Mine Gases" is printed on p. 348 of this issue of* Coal Age.—Editor.]

Retort Oven Plant at Gary, Ind.

Special Correspondence

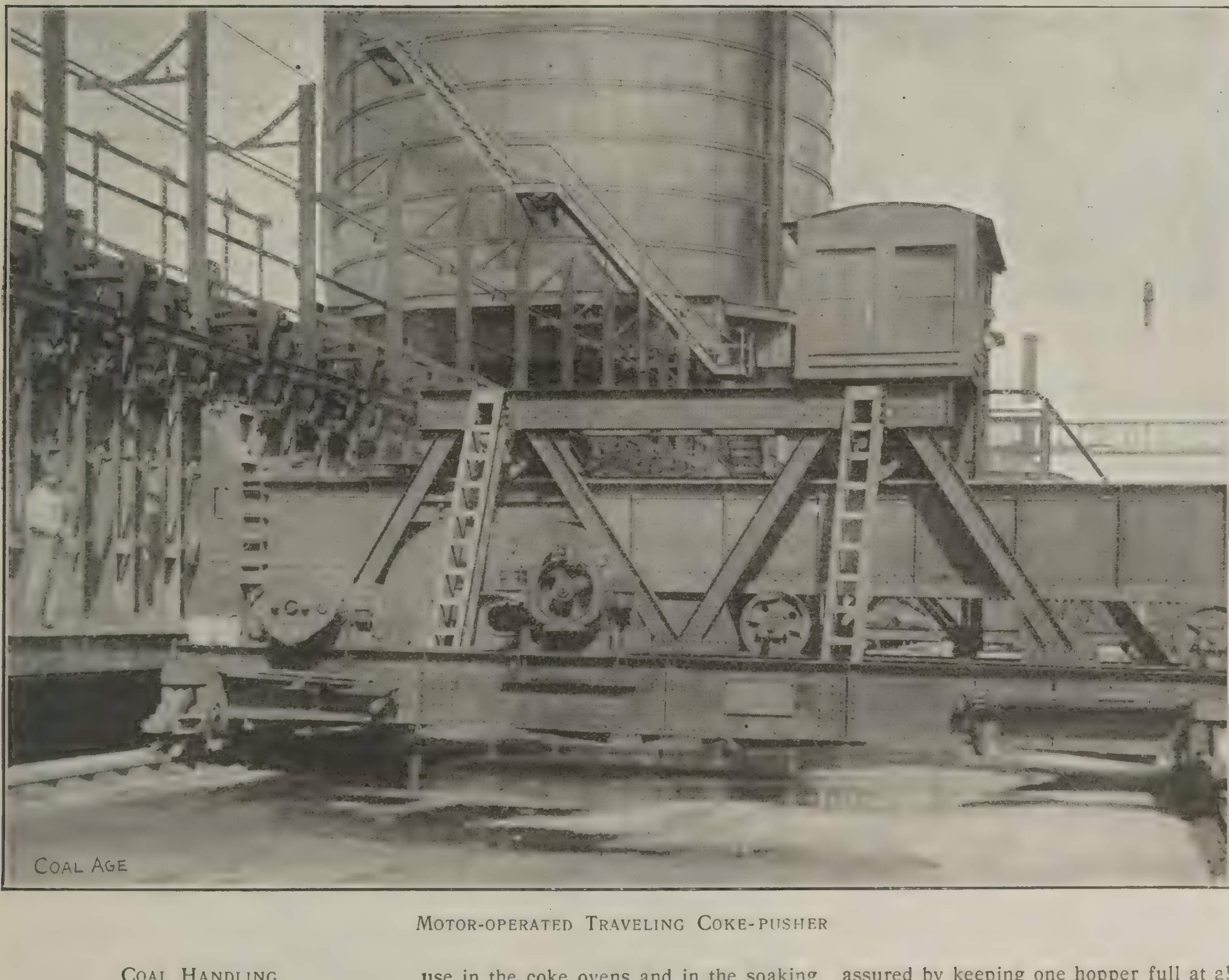
A description of one of the largest and best equipped coal-handling and byproduct plants in the world. Electricity generated with producer gas is used throughout. Capacity of plant when completed will be 9520 tons of coke per 24 hours.

The largest and best equipped coal-handling and byproduct coking plant in the world is at Gary, Ind. It is of special interest because electrically operated by motors receiving their current from the gas-power plant of the largest steel plant on earth.

Another claim to distinction lies in the use of 560 Koppers' Regenerative Byproduct coke ovens, with a total coke capacity of 8000 tons per 24 hours, and Koppers' Modern Direct Process for recovering ammonia from the gas in the form of ammonium sulphate. This is the first coke-oven plant in this country installed with the Direct Process for ammonia recovery.

The bridges are each equipped with 7-ton buckets and can load twenty 50-ton larry cars per hour. Their closing and opening lines and trolley travel are each operated by a 150-hp. General Electric, type MI motor and the two bridge trucks are operated by eight 30-hp. motors of the same type.

Coal, after being loaded into a transfer car, is dumped into one of 12 hoppers at the unloading house. These hoppers are each equipped with a shaker distributor driven by a 15-hp., General Electric, three-phase, squirrel-cage, induction motor. Each of the shakers can evenly distribute 40 tons of coal per hour on the belt conveyors. A continuous supply of coal is assured by keeping one hopper full at all times.



MOTOR-OPERATED TRAVELING COKE-PUSHER

COAL HANDLING

Let us follow the coal from its arrival at the immense storage yard, thence to the breaking and crushing building, on to the mixer building and finally to the coke ovens. We will then follow the coke from the ovens until it is quenched and ready for the blast furnaces; also trace the course of the coke-oven gases through the byproduct house until, freed of tar and ammonia, they are ready for use in the coke ovens and in the soaking pits of the steel plant near-by.

Coal for coke making is dumped from railroad cars into a concrete storage yard which has a capacity of 350,000 tons. The walls of this yard are inclined under the railroad tracks to deflect the coal away from the sides of the yard so the grab buckets of two large Wellman-Seaver-Morgan coal bridges can easily reach it.

The coal is carried from the unloading house by four belt conveyors, each of which has a capacity of 500 tons per hour. They are driven by four 30-hp., three-phase, Form K, General Electric, induction motors which, together with those used to operate the Bradford breakers, hammer-mill crushers and intermediate conveyors, are controlled by a special

electrical interlocking system. The stopping of any conveyor or machine automatically holds up all operations prior to its own, thereby preventing waste or jamming.

Preparing the Coal

The unloading-house conveyors carry the coal to Bradford breakers, each of which has a capacity of 500 tons per hour. It is here broken to 1-in. mesh and separated from what little slate, stone, wood, iron, etc., it may contain. Power for this operation is furnished by four 75-hp., three-phase, General Electric motors.

tors used here are in a separate room built on the side of the house. In many other cases, however, conveyor motors, located near conveyors in other buildings, are showered with coal dust.

Crushed coal is carried from the crusher house to the mixer building by two conveyors, each of which has a capacity of 500 tons per hour. They are 120 ft. long, travel 580 ft. per minute and are housed over to insure protection against the elements. In the mixer house are two 500-ton mixers run by two 15-hp., Form K, General Electric, induction motors with automatic control.

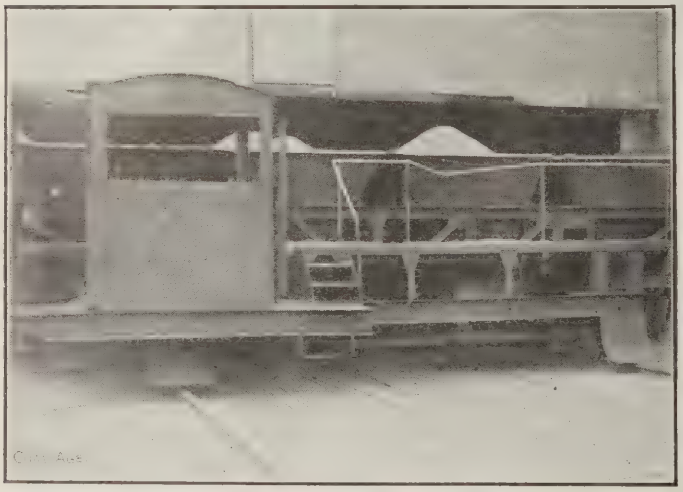
coke-oven batteries. These bins have a capacity of 2100 tons each and the six conveyors will completely fill them every 10 hours. The conveyors are driven by two 100-hp., two 75-hp. and two 30-hp., three-phase, Form K, General Electric, induction motors. It is unnecessary to run the coal-handling plant at night due to its capacity and that of the storage bins.

Coke Making

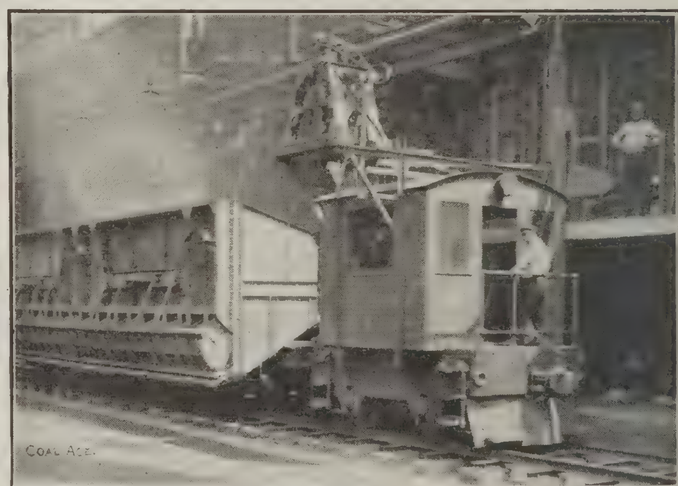
Larry cars run under the storage bins and over the tops of the coke ovens, into each of which they charge 12¾ tons of

Conveyors between Breakers and Hammer Mills

Two Squirrel-cage Motors Driving Hammer Mills



Coal-charging Larry Car



Coke Cars and Locomotive

Between the breakers and the next operation, crushing the coal in hammer-mill crushers so that 85 per cent. of it will pass through a No. 64 wire-mesh screen, are four conveyors. Each of these has a capacity of 500 tons per hour and they are driven by four 30-hp., three-phase, General Electric, induction motors. The eight hammer-mill crushers, with a capacity of 350 tons per hour, are driven by 250-hp., three-phase, Form K, General Electric, induction motors.

As the coal-crushing house is thick with coal dust floating in the air, all mo-

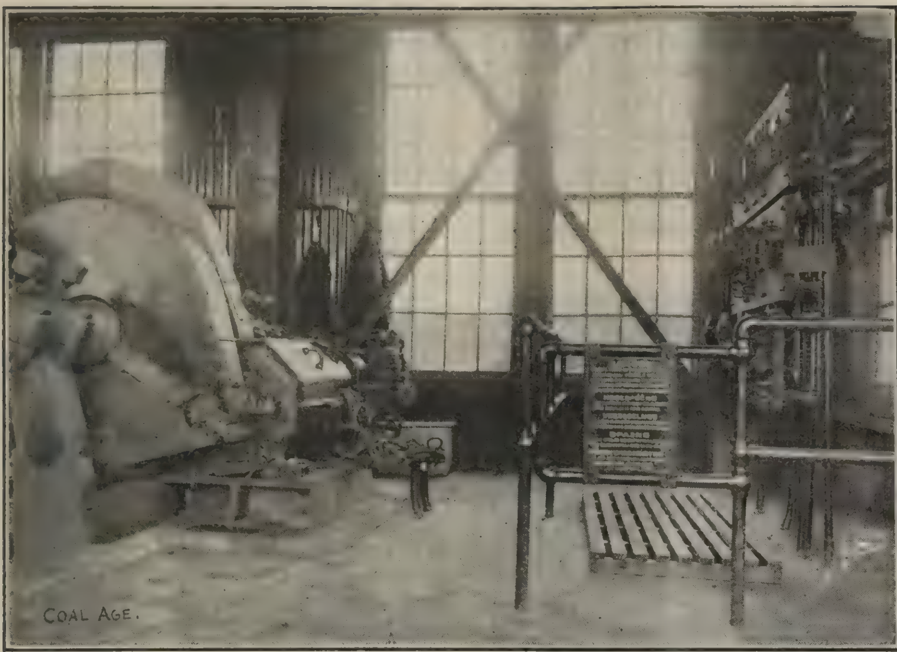
The unloading, breaking and crushing machinery and the mixer are connected by an electric signal system which indicates by electrically operated air whistles, any change in character or mixture of coal being sent through.

The mixer building has a storage capacity of 2000 tons of puverized coal. In it, 80 per cent. Pocahontas and 20 per cent. Ronco coal are mixed, which gives a coke yield of 84 per cent. of the coal charged. From the mixer house six 500-ton conveyors carry the crushed coal to four cylindrical storage bins over the

coal. The coal is then leveled by a traveling leveler which is operated by four 30-hp., General Electric motors. Charging is carried on in a certain prescribed sequence and there are always ovens ready for pushing, thus assuring continuous operation of men and equipment.

Coking requires 18 hours, at which rate the present capacity of the plant is 8000 tons per day; when entirely completed the total capacity will be 9520 tons.

The advantages of the type of oven selected for the Gary plant are interesting.



Motors and Automatic-control Equipment Operating Quenched-coke Hoists

Traveling Door-extractor Driven by a 7-hp. Motor and Located on Discharge Side of Coke Ovens

The ovens are heated with gas evolved from the coal carbonized. The coal yields from 50 to 60 per cent. more gas than necessary for its carbonization, and in the old beehive process this surplus gas is wasted.

A further advantage is that it is not essential that the gas be consumed on the spot directly it is produced, since it can be conveyed any distance without material loss. It can also be stored during the time it is not required and consumed during the working hours of the day.

The regenerators also serve as a storage for heat so that a whole battery of ovens can be shut down entirely for a week or so and started again without any heating up being necessary. This is not possible where regenerators are not used. The regenerators enable the ovens to be worked at less than one-quarter capacity without going cold, whereas most other systems cannot be worked much below their normal capacity without cooling down.

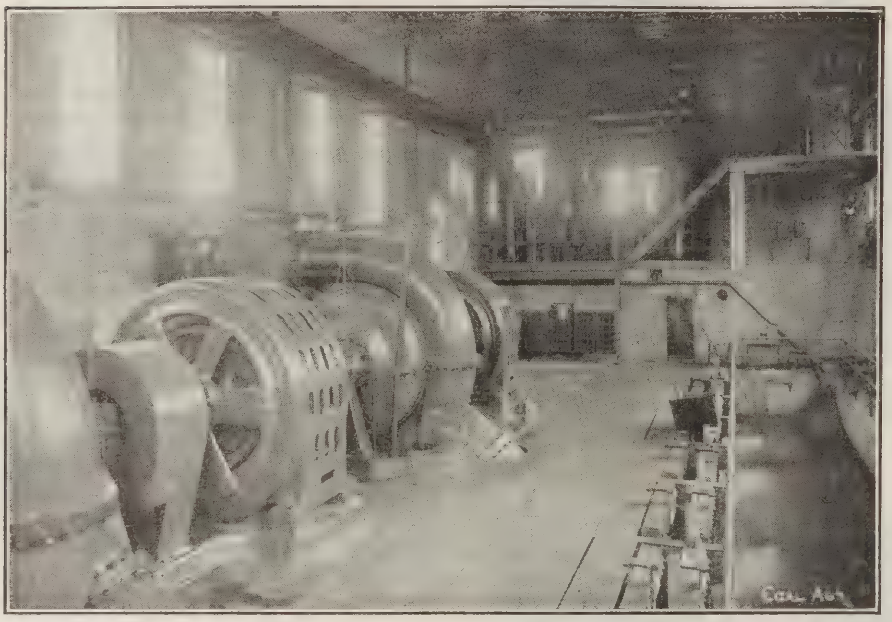
Description of Ovens

The oven chambers are approximately 39 ft. long, 9 ft. 10⅜ in. high and from 17 to 21 in. wide. They have doors at either end, operated by a traveling door machine on the coke-discharge side, and a door machine attached to the coke pusher, at the other side. The top of the oven is provided with openings for charging the coal and an opening through which the gases of distillation are drawn off to the condensing plant.

Referring to the accompanying longitudinal section, the air for combustion flows along the passageways *A*, at the front and back of the ovens, and thence it passes into the regenerators through the inlets *B*. In the regenerators, the temperature of the air rises to 1200° C. (2190° F.). The highly heated air then passes out of the regenerators into the vertical heating flues through the openings *C*. The gas from the byproduct plant, freed from tar and ammonia, is returned to the ovens by the mains *D*, running along the whole length of the ovens on each side. Branch supply pipes *H* conduct the gas into the gas-distributing channels *E*, which are situated directly beneath the oven walls; thence it passes through the gas nozzles *F*, into each vertical flue, where it ignites with the hot air entering through the passage *C*, previously referred to. A jet is, therefore, formed on a level with the oven floor in each of the heating flues in the oven walls.

The employment of regenerators renders it necessary to reverse the heating process after a certain period of time, usually about 30 min. This is done automatically by a General Electric motor-operated dial switch system, which controls the gas and air valves. The system of heating flues is divided into two sections, so that combustion can take place

alternately in each half of the oven wall. When the gas is burning in the flues in one half of the length of the wall, the products of combustion pass up the flues and enter the top horizontal flue *G*, whence they make their way down the flues in the other half of the oven wall; they then enter the regenerator through the same passages *C*, by which the air is



Interior of Pump House

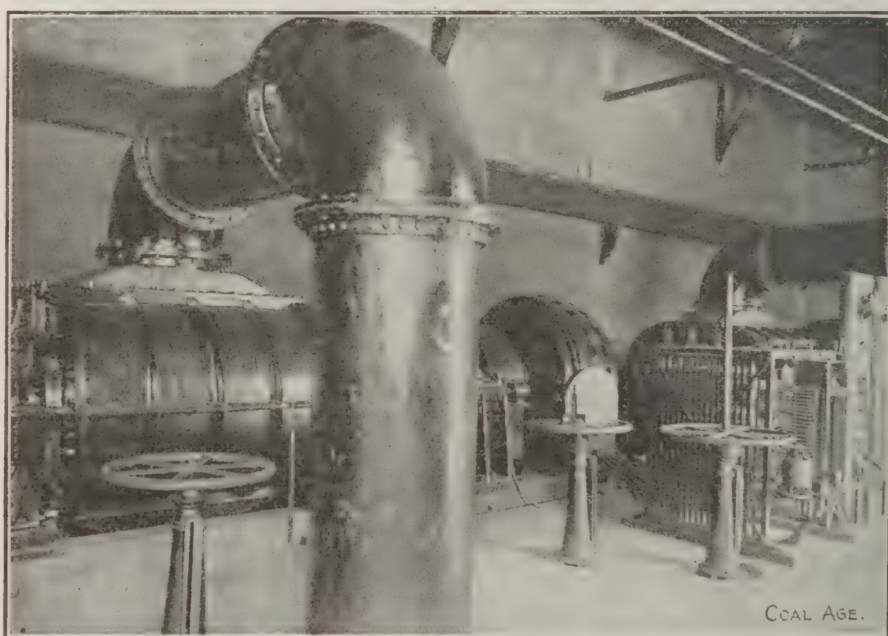
admitted to the flues when the direction of combustion is reversed. On issuing from the regenerator, the waste gases pass into the flue leading to the chimney *I*, after having given up their heat to the checkerwork of firebrick.

Accessibility of Ovens

The products of combustion of the gas and air pass up the heating flues *J*, and through the openings *K*, at the top of each flue. These openings are furnished with dampers *L*, which, together with dampers in the regenerating passages, are easily regulated so as to enable the exact amount of air to enter the flue necessary to effect perfect combustion. The sliding bricks are accessible from the top of the ovens through the openings *M* and *N*, which are fitted with easily removable plugs.

At this point, particular attention is invited to the sliding bricks and to the openings at the top of the ovens, which give ready access to the interiors. These are two of the principal features of these ovens, and distinguish them from all other constructions. The openings at the top of the ovens serve not only to provide means for regulating the dampers, but more particularly to give access to the gas nozzles *F*, and they further permit of the flues being inspected at any time.

Without the facility thus provided for examining the flues, it is not possible to work retort ovens satisfactorily. The gas nozzles are furnished with oval orifices, to enable them to be taken out with a rod having a tee-end. The orifices in the nozzles vary in size, according to their position in the flues. The removal and replacing of a nozzle can be easily effected in a few minutes.



Gas Exhausters Operated by 250-hp. Motors

It happens from time to time in all ovens that dark places appear in the oven walls, indicating that the combustion is defective; in the absence of means of access to the flues, it would be necessary to cool down the oven and break into the walls in order to remedy the defect. By means of the openings over each flue in the Koppers' ovens, the cause of any irregularity in the heating can be immediately detected and, in the great majority of cases, easily rectified in a few moments. The effect of any adjustment in the regulation of the gas and air can, moreover, be immediately seen.

Method of Operating

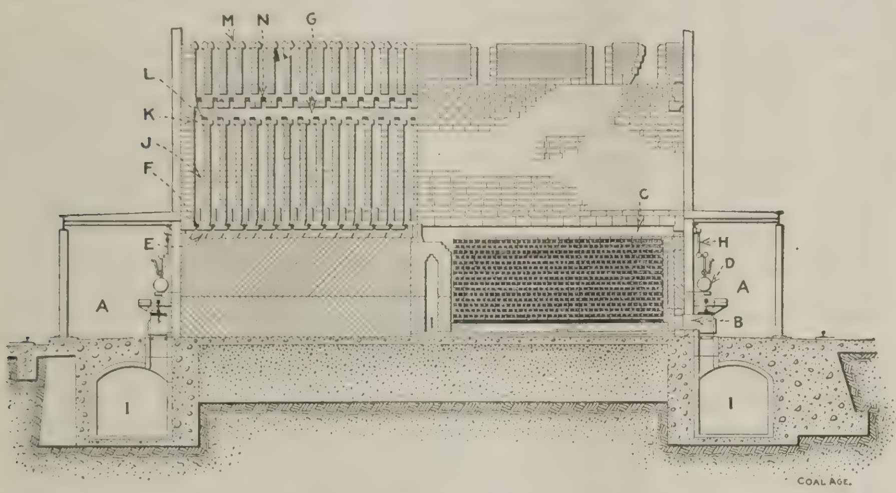
It will have been seen that each oven wall is formed of about 30 vertical flues; each of these flues is provided with a heating jet, and also with means for regulating the admission of the gas and air, viz., by substituting the gas nozzles, and by adjusting the sliding bricks over each flue, respectively. It is, therefore, obvious, that it is a simple matter to control the heating so that the oven walls will be subjected to exactly the same temperature from end to end. This uniformity in the heating, characteristic of the Koppers' ovens, has been sought by coke-oven builders for many years, and unless it be attained, it is impossible to produce a coke which will be homogeneous in character throughout the charge.

When coking is complete, and the gas fully given off, the doors are removed and the charge is pushed out by the traveling ram, which is operated by two 50-hp. and one 7-hp. (the latter on the door opener) General Electric motors.

While being pushed, the coke is partly quenched by water sprinklers, as it falls into a steel and cast-iron car, to which is attached a three-phase, General Electric locomotive, equipped with two 50-hp. type MI motors. As soon as a charge is entirely in the car, it is rushed to the shower hood, where quenching is completed. The coke is then elevated to storage bins by two automatically controlled, 30-hp. General Electric, three-

phase, form K motors, operating elevators. In the final process, the coke is run through screens operated by two 30-hp. motors of the same type.

Each two batteries of ovens are equipped with grinding pans and clay elevators for preparing luting material for the oven doors. These are operated by 15-hp., three-phase, form K, induction motors.



LONGITUDINAL SECTION THROUGH A SINGLE OVEN

Byproducts

The gases from the ovens go through divided water-sealed mains, thence to coolers of the multitubular water-tube type. After passing around the tubes, they leave at a temperature of about 30° C. The gas is then drawn by exhausters, which are driven by 250-hp., General Electric, induction motors, controlled to give a constant gas suction, and delivered to the tar extractors. The tar and ammoniacal liquor, which condense here, are run off along with the condensation from the coolers, and separated by gravity in the tar-separating tank.

From the tar extractors, the gas passes to reheaters, where its temperature is raised to about 70°C. by the use of steam. The heated gas is then conducted to the acid saturators (lead-lined vessels, containing a solution of about 5 per cent. of free sulphuric acid), and the gas leaves the saturators at about 30° C. At this low temperature the chemical affinity between the acid and ammonia is so great that a neutral salt (ammonium sulphate) is easily obtained. The salt is continuously removed from this inclosed type of saturator by an ejector and delivered onto a draining table. From here it is run off, together with the mother liquor, into a centrifugal drier in the usual way. When desired, concentrated ammonia liquor is produced instead of ammonium sulphate.

About 50 per cent. of the total daily yield of about 100,000,000 cu.ft. of gas is used at the steel plant, and the remainder is used to heat the coke ovens. The ammoniacal liquor is treated with lime, to decompose fixed ammonia compounds, and then heated to vaporize the ammonia, which is conducted to the gas main and absorbed in the saturators. About 1 per cent. ammonium sulphate and 2 per cent. of tar is obtained. The coke yield is approximately 84 per cent. of the weight of the coal coked.

This greatest of all coke plants is supplied with 60,000,000 gal. of water a day by two centrifugal pumps, operated by 1300 hp., three-phase, form M, General Electric motors.

Stearns Mines in Kentucky

By J. E. Butler*

The Stearns mines have an uptodate electric equipment and an aerial tramway.

Stearns is on the Cincinnati Southern R.R., 110 miles south of Lexington and 144 miles north of Chattanooga. Here are located the offices of the Stearns Coal & Lumber Co., the Stearns Coal Co., Ltd., the Kentucky & Tennessee Ry. and other companies whose stocks are owned by the Stearns people.

The property consists of approximately 85,000 acres of coal and timber land lying adjacent to the South Fork of the Cumberland River in Whitley, Wayne and Pulaski Counties, Ky., and in Scott, Pickett and Fentress Counties, Tenn.

The coal seams, three in number, are the lowest in the series and are designated locally as Nos. 1, 2 and 3. Only the lower two are being developed. Each is between 4 and 5 ft. in thickness. The coal became commercially accessible by the construction of the Kentucky & Tennessee Ry., which extends from Stearns westward through the property. The coal lies at tipple height above the railroad track. This is not due to chance, but in planning the railroad it was arranged that the elevation of the main line should be approximately 30 ft. below that of the beds where it was convenient to open mines. As it drops down the valley of the South Fork River the railroad intersects the beds successively.

Alternating Current and Sawdust Fuel

The first mine was opened in 1902; since then five more have been put in operation with a present production of 2000 tons daily.

For the purpose of furnishing current to the mines, a central power station was erected at the sawmill located at Stearns. This enabled the mining company to use sawdust as fuel. The plant consists of two Wickes vertical water-tube boilers of 400 hp., twin Buckeye engines, each of 400 hp., directly connected to a 450-kw. 40-cycle three-phase General Electric alternating-current generator.

The current is stepped up to 13,000 volts for the high-tension transmission line which delivers current to the substations at the mines, where it is again transformed to 575 volts. This is used for driving the fans, pumps, air compressor and direct-current generators. These generators furnish current for motor haulage and the chain coal cutters.

Incidentally, it may be mentioned in this connection that this plant has proved inadequate to supply the rapidly growing business and the company is even now planning to erect a new and larger plant at Yamacraw of a capacity not less than 1000 hp. Several types of installations are being figured on, among them a high-pressure steam turbine or a gas engine, using either producer or byproduct gas. As a counter proposition, a low-pressure turbine is being considered to use the exhaust steam from the present plant at Stearns. It has been determined that 500 hp. may be secured in this way.

Motor Haulage

Among the developments of the past year, the installation of motor haulage on the main entries of mine No. 4 must be considered. The coal is gathered from the room partings by mules and delivered

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Note—Paper read before Kentucky Mining Institute, Lexington, Ky., Dec. 11, 1911.

to sidings on the main entries, where it is picked up in trips of good length and taken to the tipple. Previous to introducing the motors every effort, consistent with economy, was made to reduce gradients to a minimum and to ease curves and straighten roads. The track was then relaid with 25- or 35-lb. steel on white-oak ties, 5x6x5½ in., spaced with 18-in. centers. The compressed terminal bond, consisting of a head on the end of a copper conductor, is used. The head is compressed into a drillhole in the rail by means of a screwjack, which exerts a pressure of from 10 to 20 tons on the head of the bond, causing the copper to expand in the hole and form an intimate contact. These bonds have thus far eliminated the troubles arising from poor contacts. The trolley wire is 0000 V-grooved; the machine wire is No. 4; the clamps are of the "sure-grip" type. On the outside hauls the trolley is strung on 8-in. round chestnut poles set 30 ft. apart with 3x5-in. white-oak crossarms. Power is obtained from a Jeffrey 150-kw. motor-generator set. Three haulage motors are used, one 8-ton and two 5-ton, all Jeffrey equipment. The plant, while small and compact, is installed in a substantial manner and has to date reached all expectations.

Aerial Tramway

Within the current year a new mine, designated as No. 11, was opened at Yamacraw on the west bank of the South Fork River. As the railroad is on the east bank, it became necessary to provide means for getting the coal across the river temporarily for the development work and later for permanent operation.

For the preliminary work, an old steam log-loading machine was set up near the railroad. A 1¼-in. plow-steel cable was strung over the river and on this was suspended, from a trolley, a bucket of two tons capacity. The coal was dumped from the mine car, through a short chute, directly into the bucket, pulled across the river, dropped into railway cars and shipped as run-of-mine. With this equipment a capacity of 150 tons in 9 hours was obtained at a cost not to exceed 10c. per ton and the wasteful practice of stocking the development coal in the mineyard avoided.

When the permanent equipment was ready for use on Nov. 1 this year, over 2000 ft. of entry and aircourse and 40 rooms were ready for the miners.

The permanent equipment consists of a Broderick & Bascom reciprocating aërial tramway of 550 ft. clear span, operated by a 35-hp. General Electric, variable-speed motor, geared to the main-driving wheel of the tramway. The 1¾-in. lock-coil track cables reach from cliff to cliff across the river and are anchored in solid rock and concrete. The traction cables are ⅝-in. plow steel. The buckets are of 52-cu.ft. capacity and travel at a speed of 800 ft. per minute.

Tipple Facilities

On coming from the mines the coal is dumped from the mine cars over a Phillips automatic kick-back tip onto the ridge of a 60-ton bin built in the shape of the letter "W." The buckets are alternately loaded through undercut gates at the bottom of the bin. At the tipple the bucket doors are automatically tripped and the coal discharges onto shaker screens of the suspended type, designed to separate four sizes of coal at any given time, but several combinations of sizes may be obtained by the opening and closing of valves in the main pan. This may be done without stopping the screen. The shaker shaft is driven at 120 r.p.m. by means of a 12-hp. induction-motor belt.

The present capacity of the tramway, which is operated by one man, is 500 tons in 9 hours and it consumes 20 to 28 hp. By increasing the size of the buckets and their speed, they may be made to handle 1000 tons daily.

The arrangement of the mineyard may be of interest. The horns of the tipple are exactly 100 ft. from the mine mouth. On this account it was necessary to extend sidings into the mines. Gradients are so arranged as to provide 200 ft. of 1½ per cent. in favor of the loads and a corresponding 200 ft. of 1½ per cent. in favor of the empties, which return to the mine through a second entry. With such favorable grades, with cars having roller-bearing wheels and with the aid of the automatic tip, one man has weighed and tipped alone 331 tons of coal in 9 hours.

Concrete Form for New Tipple at Stearns Mine No. 10

New Concrete Tipple

In order to double tonnage and shorten the hauls at mine No. 10, new openings are being made and a concrete tipple equipped with shaker screens is in course of construction. A railroad yard of like capacity is being graded.

The forms of the new tipple are being built and the reënforcing steel placed. The concrete will be poured continuously, making a monolithic structure. The screens are constructed under the supervision of the Associated Engineering Co., of Louisville.

The tipple will be equipped with double automatic kick-back dumps and the empty cars will return to the mines on either side of the main entry over a 1½ per cent. downgrade. Likewise, the loads will run by gravity from any point 1500 ft. back from the mouth of the mine over a 1½ per cent. grade. The tipple horns are but 75 ft. from the mine mouth and loads and empties at the tipple will stand under cover. At this mine an 8-ft. Jeffrey disk fan, designed for low pressures, has been installed. It is driven by a 12-hp. induction motor. It delivers 35,000 cu.ft. of air per min. at a 0.2-in. water gage. The other mines are similarly ventilated.

Within the near future, work will be started on a central tipple of 1500 tons capacity at mine No. 4. The tonnage of that mine will be increased by that from several openings on the opposite side of the river and the coal will be transferred over an aërial tramway similar to that at mine No. 11, but this bucket train will be designed for a greater capacity, or else a wire bridge will be erected to span the valley, by which cars will be brought across the river. As it will be necessary to provide means for employees to cross to their work, a combination foot bridge and car haul will probably be constructed.

This year's developments have called for the construction of 60 dwellings, which brings the total up to 350. Work of this character will be continued until a tonnage of 5000 tons is ultimately reached, but 3000 tons per day is expected in a short time.

The Briceville Mine Explosion

By R. Dawson Hall

A gas explosion in an open-light mine develops great force from the presence of much dry coal dust. Cars in use have no front gates and spill coal freely on roadways. Moistening of entries by watercar method. Fan set at foot of shaft.

A severe explosion, probably resulting in the death of 84 men, occurred in Cross Mountain mine No. 1 on Dec. 9, at 7:20 a.m. The mine was operated by the Knoxville Iron Co. of Knoxville, Tenn.

Thirty-nine miles north of Knoxville by the Southern R.R. in the County of Anderson, which is in the eastern part of the State of Tennessee, is a small town by the name of Coal Creek, named from a stream of no importance which empties its waters into the Clinch River. At this town the Southern R.R. (Knoxville & Jelico division) puts out a spur to the mines around Fraterville and Briceville, the roadway following the general south-southwesterly direction of Coal Creek.

TIPPLE OF KNOXVILLE IRON CO. MINE, BRICEVILLE, ANDERSON COUNTY, TENN.

Geology of Section

The geology of the Briceville region is interesting. Barely ¼ mile southeastward from that village, the measures have risen in such a steep anticline that, centuries ago, the coal strata were completely eroded, but while the erosion was severe, the anticline is still emphasized topographically by the Walden ridge. The hardness of the Lee Conglomerate, combined with the uplift of the measures, has prevented its erosion to the general level of the Clinch River valley.

A mile from Briceville, also southeast, the violence of the folding proved too much for the measures to withstand and a fault resulted so that the highest formation of the Silurian—the Rockwood—abuts on the second Silurian formation known as the Chickamauga limestone. In another mile another branch of the same fault occurs from the same cause. This time the limestone referred to is found to lie side by side with the Rome standstone, a Cambrian formation normally about ¾ of a mile vertically below it. The two branches of the fault ultimately come together further north. Southeastward there is no coal and Briceville is therefore almost at the very edge of the coal field. The village of Coal Creek is also at its extreme margin.

Northwestward of Briceville the lower coal measures stretch almost uninterruptedly. Only in the bottom of the New River valleys is some of the Briceville shale measure exposed. This shale formation contains the bed mined at Briceville, Coal Creek and Olive Springs.

The Wartburg sandstone lies above this formation. This sandstone, which is, in a less degree, coal-bearing, is, of course, more frequently exposed by the New River tributaries than is the Briceville shale.

Firedamp Present

It might be expected that the measures of the Briceville shale outcropping for miles along Coal Creek and Poplar Creek, would be free of gas. But so large are the undrained reservoirs of gas to the northwest that some gas is found in nearly all the mines near Briceville. Northwestward from that town is the Cross Mountain, 2350 ft. above the water level of Coal Creek, perhaps 2300 ft. above the mine I purpose to describe.

Everyone seems to agree that gas, in quantity enough to start an explosion, has been found in Cross Mountain mine

where the recent explosion took place. As early as Apr. 20, 1897, to give a concrete instance, should such be needed, the inspector in his regular round of duties found "gas at the head of the entries, on the right main entry and the inside heading of the manway." But that this gas was in quantity can be disproved if in no other way than by stating that no damage has occurred from open lights hitherto and that the method of ventilation was by a furnace till the close of 1903. However, gas is said to have been heard issuing from auger holes and the gaseous condition has probably not been improved by the passing of the headings over a trifling "saddle," by the greater distance attained from the cropping of the coal and by the increased depth from the surface.

Mine Classification

It may be here stated that under the Tennessee law the mine was a class "B" mine, which is defined as one "that is dry or dusty to such an extent, as in the best judgment of the chief inspector, renders it subject to dust explosions, and where coal or other dust is deposited on timbers, sides and bottoms of airways, entries or other workings of the mine and where the danger would be increased by too great a velocity of the ventilating currents." On the other hand, class "A" includes all mines known to liberate firedamp, but the judgment of the mine inspector gives him such a degree of latitude that the classification does not necessarily show the absence or presence of gas. The minimum current passing through a mine of class "B" is required to be not less than 100 cu.ft. per min. for each man in the mine.

The Coal Seam

Some 30 beds of coal have been uncovered on Cross Mountain, but only three are over 36 in. thick. The seam worked at the Iron Co.'s mines runs from 3 ft. to 4 ft. 6 in., with an average thickness of 3 ft. 10 in. Irregularity in thickness of deposition seems to be a marked characteristic of the section. The coal is improving in character as the work extends. The earlier work was in dirty coal, the roof being badly seamed and containing fireclay, but at a distance of about 4000 ft. from the drift the coal becomes unaffected by breaks, the roof becoming firm and reliable. The weakness of the roof caused it to fall continuously along the entries. As a result, the main entries in the old portion of the mine are as much as 8 to 14 ft. high.

The coal is a bright, clean coal of excellent quality and of the following analysis:

ANALYSIS OF KNOXVILLE IRON CO.'S COAL

	Per Cent.
Fixed carbon	55.10
Volatile matter	40.75
Ash	3.40
Moisture	0.75
	100.00
Sulphur	0.78

It has definite face- and butt-cleavage. It is not possible to give a well known name to the bed worked at Briceville, but it is termed in Tennessee the Coal Creek bed. This seam is extensively worked. The U. S. Geological Survey, which has surveyed the Briceville quadrangle, has left the correlation of the coal seams as a problem not safely soluble at the present stage of geologic exploration.

Shedded Mining Tracks of Cross Mountain No. 1

Cross Mountain Mine No. 1

The mine is opened in a simple manner. One long, straight, face entry and a parallel airway penetrate Cross Mountain several miles, and from this entry are driven, to right and left, several butt-entries. There are 28 butt-headings to the right, the last being only just started from the main heading. On the left are 26 butt-entries. As the mine dates from the year 1888, it will be readily understood that much has been mined out.

the 14th Right and 16th Left and all earlier headings being finished. The butt-headings each consist of a haulway and parallel airway.

The mine was ventilated by a 7-ft. fan driven by an electric current of 250 volts. This fan for some reason not easily explained was placed at the foot of a shaft, 100 ft. deep. It was placed on a high ridge crossing the heading so that natural draft lessened the work demanded of the fan. This fan was speeded to about 300 r.p.m. In 1905, it was reported by the inspector as "too small for the area under development, which it has to ventilate; and, but for the splendid brick brattices on either side of the main entry, it would be impossible to furnish the adequate amount of air necessary to maintain safe conditions. However, credit is due the men for the air-current passing through the large mine." These brick brattices were placed all along the main entry, the side entries being bratticed with stone or wood, for the most part. The air went up the main entry to the face and returned by two long splits, each of which traversed, in turn, the long working headings to the right and to the left of the main entry. The coal was hauled partly by mules and partly by motors of the Goodman Manufacturing Co.'s make.

The Explosion

The explosion occurred at 7:20 a.m. As often happens, a delay in receiving railroad cars had held up the morning's work. Three men who had gone into the mine with the motor had just returned and 11 men were preparing to go in when the explosion occurred. It is thought that there were 89 men in the mine at that time. As the mine employs about 130 men rumor has persisted in putting the number at 125 and, at first, the men in Cross Mountain, No. 2 were erroneously included in the probable deathlist. There seems to be no doubt but that the explosion originated on a butt-entry to the left, probably not far from the 23rd entry. At this point, the explosion was severe, blowing the gob out of the mouth of the entry into the main face heading with such violence that the heavy iron rails were bent considerably out of line. But the explosion and resulting expansion of gases filled nearly the whole mine. In headings on both sides of the main entry, men were found burned and bruised, showing that both splits of the air-current were affected. The large timbers securing the roof in the lofty haulageways near the mouth of the mine were, in many cases, blown down and, indeed, the evidences of the force of the blast could be seen even near the driftmouth. The timbers were in many cases scorched as if by lightning.

Rescue Work

The rescue work was delayed by the large amount of smoke escaping from the workings and by the bad condition of the headings, the natural results of so violent an explosion. As the fan in the mine was completely destroyed, a fan, shown in the illustration, was brought from the Black Diamond mine adjacent and was set in the mouth of an old drift. This fan forced air into the mine, and proved a potent factor in the subsequent work of recovery.

The 10-ft. Fan from Black Diamond Mine, Forcing Air into Wrecked Mine

When the rescue car of the Bureau of Mines arrived, the direction of the underground work was committed to the representatives of that bureau, the president of the coal company, T. I. Stevenson, assisting the work by maintaining an efficient organization outside and by forwarding men and supplies to aid in the work of clearing the heading. Much of the rescue work was led by J. A. Holmes, the director of the bureau, and by J. W. Paul, the chief of the rescue department, in person. A great deal of helmet work was made necessary by the difficulties in reëstablishing the air-current.

The Men Who Were Saved

The following statement of William Henderson, one of the five men saved after being in the mine nearly 62 hr., was obtained on a visit to his house. His appointed work was drawing a pillar in Room 45 of the 19th Left. The explosion took place as he was about halfway up his room on his way to work. He felt the concussion and heard a noise, but did not think any considerable explosion had taken place. His boy was at the mouth of Room 47 above him and he shouted to him, asking him what he was doing, thinking that he might have caused what little noise and wind-rush he had heard. Looking around, however, he saw smoke, and with his son he went toward the sidetrack of the 18th Left, the coal from 19th Left being drawn into that sidetrack by a diagonal roadway. They went some distance and dropped down in the smoke. Both of them went to sleep, but for what length of time they do not know. Later they woke up and the father suggested their going on further in the same direction. They later met five men from 18th Left. These had already gone out to 16th Left and had come back to find the Hendersons. So together all the men went to 16th Left, the air getting better as they went.

Improvised Safety Chamber

In that heading they built two brattices of slate about 60 ft. apart. They made these approximately gas-tight by throwing slack into the crevices. They stayed there until 9 o'clock Monday (the 11th). They had their dinner pails, but the food was spilled out or spoiled. There was water in tubs which had been used by the mules for drinking purposes, and this dubious liquid was all they had to drink. They felt they could not live in the atmosphere long, as it was becoming befouled, both by their own lamps and by the leakage from outside. The air became so foul that they could only keep their lights burning by fanning fresh air toward the flame. Two men left them at 2 o'clock, Saturday. They have since been found dead. The other men, as aforesaid, stayed till the morning of Monday, when they returned to the sidetrack of the 18th Left. There was no improvement in the air. So they went to the door of the same heading and were met by the rescue corps. The men who had worked in 18th Left were burned. In that heading Dora Irish left his father, as he was dead and penned in under a roof fall. The rescue of the five men aroused great hopes that more would be found alive. Knocking was alleged to have been heard in the Thistle mine, a Coal Creek Mining Co.'s operation, between Cross Mountain No. 1 and Fraterville. It lies to the right of the devastated mine, and it was thought that as the explosion originated on the left, there might be some hope of saving some men toward the right. Chalk marks were found on the walls, but no men. Finally some were found in the section thus marked, but they were dead.

A Dangerous Mine

The Cross Mountain mine was perhaps as well conducted as any mine in its vicinity. In fact, to some it appeared better than any. There was not an excessive number of men in the splits. The bratticing was efficiently performed in the heading. It would seem, however, that an excessive amount of work stood open, at one time, for such a small production. The ventilation should always be proportionate not alone to the men engaged, but to the extent of the workings.

Still, Cross Mountain No. 1 was a dangerous mine, with just enough gas to make the employees unsuspecting, and more than enough dust to make fearful in result the most trifling explosion. Trite but wholesome is the reiterated statement that the least dangerous mines are often the ones to be most dreaded. A dusty mine does not fill the men in it with sufficient apprehension, and a little gas, which never burns anyone, is looked upon with complaisance. The dusty condition has been viewed with apprehension by the inspectors. On July 10, 1897, sprinkling was ordered. In 1905, R. A. Shiflett, chief mine inspector at that time, ordered (1) that the mine be thoroughly inspected by a competent boss within three hours before each shift and before men enter the mine. (2) Shots in headings shall not exceed three in number past the last crosscut. This includes the turning of breakthroughs. (3) Shots in rooms shall not exceed three in number. (4) Use of slack or auger dust for tamping must be discontinued and clay or sand used instead. Some rules follow as to the handling of powder.

Inadequacy of the Water Car

But the following of these rules alone could not suffice. Nor could immunity be expected from an occasional sprinkling by a water car. The dust should be almost entirely removed, and humidification should be by steam. In a mine full of gob-headings the dust must be resting on the rock ledges along every entry so gobbed. The water from a water car cannot reach such accumulations. Steam alone can overcharge the air with moisture, so that every place that the steam enters is wetted. Water cools the air with which it comes in contact, for the air is a little warmer than the water, and its evaporation effects a further cooling. So that were it possible, which is far from true, for the water to saturate completely the air exposed to the spray, the temperature being lower than that of air yet to be met, precipitation of moisture from the air cannot be expected; the air, in fact, will still be able to drain more water from the mine wherever the absence of the cooling spray permits the temperature of the air to rise. Thus all a water car can do is to wet the main roadway and dampen the air to a degree less than saturation, leaving the air-current free to absorb moisture in its further course along the heading and in the rooms. And it is well known how inefficiently it waters slack, which will not

The Main Entry into Cross Mountain No. 1. Unaffected by Explosion

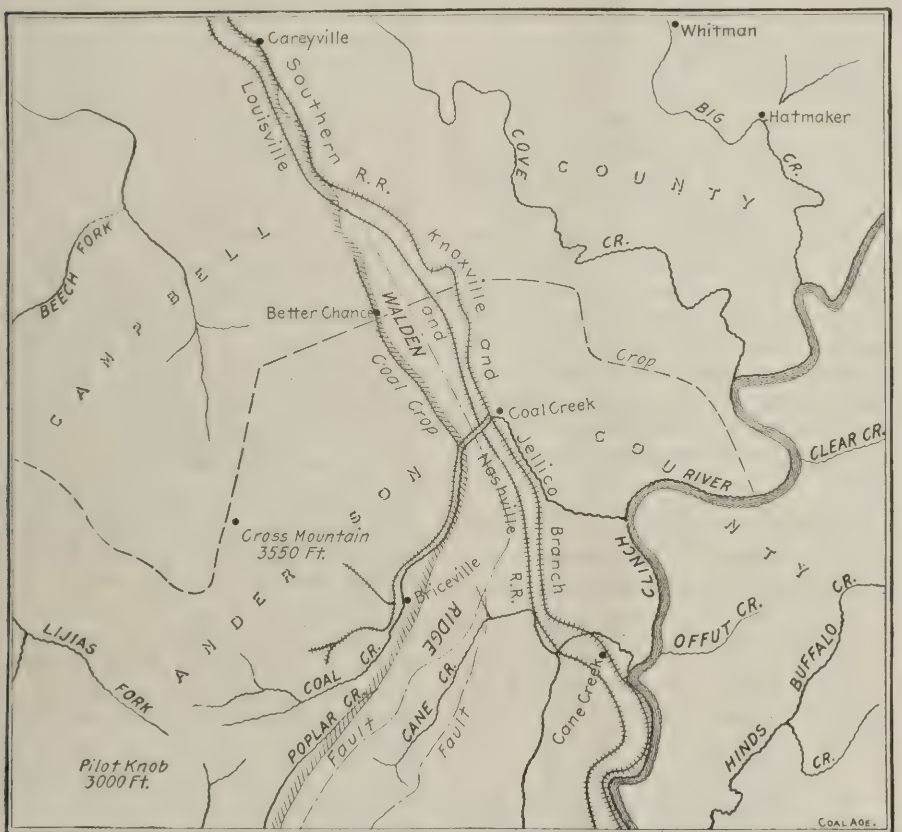
absorb it, and how tardily the water is absorbed by the air.

The Mine Car

The large amount of dust was due in part to the use of a type of car that is not uncommon in the Coal Creek district, but which cannot be too strongly condemned. In these days the tendency is toward a dust-tight car. The car in use was built without a front gate and with an 8-in. rear plank. To replace the front gate is a bar of iron, hinged at one end and latched at the other. On the flaring sideboard is a revolving latch rod, the end of which can be passed through a long slot in the crossbar mentioned. On turning the rod, an offset in the end stands crosswise of the slot and holds the bar in place. As the latch rod is turned to a right angle at its other end, a blow at that extremity revolves the rod, loosens the catch and releases the crossbar. The coal is built up from the very floor of the car, large lumps being placed against the bar and slack shoveled in behind.

The fan, being located in the mine, at the foot of the shaft, instead of on the surface, was destroyed by the force of the explosion. Why such a location should have been chosen is hard to say. Had the fan been intact the rescue work would have proceeded with less delay.

The Cross Mountain mine disaster probably comes with no new lessons, but it is possible that the old advice, which we most need to learn and follow, is the necessity of properly humidifying the mine air, the need of tight cars, the care in the placing of the fan, the danger of a dusty mine and the terrible menace of a little gas. It may be said that at Briceville there is little lack of intelligence among the miners. That is well proved by what has been said about their steadiness in danger, and their consideration for one another when facing death. They are all native Tennesseeans and Kentuckians. Not a colored man nor any convicts were employed in the mine.



Map Showing Briceville and Surrounding Country

Three Types of Coal Pockets

The particular type of construction best adapted for a coal pocket is often difficult to determine and it is therefore interesting to note the opinions in this connection of Archibald G. Monks, of Monks & Johnson, Boston, architects and engineers for coal-handling plants. In his remarks on this subject, Mr. Monks refers to three general types of coal pockets in common use: (1) The all-wood; (2) the combination concrete and wood; (3) the all-concrete.

As to the respective advantages and disadvantages of each type, he remarks that the wooden pocket, while much the cheapest to construct, is subject to the most rapid depreciation, and offers the greatest fire risk, to say nothing of the fact that it requires endless costly repairs. In most cases the dilapidated condition of timber pockets is the result of inadequate supports.

The combination concrete and wood pocket has many of the good qualities of the all-concrete pocket, and can be erected at a much lower cost. Such a pocket has reënforced-concrete columns and floors, with wooden walls, thus using concrete where the greatest strength is desired and where the most rapid depreciation is likely to occur. Mr. Monks states that one of the principal reasons that the cost of construction is lower for the concrete and wood type than for the all-concrete pocket is the fact that in the construction of the former type the wooden forms employed in making the concrete floors and supports are afterward used for building a part of the bin and wall partitions, thus effecting an additional saving beyond the gain from not having to use so many forms. In the all-concrete type the forms are usually thrown away. The second, and perhaps most important item in lowering the cost of these pockets, is the fact that mass concrete per cubic yard is much less expensive than light wall construction. In many cases concrete walls for pockets cost from $1.50 to $2 more per ton of pocket capacity than timber walls.

According to figures compiled by Mr. Monks, the interest alone for 15 years on the extra cost of an all-concrete pocket will more than pay for the entire replacing of the wooden walls of the combination type. In addition, it is difficult to make alterations in the all-concrete pocket, while they may be made with comparative ease in the combination type.

Mr. Monks admits without question that the all-concrete pocket is the best in many respects, but has found that the largest return from the money invested is secured with the pocket of concrete and timber.

Don'ts for Boiler Attendants

Don't overload the safety valves or tamper with them.

Don't let the water level sink out of sight.

Don't allow the cocks and valves to set fast.

Don't open the steam stop valves hurriedly.

Don't empty the boiler while steam is up.

Don't open manholes before easing safety valves.

Don't raise steam hurriedly.

Don't use unknown scale solvent or compositions.

Don't shake ashes against boiler fronts.

Composition of Mine Gases

By G. A. Burrell*

> *Carbon monoxide may be present in exploded firedamp and in waste products of shots. Oxygen is depleted to 3% in stagnant air. As much as 5% of methane may be found in a nongaseous mine. Extinctive atmosphere for lamps defined. Simple apparatus for measuring CH_4.*

The Bureau of Mines has, in the study it has been making of mine gases, examined samples of gases taken under different conditions, analyses of which are here presented.

Incomplete Combustion of Methane

No. 1 Sample: Incomplete combustion of methane. Original mixture contained 10.03% CH_4.

PRODUCTS FOUND AFTER EXPLOSION

10.16% CO_2	0.00% O_2
2.13% CO	0.00% C_2H_4
1.39% H_2	0.00% CH_4
86.32% N_2	

No. 2 Sample: Incomplete combustion of methane. Original mixture contained 10.94% CH_4.

PRODUCTS FOUND AFTER EXPLOSION

8.35% CO_2	0.00% O_2
4.47% CO	0.00% C_2H_4
3.66% H_2	0.00% CH_4
83.52% N_2	

In these experiments pure methane was prepared and mixed with air in such proportion that not enough of the latter was present for the complete combustion of the methane. The mixtures were then exploded and the products of combustion examined. The most explosive proportion of methane and air contains 9.47% of methane. When the latter is increased above this figure, certain products are formed, about which there has been some disagreement. Some investigators have gone on record as saying that no carbon monoxide is formed.

According to these experiments the carbon monoxide and hydrogen increase, and the carbon dioxide decreases as the methane content of the original mixture is raised. Olefine hydrocarbons, acetylene or unburned methane were not found in the products of combustion. The carbon monoxide and carbon dioxide formed, contained all the carbon originally present in the methane. To the carbon monoxide formed in this manner is due some of the carbon monoxide found in the afterdamp following mine explosions. Not all of it, however, and in many cases the smaller proportion, is formed in this manner, because the incandescent carbon of heated coal dust appears to be mainly responsible for the production of the carbon monoxide found after dust explosions by the reduction of CO_2.

Crevice Gases after Shooting

Crevice samples obtained after explosives had been fired in coal mines.

NO. 1 SAMPLE

16.8% CO_2	17.3% CH_4
22.8% CO	8.9% H_2
4.3% O_2	29.9% N_2

NO. 2 SAMPLE

9.1% CO_2	14.1% CH_4
3.2% CO	4.1% H_2
7.5% O_2	62.0% N_2

*Chemist, mine-gas investigation, Bureau of Mines, Pittsburg, Penn.

Note—Paper read before the Coal Mining Institute of America, Pittsburg, Penn., Dec. 20, 1911.

This series of samples shows the gases formed by firing blasting explosives in coal mines. Both black powder and permissible explosives produce noxious gases. These samples were taken from the crevices produced by the breaking down of the coal. The explosive and noxious character of the gases will be observed. The explosive quality accounts for the fact that the miner is sometimes burned when he inocently puts his lamp to the coal to examine the effects of his blast.

Immediate and Later Crevice Gases

No. 1 Sample, crevice sample taken immediately after shot *A* had been fired:

1.40% CO_2	1.40% CH_4
1.45% CO	0.74% H_2
19.31% O_2	75.70% N_2

No. 2 Sample, sample taken 4 min. after shot *A* had been fired:

0.56% CO_2	0.71% CH_4
0.16% CO	0.06% H_2
20.22% O_2	78.29% N_2

No. 3 Sample, crevice sample taken immediately after shot *B* had been fired:

2.50% CO_2	4.88% CH_4
1.21% CO	1.06% H_2
16.91% O_2	73.44% N_2

No. 4 Sample, sample taken 4 min. after shot *B* had been fired:

0.30% CO_2	0.25% CH_4
0.02% CO	0.01% H_2
20.61% O_2	78.81% N_2

This series of samples represents further, gases obtained after explosives had been fired to break down coal. The crevice samples were obtained by proceeding immediately to the face after the shot had been fired and collecting the samples as the gas exuded from the coal crevices. In each case a wait of 4 min. was made, and then the sampler proceeded to the face to collect another sample at about the place the miner would stand to attend to his shot. In one case, 0.16% of carbon monoxide was found, a harmful quantity. The experimental shots were fired under conditions which do not represent the best practice.

Other experiments are being carried on by the bureau to obtain further data on this subject, so as to determine the conditions which lead to the production of harmful quantities of noxious gases. Work thus far accomplished shows that it is bad practice to proceed immediately to the face after a shot has been fired. Even those powders which contain within themselves sufficient oxygen for the complete combustion of the carbonaceous matter present in the explosive, produce, when fired in coal mines, some carbon monoxide, due to a reaction with the carbon of the coal dust. Some explosives, however, are deficient in oxygen.

Deterioration of Motionless Air

COMPOSITION OF GASES FROM AN INCLOSED AREA IN AN ANTHRACITE MINE

Sample No.	Date	Percentages				
		CO_2	CO	O_2	CH_4	N_2
1	Oct. 31....	2.2	0.0	15.0	14.0	68.8
2	Nov. 1....	2.3	0.0	14.6	18.1	65.0
3	Nov. 2....	2.6	0.0	6.2	24.2	67.0
4	Nov. 2....	2.9	0.0	5.7	29.3	62.1
5	Nov. 3....	2.8	0.0	4.1	34.9	58.2
6	Nov. 6....	2.6	0.0	3.0	53.0	41.4

The gases, in this series, show the composition of the atmosphere in an inclosed section of an anthracite mine. This section of the mine was sealed off because of a fire which existed in an adjoining section. The fire did not affect the particular area from which these samples were obtained, because of a heavy intervening roof fall; consequently the gases represent those trapped and given off normally in a stagnant section, except that a stopping was leaking and some air was finding its way into the interior from the ventilating current. The stopping was tightened and the rapid absorption of oxygen by the coal is shown by the third analysis. Four days later the oxygen had dropped to 3%, even though some air was finding access to the inclosed area. The rapid accumulation of methane is also shown, 53% on the sixth day.

Methane in Nongaseous Mine

COMPOSITION OF GASES FROM AN INCLOSED AREA IN A BITUMINOUS MINE

Sample No.	Percentages				
	CO_2	CO	O_2	CH_4	N_2
1	1.50	0.00	0.30	5.29	92.91
2	1.20	0.00	0.30	5.37	93.13

This series of tests shows the composition of gases from an inclosed area in a bituminous mine. A mine fire had once existed in the area and these samples were collected by means of breathing helmets, nine months after the fire had originated and prior to the reopening of the mine. The oxygen had almost entirely disappeared. The mine is classed as nongaseous, yet an accumulation equal to over 5% methane had taken place.

BITUMINOUS MINE-FIRE GASES

Sample No.	Percentages					
	CO_2	CO	O_2	H_2	CH_4	N_2
1	8.07	1.58	1.69	1.37	3.39	83.90
2	9.14	1.32	1.83	1.03	3.60	83.08
3	2.93	0.56	10.34	0.13	0.82	85.22

Samples Nos. 1 and 2 in this series were obtained directly from a fire area, 4 and 7 hours, respectively, after the mine had been sealed off. The fire occurred just inside the pit mouth of a drift bituminous mine. Samples were obtained by boring holes through the thin roof covering. These analyses, with others, showed that air was not leaking in to an appreciable extent, and the existence of an atmosphere that could not further the progress of the fire. No. 3 analysis of this series represents the atmosphere in the same mine about 1400 ft. away from the seat of the fire. An entrance was made through another entry in the mine, with oxygen helmets, and samples of gas were obtained. The party could not proceed farther because of a heavy pall of smoke. It was impossible to better shut off the air, because of various small openings in the outcrop. The oxygen content in sample No. 3 of this series was viewed with some uneasiness, but because of the stagnation of the air and accumulation of blackdamp, it was believed that appreciable diffusion of fresh air into the burning area could not take place. Such proved to be the case.

ANTHRACITE MINE-FIRE GASES

Sample No.	Date	Time	Percentages			
			CO_2	CO	O_2	CH_4
1	Oct. 27	12:00 p.m.	3.5	1.3	8.3	11.5
2	Oct. 27	12:00 p.m.	3.8	0.7	9.6	13 1
3	Oct. 28	9:45 a.m.	3.4	0.6	10.9	10.8
4	Oct. 28	4:00 p.m.	3.4	0.6	11.3	10.3
5	Oct. 28	4:30 p.m.	3.0	0.4	12.6	9.6
6	Oct. 29	11:00 a.m.	3.3	0.6	14.1	9.0
7	Oct. 29	3:30 p.m.	4.0	0.8	13.6	12.0
8	Oct. 30	10:30 a.m.	4.8	1.2	10.1	14.1
9	Oct. 30	5:00 p.m.	4.0	1.0	12.2	12.2
10	Oct. 31	6:30 a.m.	12.2	0.4	6.6	6.6

These tests show the composition of the atmosphere in an inclosed area of an anthracite mine, while a fire existed therein. The bureau men arrived at the scene of the fire on Oct. 27. Dams were in place and water was being forced behind the dams in an effort to flood the fire area. The dams were placed in steeply-pitching chutes, and the water after reaching the roof of the chutes at the dams, had to back up hill in order to reach the seat of the fire. Because of the pitching chutes it was difficult to make the dams hold water. Samples of the atmosphere behind the dams were obtained and analyzed. The first two analyses show the results of the first day's sampling. The two days following, despite efforts to tighten the dams, inleakage of air occurred to such an extent that the fire burst forth with renewed intensity. This happened when the oxygen in Sample No. 6 had risen to 14.1%. The air was inleaking through another dam, and some of the products of combustion were finding exit at the dam where Sample No. 6 was collected. The air fanning the fire into a blaze probably contained about 18% of oxygen.

After Sample No. 6 was taken, the fire was again brought under temporary control, as shown by the decrease in oxygen. The carbon dioxide and carbon monoxide also rose. Then air again started to inleak, and in order to avoid another outburst of fire, a carbon dioxide fire extinguisher was brought into the mine and carbon dioxide was forced behind one of the dams for five hours, checking the fire until new and tighter dams could be built. The rise in carbon dioxide, due to this cause, is shown by Sample No. 10, collected one-half hour after the use of the extinguisher had been discontinued. The new dams held water well and excluded air, so that the fire was rapidly brought under control.

Mine Air in Passage

SAMPLES OF NORMAL MINE AIR FROM DIFFERENT SECTIONS OF A MINE WORKING THE PITTSBURG SEAM

Sample No.	Cu.Ft. of Air per Min.	CO_2, Per Cent.	CH_4, Per Cent.	Cu.Ft. of CH_4 per Min.
1	17,400	0.04	0.10	17
2	21,600	0.06	0.94	203
Return 3	63,000	0.11	0.75	473
Face 4	Air still	0.12	1.80	
Return 5	79,800	0.15	0.19	152
6	21,600	0.06	0.10	22
7	31,500	0.13	0.70	220
Face 8	Air still	0.11	1.38	
9	39,200	0.15	0.75	294
10	8,100	0.09	0.34	28
11	11,400	0.06	0.14	16
12	32,400	0.09	0.94	305
13	23,200	0.05	0.95	220

These tests show the carbon dioxide and methane in the normal mine air of different parts of a large mine working the Pittsburg coal seam. At the time the new Pennsylvania mining code was proposed, embracing certain features relating to the percentage of methane allowable, one of the mining companies asked the bureau to sample the air in its mines with a view to determining just how much methane was present. Since that time the bureau has trained a chemist for the work, installed a gas-analysis apparatus, and the company is now having daily analyses made. It can be stated that the bureau will do this much for other mining companies if they desire closer methane determinations than the safety lamp will show. It might be mentioned that the state inspection department of Alabama, among others, is being given similar aid. The chief mine inspector is installing a laboratory in his office and his men will frequently send in samples.

ATMOSPHERES EXTINCTIVE TO FLAME

Lamp	Percentages	
	CO_2	O_2
Wolf lamp, bonneted	3.00	16.50
Wolf lamp, without bonnet	3.00	15.82
Bunsen burner (natural gas)	3.25	13.90
Acetylene lamp	6.30	11.70
Candle flame	2.95	16.24

In these experiments, the different flames were placed under a 10-liter bell-jar and the atmosphere analyzed after the flames had become extinguished, due to the consumption of oxygen. It might be well to call attention to the tenacity to existence of the acetylene flame. In other words, it will burn in an atmosphere in which the ordinary flame cannot exist. Also, that it is bad practice to work in atmospheres deficient in oxygen to the extent any of these analyses show.

Afterdamp

The following test shows the composition of some gas samples obtained from a mine about 18 hours after an explosion had occurred therein:

NO. 1 SAMPLE

1.37% CO_2	1.23% CH_4
0.60% CO	0.28% H_2
18.14% O_2	78.38% N_2

This sample was obtained at the face of an entry by bureau men equipped with oxygen helmets. The ventilation in this section of the entry had not been restored. The seat of the explosion was supposed to have been close to this place. A canary bird, carried by an exploring party unequipped with helmets, collapsed as it was being carried in this entry about 200 feet back from the face. The men retreated without suffering any distress. The bird revived quickly when brought back to fresh air. The sample is further interesting in that 1.23% of methane was found to be present. This particular explosion was supposed by some to have been originated by the flash of short-circuited electric wires igniting coal dust, but the fact that considerable methane was found at the face points to the possibilitiy of firedamp playing some part in the catastrophe.

NO. 2 SAMPLE

0.32% CO_2	0.19% CH_4
0.04% CO	0.00% H_2 below 0.02%
20.50% O_2	78.95% N_2

This sample was obtained in a section of the mine where ventilation had been partly restored. Even so, 0.04% of carbon monoxide was still present. Our party and others spent some considerable time in this section without feeling any effects from the whitedamp, although one member stated he did not feel very well. This man had, however, been traversing this and other sections of the mine for 7 or 8 hours; consequently it is possible that he had been breathing small percentages of carbon monoxide a large part of the time. Eight men lost their lives in this explosion, and at least six of them were overcome by carbon monoxide. Some of the rescue party also experienced narrow escapes from the afterdamp. If they had provided themselves with canary birds in the beginning of the explosion work, it is probable that a large part of the distress experienced by them would have been avoided.

Methane Apparatus

Fig. 1 shows a simple gas-analysis apparatus which has been assembled especially for the use of mine superintendents, foremen and inspectors. Methane can be determined with an accuracy of 0.1% in less than 10 min. It consists of a measuring vessel *a* for measuring the gas, and a burning vessel *b* for burning out the methane from a measured volume of mine air; *c* is the sample pipette. The mine air is drawn into the measuring vessel *a* from the pipette *c*, measured, and passed into the burning vessel *b*. The platinum wire therein is electrically heated to a white heat and allowed to remain so for 3 min. The current is then broken and the pipette cooled. The mine air is then drawn back into the measuring vessel and the contraction in volume due to the burning of the methane is determined by again measuring the sample. This contraction in volume when divided by 2 and calculated to a percentage basis gives the amount of methane present.

The measuring vessel or burette has a total capacity of 50 c.c. and is divided into the bulb at the top, having a capacity of 45 c.c., and the stem, which has a capacity of 5 c.c. The stem is graduated in 0.05 c.c. or twentieths. Water is used both in the measuring and burning vessels. The apparatus works on no new principle but follows the method adopted by Coquillon, Winkler and others who burn the methane out of a measured volume of mine air.

The Bureau of Mines has assembled other types of gas-analysis apparatus more accurate than the one described, which are, however, not simple to operate, and are meant for the use of chemists.

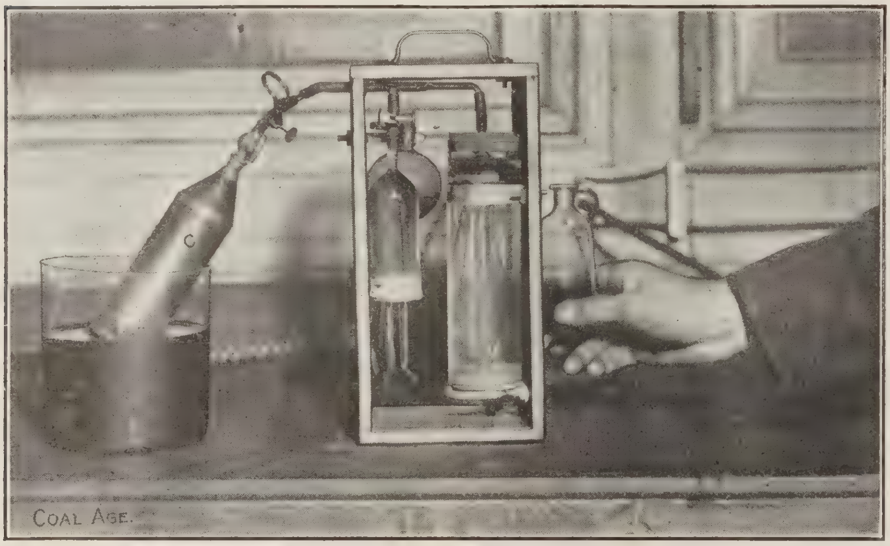


Fig. 1. Apparatus for Determining Percentages of Methane

Purchase of Locomotive Fuel Coal

By R. D. Quickel*

Frequently it is impossible for a railroad to use a certain grade of coal because it will not burn under the same conditions as other coals which are already in use, although it may be of excellent character as to its heating value, ash, sulphur content, etc. One of the worst practices in vogue today on railroads is the use of a variety of coals in a certain district or division. The locomotive fireman is the man who is chiefly responsible for the proper use of the fuel, and when he has become accustomed to using a certain grade, many kinds of trouble are frequently experienced from forcing him to use a fuel with which he is not familiar.

While it is true that railroads demand coal cheaper than any other purchaser, it must be considered that the mine having a railroad contract, is assured of business for 12 months in the year with no further expense involved.

Coal furnished on a railroad contract must first be of such a character as to enable the fireman to keep up sufficient steam to run on schedule time. There is only one way of determining whether or not the coal is of a quality to do this, and that is by actual test. Analyses are useful as indicating the character of a coal and giving some idea as to what may be expected in regard to the amount of ash, clinker, corrosion of boiler tubes, grate fingers, etc., but cannot take the place of actual trial.

When it is considered that a railroad locomotive is about as expensive a piece of machinery as it is possible to buy, that a firebox temperature of 2300 deg. F. is necessary for its proper operation, and that all the various impurities that occur in coal tend to increase the operating expenses, it is readily understood that the railroad company must take every precaution to secure a high grade of fuel.

Some operators have heretofore taken the stand that preparation of locomotive fuel was not necessary, as the railroad would take it anyhow. While the railroads have not as yet adopted the method of buying coal on a premium basis, the day will soon come when the practice of purchasing fuel by a trade name will be exceptional. The reason for this is to be found in the fact that a trade name in so many cases obviously means nothing. Railroads are sometimes accused of favoritism in regard to placing their fuel contracts with large operators. If this is the case it is chiefly because the large operator can as a rule sell at a cheaper price and can be depended upon to fill his contract. The small operator, desiring to sell fuel to a railroad, must show first that he can prepare good coal at a reasonable price and second, that he is in business for every day in the year.

The preparation of the coal is a matter of great importance in engine fuel. Some experts contend that a certain percentage of slack in a coal is beneficial. Personally, I am inclined to believe that a run-of-mine coal containing not more than 30 per cent. slack is usually satisfactory. The objection to it arises from the fact that if there are any impurities in the coal, the highest percentage is to be found in the small sizes and fine material. I have found, by actual experiment, that there is an increased consumption of 33⅓ per cent. when using a 2-in. nut and slack coal as compared with 5-in. run-of-mine. It is evident, therefore, that a large percentage of slack should be guarded against.

*Fuel agent, Queen & Crescent Route.

Note—Abstract of address delivered before a meeting of the Kentucky Mining Institute, Lexington, Ky., Dec. 11, 1911.

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This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

Mine Examinations for Certificates of Competency

The question of competency of mine officials in direct charge of work in and about coal mines is attracting increased attention in all mining states. It is universally conceded that the men in direct charge of operations in coal mines should be competent to perform the duties that rest upon them by virtue of their official position and authority.

The work involved in the operation of a coal mine naturally divides itself into two or more general classes or grades of work, which may be styled as management, supervision and operation. In large companies, operating a number of plants, there are numerous subdivisions in each group, requiring general managers, managers and assistant or district managers; general superintendents, superintendents and assistant or division superintendents; general foremen, foremen and assistant foremen, and bosses, mine bosses, firebosses, boss-drivers and timbermen.

In mining work, as in all dangerous occupations, there arises the acknowledged necessity for the competent direction of work, to the end that the same may be performed with due and reasonable regard for the safety of the workmen employed.

A workman is under orders to do a certain work—he is not in a position to dictate to his boss. If a workman is unwilling to obey, because he considers the work unsafe or dangerous, it is his privilege to step aside for the man who follows. The workman may be ignorant in respect to mining work; he may be lazy and too ready with excuses for not doing the work ordered; he may be a coward and willing for the other fellow to do the hard work, the work that requires courage and skill.

It is plain, therefore, that the question of safety, as far as the company is concerned, must be decided by the mine foreman or mine boss who is there and in immediate charge of the work. He should be the *"competent"* man and the man who should be *morally* responsible for the safety of his men. We say *morally* responsible, because it seems right and just that the mine foreman or boss can only be held legally responsible for neglect or failure to perform his legal duties, while the operator or company is likewise responsible for the employment of an incompetent person, should this be shown to be the case.

Much depends, in the solution of this question, on what constitutes a "competent" person. Can competency, within the meaning of the state mining laws, be determined by an examination of candidates? If the competency of a candidate can be so determined, who should conduct the examination; and under what authority is the certificate of competency to be granted to the candidate? Finally, does the granting of such certificate of competency by a state board of examiners, duly authorized by the state mining law and commissioned by the proper officer of the state, make the state responsible for accident that may occur under the supervision of such certified person? We think not.

It might be argued with equal force that the certification of stationary engineers by a municipality, or the inspection of boilers by a city boiler inspector, makes the city responsible for accidents due to manifest incompetency on the part of such certified official; or the licensing of physicians to practice, makes the state responsible for deaths due to their mistakes.

The fact is that the city or state, in examining and certifying to the competency of candidates to hold certain positions of responsibility, is performing a gratuitous service tending to protect the lives and property of its citizens. The state or city makes no charge for the service rendered to individual operations, and no liability attaches to the government because such service is incompetent.

The question has been asked recently, "Should not the mine superintendent be compelled to pass an examination and hold a certificate of competency?" We

answer, that, in our opinion, this is not required by the exigency of the case. The superintendent is not the man in direct charge, at the point of danger. It is true he is the mine foreman's superior officer, but his province is one of supervision.

The best mining laws without exception give the mine foremen full charge and power to direct and control the ventilation of the mine and all supplies required to make the mine safe. The same law makes the fireboss the highest authority regarding the gaseous condition of the mine and gives him full power to admit or exclude men from the mine. These two officials are, therefore, the men in charge, and the law requires them to see that the mine is safe; and, for this reason, they should be certified as competent for their respective work.

In how far does the present system of conducting examinations of prospective mine foremen and firebosses serve to determine their several competency and fitness for the positions of responsibility they seek? In many cases, the law specifies that the candidate shall possess a technical knowledge of the principles of ventilation, properties of gases, methods of working, operation of mining machinery, surveying, etc. In one case, at least, which we hope and believe is exceptional, the law specifies that, "During the progress of the examination, books, memoranda, or notes shall not be allowed."

Does this law contemplate that the candidate shall memorize the formulas, constants and values necessary to pass a technical examination of this character; and is the intention of the law makers, here, to debar from the responsible positions of mine foreman and fireboss all persons who cannot memorize the formulas and tables found in every mining handbook?

Mining handbooks are for the use of practical mining men. These men should be familiar with their contents—not by memorizing the formulas and tables they contain, but by knowing where to find the formulas and values required to work any mining problem. Mine-examining boards should allow candidates the free use of any handbooks they desire to bring to an examination where technical questions are asked. The candidate uses these in mining practice, at home or in the office—why not in a technical examination?

We must not lose sight of the fact that what is needed are able and practical men, with sufficient technical knowledge to make them competent to handle the problems that arise in daily mining practice. The best practical men are not men who can memorize formulas, but who can find and use them when required. COAL AGE strongly advocates the use of textbooks in all technical examinations.

There should, besides, be one written and one oral session, in the examination of each candidate, in which no handbooks should be allowed. In the written session, questions should be asked calling for experience on the part of the person examined. In the oral session, the examination should be designed to show the quickness of the candidate to determine the best plan of action to rescue men entombed by a heavy fall; to save men and control a fire started on the main intake air-course; to control a sharp squeeze, and other like questions requiring ready answers.

The examination of firebosses should be less technical than that of mine foremen; it should aim to show the candidate's knowledge of gases, ventilation, timbering, and his acquaintance with mine maps and surveying. A sight-test should be required that would show the ability of each candidate to detect a flame cap on the common Davy lamp, and to estimate from its height the percentage of gas in the air.

In order to make mine examinations, to determine the competency of candidates, achieve their desired purpose and secure the best men, examining boards must study closely the needs as well as the conditions surrounding the men they examine. The examination is necessarily quite different from an ordinary school examination. Its aim should be to show a competent knowledge, coupled with a sufficient experience, and an ability to think and act.

Percussion

In the communication of Mr. Verner, which appeared in COAL AGE last week, he remarks that the report of the Adrian disaster published in our columns ascribed the explosion to the fall of an electric wire. But that report took no such assured stand, and while stating that "the explosion must have been due to short-circuiting of an electric-haulage wire," added, "or possibly to the leaving of dynamite or caps within the mine, despite the fact that the use of dynamite is forbidden at Adrian except for the shooting of rock headings." This is not entering a defense of anything which was contained in that article, but is rather a protest against overlooking a not improbable initial cause.

The heading, known as the 13th Left, around which the explosion centered, had run to a rock roll, and the headingmen had been using dynamite in its extension. They might have *cached* a few sticks in a neighboring room at a point beyond the support of the room pillars, and when a cave occurred, the sticks might have been detonated by the percussion.

But why not go further and admit that black blasting powder, the fuses of permissive explosives or even the powders themselves may, if exposed to a fall of roof, be exploded by either the heat, a spark or the detonation of percussion.

The use of dynamite in 1896, when the first explosion at Adrian took place, was not as common as today, and permissives were entirely unknown in the United States. It is probable, therefore, that the first explosion arose from rock falling on black blasting powder. The permissive powders have been, it is said, abundantly tested by the Bureau of Mines to determine their explosibility from mechanical detonation. Only one, which contained chlorate of potash, failed to show a perfect resistance to such action. But it is not impossible that permissives carelessly handled so that freezing or nitroglycerin exudation can take place, may be the cause of explosion, if not kept where they are free from mechanical violence.

Care should be taken always to keep explosives away from parts of the workings liable to cave.

The necessity of periodical medical examinations of the eyes of firebosses is shown by the results of such an examination conducted at the Globe colliery, Wales, England. After a disastrous explosion caused by shot firing in a gaseous chamber, it was found there was 3 to 3½ per cent. of firedamp present, which was not detected by the fireboss because of defective eyesight; the examination clearly showed that out of 41 firebosses inspected by a government inspector, 31 were found to have defective eyesight.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Geology in Coal Mining

That applied geology finds one of its most useful fields in the exploration and development of coal lands would not seem to be open to argument, yet there may be some legitimate differences in opinion between engineers and geologists as to the proper functions of the geologist and the economic value of geologic work in coal mining.

The recent article by Prof. I. C. White and one by C. P. Collins, especially relating to the controversy that led to the Ott suit against the Berwind-White Coal Mining Co., while touching upon this subject, do not properly define the functions nor the limitations of the coal geologist. The competent coal-mining engineer is necessarily a geologist and must have a good working knowledge of the district in which he is employed, but his work does not require that broader knowledge of many districts which constitutes the capital of the consulting geologist.

Having been engaged for a number of years in professional geologic work and having had equal experience as an engineer in the operation and supervision of mines, I may perhaps be in a position to express an opinion of the value and importance of geology to the coal operator and miner that will be free from personal bias; for, as a mining engineer, I am willing to restrict the geologist to his proper sphere; and, as a geoligist, I see no reason why the mining engineer should not be limited to those functions he is qualified to perform.

Geology and the Ott Suit

It is unfortunate that the Ott suit should have been used to illustrate the value of geology in coal mining. Briefly stated, the case was one in which the Berwind-White Coal Mining Co., upon having acquired the right to mine a bed of coal described in the deeds of conveyance as the "B" or "Miller" bed, were sued by Mr. Ott because he believed the company was mining coal from a bed overlying the "B" bed, and one which John Fulton believed to be the bed "C prime." The question at issue was whether the bed being worked was in reality the "B" or "Miller" bed, long known and recognized by these names along the main line of the Pennsylvania railroad between Johnstown and Gallitzin, or some other bed. Mr. Ott contended that the coal worked was too close to the surface for the "B" coal and, as stated by Mr. Collins, sunk several diamond-drill holes to learn the truth. Many geologists and engineers examined the cores from these boreholes and either failed to reach definite conclusions as to the identity of the several coals shown by these cores, or failed to substantiate their conclusions by arguments that would be accepted as proof in a court of law.

The matter was further complicated by the fact that between the region where the "B" or "Miller" coal had long been worked and recognized, and the mine in question under Mr. Ott's farm, there intervened several miles of territory in which this bed had not been opened and worked, and it was therefore impossible to trace bed "B" step by step, by mine workings, continuously from the first mentioned region to the Ott place.

Under such circumstances the identity of any bed of coal must always be largely if not entirely a matter of conjecture and not susceptible of legal proof. We know enough of the uncertainties and vagaries of coal beds to know that one may be replaced by another that normally should be found above or below it; that such a change may occur in short distances; that a bed normally thin may thicken to workable size and another normally thick may thin to small size or disappear entirely, and that the intervals between the coals, and between the beds of coal and the limestones, sandstones and other rocks, may increase or decrease in short distances, so that a bed of coal apparently found at a certain horizon may not be the bed normally present at that horizon but some other bed that is usually found higher or lower in the coal series.

Impossible to Establish Identity from Borings

To establish the identity of the coal worked on the Ott place from borehole cores therefore was manifestly impossible, and it was also impossible to prove the identity of the coal by actually tracing it through mine workings continuously from where the "B" coal was known and worked, because such workings did not exist. The actual identity of this coal may never be proved beyond question until such mine workings do extend continuously between these points.

While it was not possible to establish the identity of this coal as a legally proved fact, it was quite possible for engineers and geologists to present data that might be sufficient to convince an engineer or operator that the bed being worked was or was not bed "B."

In preparing the defense in this case the Berwind-White company placed the preparation of the evidence in the hands of Mr. Baird Halberstadt, of Pottsville, who collected a large quantity of material in support of the company's contention that the seam mined was bed "B," and other geologists were called upon to confirm and strengthen the conclusions made by Mr. Halberstadt. But it must be remembered that while in this way a great cumulative mass of evidence could be presented, all of it rested upon the personal opinion of those who had examined these data, and the result therefore could not approach the dignity of a demonstration. In the same way the conclusions reached by Mr. Fulton and those who agreed with him were personal opinions, and could not be considered as proving the truth or falsity of either view.

Distinction between Facts and Opinions

While it may seem a waste of time to go into a matter of this kind at such length, it appears to me to be justified, because it is useful to emphasize a fact of which this case furnishes a most illuminating example; namely, that the geologist should distinguish more clearly between fact and opinion, betwen proof and surmise. Possibly Mr. Collins and Mr. Halberstadt may be right in their opinion, and personally I think that quite probably they are, and possibly Mr. Fulton may be right, but it should have been apparent to all concerned that neither party was prepared to prove anything. Mining operations stretching continuously from point to point, the actual opening of the coal along its outcrop at innumerable places, or a continuous row of boreholes, would have been necessary before anything even approaching the semblance of proof could have been adduced and offered as evidence in this case.

The geologist may often be thought to have an ability to identify coal beds not justified by the history of geologic examinations, and the public may often be ready to accept an exaggerated view of his ability in this direction. The history of all attempts to identify the coal beds of different regions or localities, whether such regions or localities are widely separated or are in close proximity to each other, furnish many examples of the errors which the geologist must inevitably

make. As an illustration of this, may be cited the identification of a bed of coal in the Morrisdale-Houtzdale Basin, in Clearfield County, made by the writer in 1884, and accepted for many years by operators as demonstrating the coal in question to be the "B" bed.

After working this coal bed for many years under the belief that it was bed "B," abnormally located 30 or 40 ft. higher than its proper place in the series, it was accidently discovered that bed "B" existed below the coal worked, in its proper place and with its normal characteristics, and that the bed worked was in reality bed "C" (or a bed normally thin, lying close to bed "C"). Other instances will be found in the many changes in nomenclature and identifications made by Prof. White and others in attempting to work out the true succession and age of the coals in the West Virginia coal fields, a work that is still in progress.

GEOLOGIST VS. ENGINEER

It is extremely questionable whether in controversies of this nature either the engineer or geologist can profitably be employed by the contestants, for the character of the testimony must generally be confined to the personal opinion of the witness, supported by more or less disconnected facts, and such testimony is not usually of sufficient force to insure a final decision covering the points at issue. Recognizing these limitations many coal geologists decline to appear as expert witnesses or discourage their clients from calling them as witnesses, preferring to limit their services to the rendering of such advice as in their opinion may be of value to their clients.

In his relation to his clients, whether concerning suits at law or the development or purchase of mining property, the geologist is naturally in an advisory position and the value of his services must rest upon his ability to advise wisely. This will depend upon the nicety with which he can weigh the relative importance of all the matters at issue, including the general business and commercial conditions affecting the proposition, as well as the technical geologic facts, the opinions based upon these facts and the weight to be accorded to such opinions, and to serve his client most usefully he must be prepared to advise definitely and positively, because his client probably does not have such a sense of proportion regarding technical matters as will enable him to judge of their relative values, and is, therefore, quite likely to reach unwarranted conclusions or to be so confused by apparent inconsistencies as to be unable to form a definite opinion.

The functions of the mining engineer when engaged in an advisory capacity are well defined and are of a definite nature. He deals with the coal, ore or mineral deposit as an entity and with the quantities, qualities, costs, prices and physical and mechanical problems of mining and preparing the material for market. Unless especially qualified by geological experience his field should not include those more or less abstruse problems of applied geology, which may embrace uncertainties, conjectures and geological hypotheses and theories, for these belong to the geologist. The mining engineer properly deals with known deposits and the methods of utilizing them, the geologist with unknown and partially known deposits to determine their extent and value.

H. M. CHANCE,
Mining Engineer.

Philadelphia, Penn.

The Foreman's Trouble

In recent issues of COAL AGE, you have been rather severe on mine foremen and superintendents. I believe almost every mine foreman and superintendent looks ahead to the future successful development of his mine. Furthermore, I am sure most of us have working projections made, and lie awake nights formulating definite plans for development.

The real trouble lies in the fact that the operator is too eager for returns on his investment, and wants to curtail expenses to the lowest notch. He reminds the superintendent at every opportunity, that he must keep down expenses, and of course, the superintendent passes it down to his foreman.

I do not claim all operators do this, but there are a great many who follow such a plan. As Mr. Mooreshead mentioned in a recent issue of COAL AGE, wide entries cause falls and squeezes, resulting in heavier expenses than if they had been driven narrow. This subject is of vital importance to the successful working of a mine, and I would like to read the opinion of some other mine foreman or superintendent.

Marion, Ill. SUPERINTENDENT.

The Human Element

Since the appearance of the editorial in COAL AGE of Dec. 9, on "The Human Element," another explosion has occurred. We have the usual report that the mine was in "excellent" condition and we shall read again the same story about "the model mine blowing up." What is more, we shall continue to read "the same old story" unless some "experts" get the "dust" out of their eyes and see things in their proper light.

It is true that "careless and vicious men find their way into the best of mines" and they are undoubtedly a menace, but that menace is fairly universal and it may be assumed that these "careless and vicious men" are just as plentiful, and perhaps more so, in mines badly arranged and poorly managed.

I have a fairly complete record of mine explosions in the United States for the last 23 years, together with the conditions under which they occurred, and I have not found a single case in all these years where an extensive dust explosion occurred in a badly arranged and neglected mine, while, on the other hand, the record shows that the most violent and extensive explosions have taken place in mines that were—like the Briceville mine—in excellent condition.

These are facts and it would be rank slander to assume that the "experts" were not aware of their existence, but, knowing about them, the "experts" so far have failed to offer an explanation as to the cause. Why? It would be interesting, at least to some of us, to know the reason.

JOHN VERNER.

Chariton, Iowa.

Fair Play for the Mule

In the last issue of your paper, I note the article on "Fair Play for the Mule," by Joseph Virgin. In reference to the remarks he makes, relative to Eli Conner's recent article, I may say that while I believe that Mr. Conner's comparison of mechanical and mule haulage refers to actual experience at Ehrenfeld, it does not do so exclusively.

When gathering motors were installed at the Sun mine, in the New River field, I held the position of district superintendent, under Mr. Conner. At that time he advanced the same argument as Mr. Virgin, but I believe the performance of the motors in that mine did much to change his views.

If Mr. Virgin will compare the expense necessary to keep up mule haulage with that needed to maintain a motor haul in the same place, I believe he will find it is rather costly to give the mule "fair play"—especially if the bottom be fire clay and the road a little damp.

After a mule has tramped on a switch bridle, that switch is not much better, if as good, as the stub switch, which is generally used with mule haulage.

In making the comparison we must add the cost of the maintenance of the mule to the upkeep of the road, and keep in view the fact that the speed and the endurance of the motor enable it to transport the cars a greater distance than they could be hauled by a mule.

If we sum up the whole cost of giving the mule fair play, I believe we will find the account will show a balance in favor of gathering motors. In my estimation the place to give the mule fair play is on the farm, not in the mine.

G. M. SHOEMAKER,
Manager, Virginia-Lee Co.

St. Charles, Va.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

Preservation of Steel Rope

Is coal tar, after being treated with freshly slaked lime, injurious to steel-wire haulage rope? Will it cause the wires to become pitted, and could it possibly cause crystallization to take place in the wire?

Bella Ellen, Ala. SUPERINTENDENT.

This question is of great importance to all users of wire rope, in mine-haulage practice, and was submitted to the manufacturers of wire rope, in this country. Following are the replies received.

"Either coal tar or pine tar can be used on wire rope without detriment, provided the tar is first neutralized by boiling with freshly slaked lime. Unless the tar is thus completely neutralized, the acid, which it contains, will attack the steel, and cause brittleness.

"We do not advocate the use of tar, however, on running ropes, for the reason that it is practically impossible to thoroughly seal a rope in this manner. The tar hardens and strips off or cracks, allowing moisture to reach the rope, causing it to rust under the tar. We consider it is better to use a lubricant free from acid, and one that will penetrate the rope and preserve the inner wires, which are, after all, the reserved strength of the rope. We have found that many users who have covered or partly covered the outside of the rope with a heavy dope are, later, surprised to find that the inner wires have become corroded and lost their strength. It is best, in treating a wire haulage rope, to start with a lubricant that will penetrate, and then build up so the inner and the outer wires alike will be protected."

JOHN A. ROEBLING'S SONS CO.

Trenton, N. J.

"In the process of drawing wire, lime is used as a coating to protect the surface of the wire from corrosion. If a steel rope, coated with a mixture of coal tar and slaked lime, becomes pitted it cannot be due to any action of the lime, but rather to its insufficiency; or the fact that it has not been mixed so as to thoroughly neutralize the acids in the tar.

"We do not, however, advocate a mixture of coal tar and slaked lime as a coating for wire ropes, as it flakes off when dry. The compounds of pine tar are better, and those of crude petroleum and graphite better still. In this connection we draw attention to page 11 of our booklet, 'Wire Rope Preservatives.'"

THE TRENTON IRON CO.

Trenton, N. J.

"We would advise that a composition of coal tar and lime is not injurious to wire ropes.

"Some years ago, before the advent of special lubricating greases, a composition of coal tar and lime was recommended by wire-rope manufacturers.

"It is probable these people have had trouble with sulphur water, which penetrated between the strands of the rope and pitted the steel. If the crystallization spoken of took place it might result from the action of the acid water on the steel, which destroys the structure of the steel and makes it brittle. The coal tar and lime could not produce this effect."

HAZARD MANUFACTURING CO.

Wilkes-Barre, Penn.

[We believe the above letters answer our correspondent's query fully and, in his behalf, we wish to thank the writers for the explanation.—EDITOR.]

Wet Rag in Afterdamp

I note that in your issue of Nov. 18, in the article on the Adrian Mine Explosion, you state that "two men had enough presence of mind to stop, dip their handkerchiefs in the tea contained in the tanks of their dinner pails and carefully wrap their mouths with the damp rags." What is the action of such a covering over the mouth?

PUZZLED SUBSCRIBER

Punxsutawney, Penn.

The question is a hard one and your letter suggests that you have realized its difficulty. It will probably not be news to you that the method of using a wet rag or sponge is one which has been repeatedly tried and found availing in work where air is vitiated. Doubtless you have also read that old explanation that water dissolves carbon dioxide, and so makes the air respirable. But as you may have considered, water only feebly dissolves carbon monoxide, and so that action is probably not one of solution or it would be without efficacy in excluding the most poisonous of the gases encounted. In fact, the order of solution in water at 68 deg. F. is:

ABSORPTION FACTORS FOR MINE GASES

Carbon dioxide	0.90100
Oxygen	0.03137
Carbon monoxide	0.02320
Nitrogen	0.01599

Moreover, the action of carbon dioxide is now realized to be objectionable rather as it replaces oxygen in the air than for any other reason. If 10 per cent. of CO_2 is absorbed, the percentage of oxygen will be increased one ninth of its former value. If 9 per cent. of oxygen is present the wet rag absorbing the last molecule of dioxide would only make that proportion 10 per cent. So the absorption of carbon dioxide but little improves the mixture.

An ordinary bandanna measuring 15x21 in., a common size, was compelled to absorb all the water which it was capable of lifting from a measured volume of the liquid. A reasonable amount of the loose water was permitted to run back into the measure, the kerchief being held meantime by two of its tips. The loss of water in the original receptacle was then measured. To keep on the safe side it is assumed that the kerchief water is wholly available for inspiration, that it does not evaporate, is not absorbed by the person of the wearer and does not seep out later on. The amount of water engaged by the bandanna under such assumptions is 5 cubic inches.

We assume that the air is vitiated by 10 per cent. of CO_2, or 10 per cent. of CO, not an unreasonable amount, for the percentages might be well imagined nearly doubled without improbability. We assume moreover, that the temperature is 104 deg. F. The normal inspiration as stated by J. S. Haldane, is 432 cu.in. per min. This figure for inspiration is also assumed correct, although Doctor Haldane states that during muscular exertion, the volume of air breathed may be 6 or 8 times as much as during rest. Thus in one second 0.72 cu.in. of CO_2 and an equal volume of CO would be inspired. From these facts the table following is made up, the coefficients of absorption used being those of gas at 104 deg. F.

TIME OF GAS SATURATION OF WET BANDANNA

Gas	Coefficient of Absorption	Cubic Centimeters of Gas Absorbed by Kerchief	Time for Complete Saturation Secs.
CO_2	0.506	2.53	3.51
CO	0.018	0.09	0.12

It is clear that the handkerchief does more than dissolve the gases mentioned, because if that was all it accomplished, it could only serve a fleeting purpose.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Some Recent Utah Mine Foreman Examination Questions

Mining Books and Magazines for Mine Foremen

Ques.—Do you receive and read any instructive literature pertaining to the various systems of mining coal, and explaining points relating to the safety of operating mines?

[Coal Age congratulates the Utah board of examiners upon its expressed desire to know how much effort candidates for examination are making to inform themselves on matters pertaining to the mining of coal and the safe operation of mines, by reading mining books and magazines. There is nothing better for gaining such information than a good, technical mining weekly.—Editor.]

First-aid Methods

Ques.—What is the correct method of procedure in regard to the first-aid treatment to be given persons injured and suffering from (a) burns; (b) electric shock; (c) broken limbs; (d) bleeding from cuts or wounds; (e) being overcome with gas? Explain fully.

Ans.—In all cases, keep cool; send promptly for a physician and, when possible to do so without danger, remove the sufferer to a quiet place and good air.

Treatment of Burns

(a) Remove clothing from the burned parts by cutting away the cloth carefully; and quickly cover the burned surface with light, soft linen or a layer of absorbent cotton to exclude the air. If possible, moisten the parts burned with a warm solution of common baking soda, or an emulsion of boiled (linseed) oil and limewater. Uncover but a small portion of the burn at one time. Do not expose to heat, and protect from dirt.

Treatment of Electric Shock

(b) A brief contact with, say a 250-volt current, may give a severe shock to the nervous system that will pass off shortly. A more prolonged contact produces unconsciousness or death, depending on the individual, the quantity of current and its passage through the body. A strong man may resist successfully a current that would be certain death to a man with weak heart or nerves. If the current passes through the body its effect is greater than that produced by the passage of the same current through the legs only.

Shut off the current, cut the wire, or by any means remove the person from the contact as quickly as possible. It may be possible to short-circuit the current and blow out a fuse. To remove a person from contact, a kick is often safer, because the current then only passes from one leg to the other, instead of through the body. Stand on a dry board or paper; if at hand, use rubber shoes or gloves, or both. Act quickly; a few seconds may prove fatal.

When contact is broken, lay person on his back; loosen the clothing about the neck, chest and waist; give plenty of fresh air; but avoid cool drafts, as the body should be kept warm.

If respiration has ceased, artificial respiration must be begun by drawing the tongue forward with handkerchief so that it will not obstruct the windpipe, and kneeling at the patient's head raise his arms first straight above his head; then throw them forward, bending the elbows and pressing the arms firmly against the sides and chest, to expel air from the lungs. Continue to work the arms, in this manner, forward and back, as a bellows, till natural breathing is restored. If the heart has ceased to beat, sometimes a sudden rap on the left chest will start its action, which must be done promptly or death is certain.

In all cases where artificial respiration is used, efforts to restore the patient to consciousness should not be discontinued till after a long time and when every possible means has been exhausted.

Treatment of Broken Bones

(c) Move the patient with great care to as comfortable a position as possible, but do not attempt to carry him far if the fracture is painful or the bone is broken badly in one or more places. If the limbs are broken bind them together or to the body in such a way that the removal of the patient to a more desirable place will not aggravate the trouble. If necessary to remove clothing cut it away and do not pull it off. It will often be necessary to improvise a stretcher by running two long drills through the arms of two or more coats; or to bind the patient firmly and carefully to a brattice board or to two lengths of tracking tied together. Every move must be made gently. Then remove the sufferer to where he can be treated by a physician. Do not attempt to set a bone, but only make the patient as comfortable as possible till a physician arrives.

To Arrest Bleeding from Cuts or Wounds

(d) Lay patient down, generally on his back, and elevate, as far as can be done, the limb or part of body from which the blood is flowing. Apply pressure to the bleeding parts, with the thumb and fingers; or by a knotted bandage, the knot being arranged to press the wounded part so as to impede and stop the flow of blood. If the blood is a bright red and spurts more or less from the wound, an artery has been severed, and the pressure must be applied to the blood vessel somewhere between the wound and the heart. Venous blood flowing from a vein is a darker color and wells up or flows steadily from the wound.

Keep the body warm, if necessary using hot-water bags or compresses; but in severe bleeding it is often necessary to apply ice or a cold iron immediately over the wound, to assist the coagulation of the blood.

Treatment of a Person Overcome with Gas

(e) Remove the patient speedily to fresh air. If unconscious, keep body warm; dash cold water over face, from side, so as not to obstruct the nose. If necessary, employ artificial respiration to restore breathing. Give no stimulants; but peroxide of hydrogen, diluted with an equal quantity of water, is beneficial if the gas inhaled is carbon monoxide (CO). Rub the limbs upward briskly, to assist the flow of venous blood back to the heart and induce circulation. The inhalation of oxygen is always used with good effect to drive the poisonous gas from the lungs.

Every mine of any considerable size should have a well equipped hospital. The hospital should be convenient to the workings and not too far from the shaft. It should be well ventilated and oxygen tanks should always be kept on hand ready for use.

Combustible Material in Mine Entries

Ques.—What should be done with torn, unused brattice cloth found lying in the entries or the workings of a mine?

Ans.—Brattice cloth and all other combustible material not in use should be removed from the mine, if it cannot be used again. If it is good for further service it should be stored in a suitable place either in a mine shanty or a storeroom on the surface. It should not be allowed to accumulate in the entries or other parts of the mine.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

Representative Palmer has introduced a bill revising the Bureau of Mines Act which has been referred to the House Committee on Mines and Mining. In this it is proposed to amend section 2 of the act to read as follows:

"It shall be the province and duty of said bureau and its director, under the direction of the Secretary of the Interior, to make diligent investigation of the methods of mining and quarrying in slate, cement rock, granite, and other quarries, especially in relation to the safety of miners and other operatives, and the appliances best adapted to prevent accidents, the possible improvement of conditions under which mining and quarrying operations are carried on, the treatment of ores and other mineral substances, the use of explosives and electricity, the prevention of accidents, and other inquiries and technologic investigations pertinent to said industries, and from time to time make such public reports of the work, investigations, and information obtained as the Secretary of said department may direct, with the recommendations of such bureau."

Segregated Coal and Asphalt Lands

Representative Carter has offered a bill to provide for the sale of the surface of the segregated coal and asphalt lands of the Choctaw and Chickasaw nations and for other purposes. In this it is provided that there shall be an appraisal of the lands. Section 1 specifies that "the coal or asphalt deposits in each lease shall be appraised separately from the surface" and "the unleased coal and asphalt deposits shall be appraised separately from the surface according to the tracts used by the United States Geological Survey."

It is further provided that each holder of a coal or asphalt lease shall have the right to purchase at the appraised value a sufficient amount of the surface covered by his lease to embrace improvements, up to a maximum of 10 per cent. of such surface, subject to certain conditions and the approval of the Secretary of the Interior.

The methods of entering upon the lands for the purpose of prospecting are described and section 5 of the bill directs that the sale shall be carried on at public auction. The sum of $50,000 is appropriated for expenses.

Domestic Coal Locations in Alaska

Senator LaFollette has offered a new bill (Senate No. 3124) in which he proposes to amend the bill of the same number already introduced for the purpose of regulating the leasing of coal and coal lands in the territory of Alaska, which he presented last session.

The bill is of considerable importance because it indicates a decided change in the program of the progressive group in Congress with reference to the treatment of the Alaska coal lands. The new bill proposes to strike out section 8 of the measure already proposed and provide that any citizen of the United States duly qualified may, under the same conditions as in the case of placer claims "secure a domestic coal location for a period of ten years and no longer, which location shall give a right to the exclusive possession for coal-mining purposes only of a rectangular area of unappropriated public coal land in Alaska not exceeding ten acres in area nor larger than a square of ten acres in any dimension.

"A domestic coal location shall not be staked or recorded except by the locator in person, and shall not be sold, leased, hypothecated, or otherwise disposed of. The coal mined from any such location shall not exceed 2000 tons in any one year, shall be subject to no royalty, and shall not be exported from Alaska. Domestic coal locations may be made immediately upon the passage of this act, notwithstanding any existing withdrawal of coal lands, but subsequent withdrawals shall be effective as against such locations, unless the same shall be specifically expected therefrom."

Government Railroad for Alaska

A new section, also to be added to the bill, reads in part as follows:

"The President shall cause the construction and operation of a railroad from the Matanuska or Bering River coal fields in Alaska to the coast. The Secretary of War is hereby directed without delay to examine all existing surveys for railroads from the Matanuska and Bering River coal fields in Alaska to the coast, and if it shall appear that the probable cost of constructing a coal-carrying railroad from one of said coal fields to a harbor open all of the year is less than half the probable cost from the other of said fields to such a harbor, then the Secretary of War shall proceed forthwith to locate a railroad on the best practicable line along or near the route so determined to be less costly."

Alabama

Birmingham—A decree was recently rendered by Judge W. I. Grubb, denying the petition of the St. Louis Trust Co., as trustee for the J. H. Mudd estate, for an injunction to terminate the lease of the Galloway Coal Co. and restrain the company from operating its mines on certain lands in Bibb County. It is reported that the Galloway company contemplates making various improvements on the Bibb County coal lands, which improvements will probably be carried forward now that the suit over the land has been settled.

The new byproduct coke ovens of the Tennessee Coal, Iron & R.R. Co. are nearing completion. It is intended to fire the first battery of these ovens early in January.

Gadsden—The property of the Raccoon Mining Co. at Altoona, will be put in operation, after a long shutdown. About 100 men will be employed.

Colorado

Denver—The Colorado coal fields are now the only coal-mining districts in this country or Canada where labor troubles of any magnitude remain unsettled. Although the mines in both the Northern and Southern fields continue in operation, the condition in the former is one of suspended hostilities and in the latter field it is reported that a strike is imminent. The operators of northern Colorado openly charge Gov. Shafroth with favoring the cause of the strikers and neglecting to take proper measures to secure the peaceful and unmolested operation of their mines. In the Southern field, the report of a commission appointed by the governor, which shows the men to be losing 2½c. per ton on an average because of the change from a lump-coal to a run-of-mine basis of payment, has revived the dispute which caused the threatened strike of 1000 employees of the Colorado Fuel & Iron Co., last October. Although not previously a union field, it is reported that the men have recently become generally organized and a strike involving perhaps 20,000 workers is probable.

Agitation by the Denver Chamber of Commerce directed toward securing a

lower price for coal and recommending the operation of mines by the state, has elicited from President Evans, of the American Fuel Co., an offer to sell that company's property to the state at 50c. on the dollar. Mr. Evans is so strongly of the opinion that coal cannot be produced and sold more cheaply than it is at present that he declares that this offer is made in perfectly good faith and stands.

Illinois

Chicago—An executive meeting of the coal-mine operators of the Illinois and Indiana coal fields was held in Chicago, Dec. 14. The meeting was for the purpose of conferring with the Ohio and Pennsylvania operators, but it was unofficially declared that the latter delegations had not arrived, it being said that these two states are opposed to entering into an agreement. Another meeting was arranged for, to be held in Columbus, Ohio, within 10 days.

Isaac A. Smith, who is interested in the proposed Springfield & Central Illinois Traction Co., reports that it is probable that the proposition as outlined, which is to connect with several mines in the central Illinois field, will go through within a short time.

Taylorville—The Peabody Coal Co. is developing three mines, in the vicinity of Taylorville and Kinkaid. Work on all three is now reported to be in progress. It is understood that a large central electric plant will be located at Kinkaid.

Marion—A charter has been granted to the Johnson City Connecting Railway Co. It is proposed to construct a railroad in Williamson County, connecting several of the mines in the vicinity of Johnson City and Marion.

Indiana

Indianapolis—Chairman Wood, of the state railroad commission, has issued an order amending the car demurrage rules to except from demurrage the cars loaded with coal or coke and awaiting transportation at the mines or coke ovens. Before the amendment, only those cars at the mines or ovens which were waiting to be loaded were excepted. The order, which was made without objection by any of the roads, was asked for by the Vandalia Railroad Company.

Members of the United Mine Workers of America balloted, Dec. 12, for their national officers. The most important contest was for the office of president, John P. White, of Oskaloosa, Iowa, being opposed for reëlection by Thomas L. Lewis, of Bridgeport, Ohio, a former president of the organization. Edwin M. Perry, of Iowa, had no opposition for reëlection as secretary-treasurer, but there was a large number of candidates for other offices. The results will not be officially announced until the convention in January.

Terre Haute—The formation of a national federation of bituminous coal operators is understood here to be an assured fact. The appointment of a committee on organization and constitution at a recent meeting has been announced. Philip H. Penna, secretary of the Indiana Bituminous Operators' Association, said that the national organization had been in the course of formation for several years, and that final steps were taken last week at Chicago. Mr. Penna said that assurances have been received that every coal-producing state in the Union will be represented.

Kentucky

Louisville—The Elkhorn coal field is to have another railroad, one with an eastern and southeastern outlet. The Carolina, Clinchfield & Ohio will start from St. Paul on its main line in Wise County, and pass through Coeburn, Norton, Glamorgan, and the Pound section in the Virginia coal fields; through Pound Gap on the state border by a short tunnel, and so on to Jenkins, connecting there with the Big Sandy & Elkhorn, a branch of the Chesapeake & Ohio, now being rapidly constructed into Jenkins.

At the midwinter meeting of the Kentucky Mining Institute, held at Lexington, Dec. 11, a number of owners, managers and general superintendents of coal mines were present. Vice-president R. B. Hutchcraft presided. Appropriate resolutions regarding the death of President Atkinson were adopted. A number of papers, dealing with the practical operation of mines, were read and discussed.

If the plans of Eastern capitalists, headed by Gen. T. Coleman Du Pont, of Wilmington, Del., who are conferring with the owners of several coal mines in southwestern Kentucky, go through, a coal merger, estimated to involve $10,000,000, will be completed. The coal companies to be taken over are the W. G. Duncan Co., the Powderly Coal Co., the Lam Coal Co., the Wickliffe Coal Co. and the Memphis & Broadway Coal Co. According to the terms of the consolidation, the control must pass from the Kentucky operators to the Eastern capitalists.

Missouri

St. Louis—The top works of the mine of the Northern Central Coal Co., at Higbee, were destroyed by fire on the night of Dec. 12. The output of this mine was largely contracted to the Chicago & Alton for company fuel.

The St. Louis Coal and Coke Company has been incorporated for $50,000. It will handle the output of the Colp Mine at Pittsburg, Ill., the Gent Coal Company's mine near Marion, and the Galatia Coal Company's mine at Galatia.

Nevada

Goldfield—Great interest is being manifested in the development of the coal mine at Coaldale, 60 miles north of here. An analysis of several samples of the coal shows it to contain about 50 per cent. fixed carbon and 33 per cent. volatile matter. The property is being worked by a slope 150 ft. long which taps the coal at a depth of 80 ft. below the surface, the seam varying from 8 to 11 ft. in thickness. Indications are that the deposit covers a considerable area and it is thought probable that the Tonopah & Goldfield R.R. will build a spur to the property.

Ohio

Cleveland—It is understood here that the proposed $30,000,000 coal merger in No. 8 field, Ohio, is likely to prove a failure on account of the Ohio anti-trust laws and other unexpected obstacles. W. F. Kann, of Pittsburg, is representing the operators and F. J. Lisman & Co., of New York, are in charge of the financing. The company was to have issued $10,000,000 preferred stock, $5,000,000 common stock and $15,000,000 bonds.

Columbus—The Eastern Ohio Coal Operators' Association appeared before the Interstate Commerce Commission, Dec. 13, against the Wheeling & Lake Erie, the Baltimore & Ohio, and the Pennsylvania Lines West of Pittsburg, charging that the rates on coal from the mines in eastern Ohio to Lake Erie ports are unjust and discriminatory. The present rate is 85c. a ton on all three roads and the association, which is composed of 40 individual operators, is willing to leave the commission to decide on what it considers a fair rate.

The Black Top mine, in the Crooksville field, will not be reopened until after Jan. 15, if then, according to State Mine Inspector Harrison, who recently inspected the mine. A portion of the mine was sealed up after a recent fire, and samples of air taken through tubes inserted in the wall show the presence of considerable gas.

Toledo—By the terms of two decisions handed down by United States Judge John M. Killits, Dec. 9, the Hocking Valley R.R. Co. must answer to indictments of having granted rebates to the Sunday Creek Coal Co., and the latter concern must stand trial on the charge of having received rebates. The summary of the opinion is that the granting of unlimited credit by the issuance of notes to guarantee freight charges is a violation of the Elkins anti-rebate law, and both the grantor and the firm accepting rebates are guilty.

Cincinnati—Commencing Dec. 1 the Burlingham Coal Company, of this city, has secured control of the St. Clair col-

liery, at Eagle, W. Va. A new operation will be opened on the property, which is on the Chesapeake & Ohio railroad. Louis Watkinson remains as president of the company and will continue in charge of the operations.

Oregon

Portland—H. S. Brinley, of Portland, has taken a lease on an 8-ft. vein of bituminous coking coal recently uncovered on the property of the Benedictine Fathers, near Mount Angel, Oregon.

An important strike of bituminous coal is reported from the Rainy Hollow district near Haines, Alaska. The vein is said to extend across the British Columbia boundary.

Pennsylvania

Bituminous

Westland—The Midland No. 3 mine of the Pittsburg Coal Co., employing nearly 400 men, closed down, Nov. 29, for the winter. Some of the men are being employed at the Midland No. 1 and the Allison mines of the same company, while the others are being employed in the Ohio and West Virginia coal fields.

Pittsburg—Delegates from 45 branches attended the meeting, Dec. 14, of the River Coal Employees' Relief Association of the Monongahela River Consolidated Coal & Coke Co. The financial report of the association was read and officers elected for the ensuing year.

The Coal Mining Institute of America held its winter meeting in the quarters of the Engineers' Society of Western Pennsylvania, this city, Dec. 19 and 20. In addition to addresses by the presidents of the two organizations, eight interesting papers were presented.

Following a conference of coal operators and electrical experts with Chief Mine Inspector James E. Roderick, held recently at Pittsburg, Supt. W. R. Calverly, of the Berwind-White Coal Mining Co., has appointed a committee of mining and electrical engineers to agree upon a uniform system of indicating on maps electrical equipment used in the mines of the bituminous regions of western Pennsylvania.

It is announced that the West Penn Traction Co. will build a line connecting West Newton and Hunker, a distance of 10 miles. The company will then need but four more miles of road to give it a continuous right of way through the coke regions from McKeesport to Scott Haven.

Immediate improvement of the Allegheny River from its mouth to the Mahoning Creek, a distance of about 60 miles, by the construction of five locks and dams is the recommendation of Col. Newcomer, resident engineer at Pittsburg, to the chief of engineers, made public, Dec. 14. For this work it is estimated that an appropriation of $2,500,000 will be required. The improvement of the Allegheny will have to wait specific appropriations, which may be included in the forthcoming river and harbor bill, or may be delayed in view of the already heavy appropriations for the Ohio.

Anthracite

Scranton—The Carlton Coal & Mining Co., recently incorporated, is reported to have begun work at an abandoned property, leased from the Lackawanna company. There is still considerable coal in the old workings, including a large number of pillars. A small breaker has been erected.

Wilkes-Barre—The anthracite conciliation board met here, Dec. 11. The grievances of the employees of the Alden Coal Co. were taken up, and, with one or two exceptions, the miners were sustained in their complaints. The award is retroactive and means back pay for the men, dating from Aug. 1, 1911. Grievance No. 201, preferred against the Lehigh & Wilkes-Barre Coal Co., was continued over to the next meeting.

Two serious cavings of the surface occurred recently in this vicinity; one at Plains, where an important street crossing subsided about 2½ ft., and one at Courtdale, where the Kingston Coal Co. has recently expended a considerable sum to strengthen the mine workings against caving. In both instances a number of houses were disturbed and damaged.

Lansford—One of the largest operations in the anthracite field was started recently by the Lehigh Coal & Navigation Co., when a force of men began work on sinking a shaft which will eventually tap six veins of coal and mean the erection, near Hauto, of a mammoth new breaker.

It was announced, Dec. 12, that the Lehigh Coal & Navigation Co. will issue $3,000,000 of collateral trust 4½ per cent. bonds for the purpose of financing an electric power plant, which will utilize waste coal. The new plant will be located near Hauto, about eight miles above Mauch Chunk, along the Nesquehoning Creek, and will involve the construction of a new dam to increase the capacity of an existing reservoir.

Shenandoah—The main steam pipe, 15 inches in diameter, that carries steam from 20 boilers at Maple Hill Colliery, exploded recently, demolishing the roof and one side of the boiler house. Three men barely escaped from being struck.

Tennessee

Knoxville—Frank White and others have purchased the leasehold and improvements on 800 acres of coal lands from the Valley Creek Coal Co. The property is on Clear Fork, adjoining that of the Pruden Coal & Coke Co. Mr. White states that an organization will be perfected and the mines operated.

According to the latest available reports from Briceville, 46 bodies have so far been recovered in addition to the five men who were taken out alive from the Cross Mountain mine. Dr. J. A. Holmes has left the rescue work in charge of J. W. Paul and Dr. Rutledge.

Washington

Spokane—As the result of a decision recently handed down by the U. S. Supreme Court, which declares that a person or association is limited to one coal-land entry in Alaska, trials will be begun at the next term of the federal courts which may involve the title to lands valued at many million dollars.

The Northwest Coal Co., of North Yakima, is making preparations to develop a large bed of coal in the Taemun Creek basin. Charles Wickle is manager.

West Virginia

Welch—The grading for the new mining plant of the Pocahontas Consolidated Collieries Co., on the South Fork of the Tug River, is completed, and as soon as the railroad is laid to the mines, operation will be commenced.

The electric plant of the Pocahontas company, located at Switchback, which in addition to furnishing power for the Collieries plants, supplies the Appalachian Power Co., selling power to the towns of Pocahontas and Bramwell, will be increased to meet the new conditions. The Collieries Co., as well as the towns of Pocahontas, Bramwell and other towns and various coal plants, will eventually secure power from the Appalachian Power Co's hydro-electric plants which will be established as soon as the dams being erected by the company in Carroll and Grayson Counties are completed.

Canada

Alberta—The Superior Coal Co., capitalized at $1,500,000, has been launched by B. K. Bullock, well known in coal-mining circles in this province. The property is situated 3½ miles from Tabor, just north of the Belly River. Development has been going on steadily for some time and already two tipples have been erected, approximately one mile apart. An area of 5043 acres was purchased from Osler, Hammond & Nanton, of Winnipeg. The seam is 4 ft. 2½ in. thick, with a minimum of shale, making the work of mining a comparatively easy matter. A test of the coal shows it to contain 46 per cent. carbon.

Nova Scotia—The properties of the North Atlantic Collieries Co. were sold under execution at Sydney, Dec. 14, for $70,500, to H. C. Foss. It is understood that they were purchased for Stone & Webster, of Boston, Mass.

Personals

Edward Savage, of Pittsburg, Penn., has succeeded Lowther Ferris as sales agent of the Carnegie Fuel Co., in Minnesota and Wisconsin.

George Z. Hosack has resigned as vice-president of the Pittsburg Coal Co., effective Dec. 31. Mr. Hosack will become president of a new company, known as the Cross Creek Coal Company.

J. G. Skidmore, of the Madison Coal Corporation, has been elected president of the St. Louis Coal Club, a recently organized association of coal men in and about St. Louis. A. A. Bryden, Borders Coal Co., is vice-president and E. J. Wallace, Missippi Valley Fuel Co., is secretary and treasurer.

F. E. Doubleday, general manager of mines for the Central Coal & Coke Co., Pittsburg, Kan., has resigned, effective Dec. 1. He has been succeeded by William McKinley, who has been a superintendent of mines for the company for a number of years, most of the time in the vicinity of Huntington, Arkansas.

H. S. Geismer, who was recently appointed one of the receivers of the Chattanooga Iron & Coal Co., is a member of the Keiser-Geismer Engineering Co., of Birmingham, Ala., and until lately was superintendent of the Tennessee division of the Southern Iron & Steel Co., operating the Chattanooga furnace and the Dunlap mines.

Capt. W. A. May has been elected vice-president and general manager of the various coal companies controlled by the Erie. These are the Pennsylvania Coal Co., the Hillside Coal & Iron Co., the Northwestern Mining & Exchange Co. and the Blossburg Coal Co. Since the Erie took possession of the Pennsylvania Coal Co., Capt. May has been acting as general manager.

Obituary

David W. Howie, Sr., aged 69 years, died suddenly Dec. 7, at the home of his daughter in Milwaukee, Wis. Mr. Howie was prominently identified with the Milwaukee coal trade, having been a coal dealer in that city for the past 30 years.

Hugh Coll, for many years superintendent in charge of water supply for the H. C. Frick Coke Co., died Nov. 29, at Easton, Md., after a brief illness from typhoid fever. Mr. Coll was a member of the Frick Veterans' Association.

Col. J. B. Stephenson died at his home, in Roanoke, Va., Dec. 5. Of late years Col. Stephenson had not participated actively in business. He was a man of considerable wealth, having invested a number of years ago in coal lands, which have since become the property of the Pocahontas companies, and have yielded a large revenue.

Construction News

Myersdale, Penn.—Frank B. Black and associates have purchased a large tract of coal land lying on the Negro mountain ridge between Garrett and Wilson Creek, with a view to beginning operations in the near future.

Birmingham, Ala.—It is reported that certain improvements which the Galloway Coal Co. have contemplated making on their property in Bibb County will probably be carried forward now that litigation in regard to the lease has been settled.

Knoxville, Tenn.—The Southern Mining Co., Williamsburg, Ky., which recently leased the operations and coal-land holdings of the Asher Coal Mining Co., of Wasiota, Ky., is said to contemplate spending about $500,000 in developing and equipping the mines.

Blairsville, Penn.—W. P. Graff, R. M. Smith and associates, of Blairsville, have purchased a 250-acre tract of coal land from the Isabelle Furnace Co. and will immediately make preparations to mine coal. This is a Cokeville operation which the steel corporation shut down about 10 years ago.

Somerset, Penn.—The Quemahoning Creek Coal Co., Charles J. Harrison, Somerset, president, is opening a new mine between Somerset and Jenners. The company will erect an up-to-date tipple and install electric mining machinery. Thomas Daly, of Grafton, W. Va., is consulting engineer in charge of construction.

Norfolk, Virginia—It may be stated positively that both the Norfolk & Western and Chesakeake & Ohio railways will build this year new coal piers, modeled after the Virginia Ry. pier, but embodying such changes and improvements as may seem advisable. Both of these new piers will be used exclusively for loading steamships and will add greatly to the dumping facilities at Hampton Roads. It is expected that arrangements will be made at the new piers to prevent the excessive breakage of the coal, which is one of the chief objections to the old style piers.

Recent Incorporations

Kentucky—The Clover Fork Coal Co., of Harlan; capital $50,000. In corporators: A. F. Whitfield, Cyrus Whitfield and B. W. Whitfield.

Arkansas — The Hartford Smokeless Coal Co., of Little Rock, capital stock $6000: Incorporators: C. B. Blackburn, John W. Tyler and O. C. Hansen.

Texas—The Southwestern Fuel Co. of Fort Worth; capital stock, $60,000. Incorporators: Herman L. Smith, Thomas D. Ross and Francis A. Douglass.

West Virginia—The Jolliffe Coal & Coke Co., of Fairmont, capital $150,000, has been chartered to operate in the Lincoln district of Marion county. The incorporators are Jacob S. Hayden, M. A. Jolliffe and associates, all of Fairmont, W. Va.

The Gascoaloil Co., of Charleston; capital $25,000; to deal in and develop mineral lands in the Big Sandy district of Kanawha County. Incorporators: D. B. Brawley, D. A. Brawley, W. B. Brawley, H. D. Brawley and R. M. Brawley, all of Charleston.

The Spruce Fork Coal Co., of Charleston; capital $400,000 to do a general coal-mining business, operate byproduct plants, cut timber and manufacture lumber in Logan County. Incorporators: William M. Humphreys, Jr., J. Keating Willcox, J. L. Montgomery, Frank L. Whitley and T. Truxton Stiles, Jr., all of Philadelphia, Penn.

Columbus, Ohio—The Hemlock Co., of Columbus; capital, $50,000; to mine and sell coal and prospect for oil. Incorporators: N. C. L. Kachelmacher, R. A. Magly, F. R. Anderson, C. B. Donahue and M. Burke.

Industrial Notes

Brown Brothers, of Elmira, N. Y., established for 18 years in the woodworking industry, announce a wood-pipe department equipped with every modern device. Max M. Brown, widely known in the coal industry, will be in charge of the field sales work, assisted by Col. Archie E. Baxter, Benj. B. and Paul B. Brown. J. C. Brown, inventor of various types of woodworking machinery, will handle the producing end. High class stock and extra lengths will be specialties of the new pipe-manufacturing department of this concern.

The Ottumwa Box Car Loader Co., of Ottumwa, Iowa, has completed the building of a modern coal-mining plant at the Acme property of the Acme Coal Co., Sheridan, Wyo. This plant is one of the largest and most uptodate installations west of the Mississippi River. It consists, in part, of a steel tipple containing shaker screens, automatic feeds, weigh pans, scales, etc., which prepares four sizes of coal for loading directly onto railroad tracks. The mine cars are brought to the tipple from the mine level on a steel approach and are handled by a modern car-haulage system. When market conditions so require, all sizes of coal, except lump, are carried from the tipple to a rescreen house by means of a 30-in. belt conveyor supported on steel trusses. The rescreen house is equipped with a revolving screen for preparing five sizes of coal, which are deposited in large steel bins for loading out on the three railroad tracks and at both sides of the building. The slack size of coal is carried by means of a conveyor to the power plant, which is located near-by.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

While there is no decided improvement over the depressed condition of the market last week, most reports are more optimistic, and indicate a general steadying up in trade. Weather conditions still continue adverse for domestic, while on the other hand encouraging reports from industrial centers, especially in steel, are having a noticeably stimulating effect on the steam fuels.

Conditions on the Atlantic Coast are about normal and supplies good, although water freights continue high. There is a perceptible absence of new business, but the contract tonnage is heavy and there is no coal on demurrage. At Pittsburg domestic has fallen off, but steam continues good, and reports for November show a heavier tonnage moved all-rail than last year. It is believed there that stocking in anticipation of the coming wage conference will begin after the first of the year.

Trade in Ohio is quiet, but prices are firm. The weather has been warm and supplies are large, but steam is considered normal for this period. In states to the south conditions do not appear so favorable, and there is still evidence of a demoralized market.

A free supply of cars in the Middle West has resulted in overshipping the market, and conditions there are probably the worst in the country. Prices have slumped in some instances to the lowest point in a number of years, and the only chance for improvement in evidence is the resumption of a number of the large steel plants.

Mines in the Rocky Mountain states are mostly working full time, while on the Pacific Coast the weather is mild and trade continues normal or quiet.

Boston, Mass.

With colder weather, and a northeast storm preventing the movement of transportation, the situation is rather firmer than a week ago. A shortage of labor is rumored in the West Virginia fields, and receipts at the loading piers are beginning to be light. The arrivals of off-shore tonnage are understood to be more than usual, and no one here would be surprised to see a material advance in f.o.b. prices before the holidays are over. It is stated \$2.70 and \$2.75 have already been quoted for spot shipment at Hampton Roads. Mystic Wharf prices, on cars, Boston, are practically at the same level as for a fortnight past, namely, around \$4, although during the very mild spell 10 days ago, alongside prices for cargo lots were decidedly weaker.

On Georges Creek and the Pennsylvania soft coals at tidewater, there is no apparent change. Barges are still moving slowly, and have to be arranged for well ahead of requirements. Some of the better brands from Somerset County are netting \$1.30@1.35, at the mines, a higher level than has obtained for some time.

The supply of tonnage is still behind the demand, and while the \$1.15 rate was said to be had during the soft period last week, rates are now supposed to be back at \$1.25 for the larger vessels, Norfolk and Newport News to Boston.

New York

The bituminous market here at New York has held its own this week. While there has been only a small amount of new business coming in, contract demand has been steady and quite ample for the prompt disposition of arriving and standing tonnage at the New York piers. It is likely that shipments to New York tidewater are not relatively so heavy as a few months ago because now the demand from rail points is so large and absorbs such a big percentage of the production that the shipments which are being made to this market, are not much greater than the present needs. Nevertheless there is a large tonnage moving, as is evidenced by the fact that all of the New York piers have been extremely busy this week, dumping up to a large percentage of their capacity.

The mines supplying this market with steam coal are practically all working full time and it is interesting to note, notwithstanding this, the absence from this market, for the moment, of demurrage coal.

Shortage of marine transportation continues to be a source of worry to the coal trade and the markets in the East along the Sound would no doubt readily take up a larger tonnage, were boats for this trade more plentiful, but the weather has again been adverse to the prompt movement of tows.

Spot prices are not much changed; the bulk of the business now moving is on contract so that there is not enough spot demand to cause any substantial advance in prices.

Philadelphia, Penn.

The milder weather that has been prevailing in this vicinity opened the present week, although predictions are that there is likely to be cold weather and snow before the close of the week, and that snow-covered ground may be expected for the holidays.

Another week has passed, and yet no indications of a depression in the wholesale market. This is particularly true of the tidewater market, where all sizes are in much demand. Vessels are held up, awaiting the arrival of certain sizes of coal from the mines, especially stove and chestnut, and the relief that would naturally be expected from the slump in the local market, is not evident, although in a measure assisting somewhat.

The bituminous market still continues its on and off policy. Some of the operators approached state that business is fairly good, and others are down in the mouth, but still continue hopeful. High rates of freight at tidewater have had the effect of curtailing considerable tonnage that would otherwise go in this direction. As high as \$1.25 to Boston has been asked and paid.

Pittsburg

Bituminous—Domestic demand, which was quite good, fell off somewhat last week, but is expected to prove better this week. Manufacturing demand is good. There has not been a great deal of stocking yet, but a decided movement in this direction is expected, after the first of the year, in anticipation of a suspension after the present wage scale expires, Apr. 1. The strength of the general demand is shown by the fact that the leading interest in this district, disregarding shipments in the Lake trade, shipped more coal in November than in the corresponding month of last year. Prices are a trifle firmer in the past fortnight, by about 5c. a ton, and we advance quotations on nut, mine-run and ¾-in. by 5c. a ton and on 1¼-in. by 10c., quoting slack at 70@75c., against 65@75c., as follows: Nut, \$1.05@1.10; mine-run, \$1.10@1.15; ¾-in., \$1.20@1.25; 1¼-in., \$1.35@1.40; slack, 70@75c. per ton at mine, Pittsburg district. These prices apply on ordinary sales, but are occasionally shaded on odd lots which have to be moved.

Connellsville Coke—A little additional contracting for furnace coke for deliv-

ery in the new year has been done, and probably three-fourths of all the furnace coke to be covered at this time is now closed. This reckoning does not include cases in which furnaces not now provided with contracts may blow in, if the present improvement in the iron and steel industry continues for any length of time. Spot furnace coke continues very stiff and it is not easy to pick up any considerable tonnage at $1.60, the advance price quoted last week, while there are predictions the spot market will reach $1.70 before the end of the year. This, however, represents merely the usual movement at this time, and the market may be back to $1.50 in January unless general conditions have meanwhile improved. We continue to quote: Spot furnace, $1.60@1.65; contract furnace, first half, $1.60@1.65; year 1912, $1.65@@$1.75; prompt foundry, $1.80@1.90; contract foundry, $2@2.25, per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Dec. 9 at 319,130 tons, an increase of 3000 tons, and shipments at 3490 cars to Pittsburg, 4937 cars to points west and 1092 cars to points east, a total of 9519 cars, or 67 cars more than in the preceding week.

Baltimore, Md.

Warm weather conditions had a depressing effect on the Baltimore market during the week and, viewed as a whole, there was little to encourage the trade here. There has been an entire absence of seasonable weather for five days or more, and the high temperature has practically eliminated any signs of spot business, which proves quite profitable to operators, when the market is active.

A considerable tonnage moved from the mines in Maryland, West Virginia and other states, but it was shipped under contract, and this movement had little or no effect on the market, especially so far as prices were concerned.

What few sales were recorded outside of contract shipments throughout the week were for steam coal. The gas-coal market was absolutely stagnant.

Buffalo, N. Y.

The coal trade is still badly affected by the weather, even bituminous suffering severely, on account of its large use in the heating of office buildings, which have required little fuel as the thermometer has scarcely been down to freezing for 10 days. Still, considering the quiet state of the trade during the fall, the demand has been fair and promises to continue so.

With the return of seasonable weather there is every promise of a good general coal trade, although the stir is not expected to be sufficient to advance prices.

As a rule the mines in the bituminous regions are running on practically full time and there is no coal accumulating on track except where the railroads are failing to keep up with their work, which is reported in a few instances.

Bituminous prices are as formerly, with some added stiffness: $2.50 for Pittsburg three-quarter, $2.40 for mine-run and $2 for slack, with coke about the same, at $4.25 for best foundry, to $3.50 for stock coke.

Anthracite is suffering severely from warm weather. But for the great call for it through the fall the trade would be in poor condition. Lake shipments for the season have ceased, being 3,919,429 tons, as against 3,639,368 tons for 1910.

Cleveland, Ohio

According to reports, coal is moving pretty freely from the upper lake ports. Many of the vessels that are laid up at Fort William and Port Arthur are under charter, but at Duluth, where the fleet is much larger, only a few steamers have been tied up.

The steam trade does not show any great improvement as to demand or prices, excepting in slack. Youghiogheny slack coal has been plentiful with prices stiff. The domestic trade is slack on account of the extremely mild weather the past two weeks, but, according to weather reports, we are expecting a cold wave.

Prices in Ohio fields are: No. 8 slack, 75c.; mine-run, 90@95c.; ¾-in., $1@1.05; 1¼-in., $1.10@1.15; Middle district: slack, 75@80c.; mine-run, $1.05@1.10; ¾-in., $1.15@1.20; 1¼-in., $1.40@1.45; Pocahontas, mine-run, $1.10@1.15; lump, $2.15@2.20.

Columbus, Ohio

Continued warm and rainy weather has caused a let up in orders in the domestic trade and on the whole the market in the Buckeye State has been quiet. Another cause for the slack demand is the approach of the holidays, which is usually a signal for a falling off in orders from the consumer.

Prices are still fairly well maintained at the circular figures issued in September. There is no disposition as yet to advance the circular quotations, although there was some talk recently that an advance might be made some time in January.

Prices are ruling rather firm in all grades despite the weather conditions. In the steam trade the requisitions are coming up to the usual amount for the time of the year, although some slowness is reported in certain lines of manufacturing. The railroads are taking a larger amount of steam grades and in some cases there is a disposition to store in anticipation of a suspension.

Operations in Ohio fields have not been active lately because of the slackness in the domestic trade. In the Hocking Valley fields the output has been about 70 per cent. of the average and the same percentage prevails in the Jackson, Masillon and Cambridge fields. In the Pomeroy Bend field the output has been slightly larger. In eastern Ohio the production is also curtailed considerably because of the general softness of the trade.

Prices prevailing in Ohio fields are:

Domestic lump in the Hocking Valley	$1.50
Domestic lump in Pomeroy Bend district	1.60@1.75
Fancy grades of domestic coal	1.85@2.35
Three-quarter inch	1.35
Nut	1.15
Mine-run in eastern Ohio	0.95@1.05
Mine-run in the Hocking Valley	1.05@1.15
Coarse slack	0.35@0.45
Nut, pea and slack	0.40@0.50

Cincinnati, Ohio

Three weeks ago the car situation was so tense that coke racks were used to transport lump coal, while today it is just the reverse, and cars of all kinds and in any quantity desired are readily supplied. Unseasonably warm weather has prevailed for two weeks and the demand for both lump and steam coal is consequently much less. Wholesalers, holding contracts calling for a specified delivery, are being asked to delay as much as possible.

While the wholesalers and operators are accommodating their customers in this matter they are doing so at a distinct inconvenience to themselves. The request comes just at the time when the mines are turning out the maximum output per day, due to the fact that the miners are endeavoring to increase their Christmas pay checks.

There is probably more fuel being sold on demurrage here than for some time. The Northern markets consumed a part of it for a time but even that has fallen off so that there is not much relief now. In all cases, however, it is not believed that the sales have been of sufficient importance to interfere with the general level of prices.

Charleston, W. Va.

As far as output is concerned, there has been little or no change in this state during the past week over that of the previous week. There has, however, been some increase in price, which will insure the continuation of a number of operations that would otherwise have soon been compelled to close down.

The Smokeless Coal Association, which has had several meetings during the past few months, held one, last week, in Philadelphia, at which 98 per cent. of the

smokeless-coal operators on the Chesapeake & Ohio, the Norfolk & Western and the Virginia railways were represented. It was agreed among them that their future success depended upon the securing of a better price for their coal, and in order to secure the continuation of operations of many of the mines, the price of smokeless was advanced 10c. a ton. This, of course, applied to run-of-mine and tidewater shipments, which will net the operators $1.20 from the New River, Kanawha and Pocahontas fields, making all contracts hereafter $2.70 at tidewater.

Hampton Roads, Va.

Business at the Hampton Roads ports has been quite good during the past week. Notwithstanding the high coastwise and foreign steamship rates, several of the large shippers have been short of coal and compelled to buy from other agencies.

Prices are firm and fairly well maintained and there is a tendency for the coal operators and sales agencies to work together as regards both sales and prices. This is a different state of affairs from that which has obtained during the past year. The export business is growing in volume every month and will certainly be at its greatest during 1912. Several contracts have been made for foreign shipments, principally to South America and the Mediterranean ports, beginning Jan. 1.

Louisville, Ky.

A period of warm, rainy weather, combined with the approach of Christmas, has caused a slump in the local retail trade, and the dealers are loud in their complaints. Due to these conditions, the consumers are buying only what they actually require. There is plenty of coal available, both river and railroad, and the prices remain about as last week. Pittsburg lump is being sold as low as $3.50, and nut at $3.25. These prices are on a cash basis, however, and are due to the rate war recently started. Straight Creek is being offered at $3.75, and Jellico egg at $3.60. Anthracite, broken, egg, stove, nut and chestnut are quoted at $7.25 in carload lots, f.o.b. Louisville.

Wholesale prices are ranging as follows, f.o.b. mines: Straight Creek, block and lump, $2; Rich Mountain, of Genuine Jellico, $2.25; higher grades of nut and slack, 85c., and the cheaper grades, such as the Dean, 50@60 cents.

Nashville, Tenn.

Another week of warm and unseasonable weather finds the coal trade, as usual in this field, in a demoralized condition. While the operators are making a heroic effort to maintain prices on lump at $1.50 per ton, and have been fairly successful in doing so, there is no demand for coal at any price. It is not a question of price; the dealers have no business, and consequently no use for coal. There has been little life to business this season and it will take more than a few days of cold weather to stimulate the demand.

Owing to the small amount of lump coal produced during the past 10 days, there has naturally been a small amount of screenings, but there seems to be little, if any, better demand than has existed during the entire fall, and the price is practically unchanged.

Indianapolis

The general coal business is better than it was a month ago, and the operators are unquestionably more hopeful than they were then. This improvement has come about largely through the railroad companies' storing coal preparatory to any strike that may occur next spring. Many of the steel mills are now doing a good business and the chances are that they will continue active.

The price of Indiana coal has taken another drop, lump now selling at $2.75 @3 and Brazil block at $2.50@3.25. This is the lowest that Indiana coal has sold during the winter months for many years.

Minneapolis—St. Paul

The mild and open winter which has prevailed during the past month, is responsible for the quiet condition of affairs in the coal trade. Wholesalers do not look for better conditions until after Jan. 1, even if cold, severe weather does set in. So far as can be learned it appears that the dealer trade in this territory is well stocked up, and dealers are requesting orders to be held up for later shipment. Retail trade is holding up steadly but is by no means rushing.

The dock people are complaining at the slowness of demand on bituminous coals, while the anthracite trade seems to be fairly active and shipments are almost normal. Screenings from the docks are sold in the Twin Cities at ridiculously low prices.

Prices are not what they should be on all-rail coal from Indiana and Illinois, some Franklin County coal selling for as low as $1.50 at the mine. Miners will be only working about half time during the holiday season, and coal will be coming up slower. This will have a tendency to bolster up prices a little.

St. Louis, Mo.

The market is in much the same condition as last week, with the exception that some of the operators are down to where they are selling coal at less than cost of production. Everything took a slump, with the exception, of course, of anthracite and smokeless, and even screenings dropped off from 5c. to 10c. a ton in the face of what appeared to be a shortage on that size.

Several of the mines in the high-grade field, and also some in the Standard, have shut down until the demand gets better.

Franklin County coal under demurrage at East St. Louis sold for as low as $1.25, and Carterville lump and egg under demurrage has been selling as low as $1.15. Carterville mine-run under demurrage has been offered at 85c., and Standard mine-run at 72½c. The prevailing prices are:

Franklin County	
Lump and egg	$1.40@1.50
No. 1 nut	1.25@1.35
No. 2 nut	1.15@1.25
No. 3 nut	1.00@1.10
2-in. screenings	0.65@0.75
Carterville	
6-in. lump	$1.25@1.35
3x6-in. egg	1.20@1.30
No. 1 nut	1.15@1.20
No. 2 nut	1.00@1.10
No. 3 nut	1.00@1.05
2-in. screenings	0.55@0.65
Mine-run	0.95@1.00
No. 1 washed	1.50@1.60
No. 2 washed	1.20@1.30
No. 3 washed	1.15@1.25
No. 4 washed	0.80@0.90
No. 5 washed	0.40@0.50
Standard	
6-in. lump	$0 90@1.00
2-in. lump	0.85@0.95
3x6-in. egg	0.80@0.85
No. 1 nut	0.70@0.75
No. 2 nut	0 60@0.65
Screenings	0.40@0.45
Mt. Olive	
6-in. lump	$1.35
3-in. lump	1.25
3x6-in. egg	1.00
No. 1 nut	$0.80@0.90
No. 2 nut	0.75@0.80
2-in. screenings	0.40@0.45

The higher-grade coals from the inner district, such as Trenton, etc., are still holding at from $1.75 to $2. The tonnage from the Springfield district has practically ceased, and this is also the case with the Harrisburg and Gallatin Counties. Big Muddy coal is moving slowly at $2.25 for 6-in. lump and $2 for 2-in. lump.

There has been a marked decrease in the demand for anthracite, and practically all sizes have been under demurrage at East St. Louis during the past week. One commodity in good demand is coke, especially in the Northwest, and gashouse is bringing $4.75 at St. Louis, with byproduct at about $4.90.

Chicago

There is an apparently complete demoralization in the Chicago market, with a slash in prices in almost every direction. A free supply of coal, plenty of cars and little buying are the chief factors contributing to this situation.

The range of prices has been unusual. Smokeless lump and egg, which commanded $2.25 two weeks ago, is being disposed of at almost the buyer's own price. Starting around $2, the price vacillated for a time and then tumbled

to $1.90, from where it dropped soon after to $1.75, and even $1.60 and $1.50 in some instances.

Smokeless mine-run, which was firm a short time ago at $1.10, fell to 90c. and 85c. Hocking coal has felt the effect of the weak market, and went first to $3 and later to $2.90. On Franklin County coal the price in Chicago proper has remained around $1.50 for car-service coal; Carterville also has been weak. Screenings showed greater strength than was expected, the decline being not more than 10 cents.

Prices direct from the mines, in net tons, to retail dealers and steam users on spot shipments are as follows:

Sullivan County	*Chicago*	*F.o.b. Mines*
Dom stic lump....	$2.35@2.50	$1.50@1.65
Egg..............	2.30@2.40	1.45@1.55
Steam iump......	2.10	1.25
Screenings......	1.37@1.52	0.50@0 65
Springfield		
Domestic lump....	2.07@2.22	1.25@1.40
Steam lump......	1.97@2.07	1.15@1.25
Mine-run.........	1.83@1.87	1.00@1.05
Screenings........	1.32@1.42	0 50@0.60
Clinton		
Domestic lump....	2.12@2.27	1.35@1.50
Steam lump......	2.00@2.20	1.25@1.45
Mine-run.........	1.82@2.02	1.05@1.25
Screenings........	1.42@1.52	0.65@0.75
Pocahontas and New River		
Mine-run.........	$2.95@3.05	$0.90@1.00
Lump and egg....	3.65@3.90	1.60@1.85

Coke—Coke is quoted at: Connellsville, $4.50@4.65; Wise County, $4.50@4.65; byproduct, egg and stove, $4.95; byproduct, nut, $4.55@4.65; gashouse, $4.85.

Spokane, Wash.

The prices at Spokane remain unchanged and are the same quoted for the month past. The general condition at present seems to be most favorable, the weather not being too cold, and the supply is not decreasing as fast as usual at this time of the year. The shipments continue to be good, and the stocks are slowly being replenished.

Portland, Ore.

Portland has been fortunate in the weather line, so far this winter, which is not appreciated by the coal dealer, for certainly it has not stimulated the demand. The thermometer went down to 31 above, some weeks ago, which is by far the coldest since early last spring.

The demand for coal has been light, so the dealers have found no necessity to advance prices and values are exactly where they stood when the winter schedule went into effect in October. No new shipments have arrived from Australia, and none is due to arrive in the immediate future, although a few cargoes are *en route*. The period when fuel is most in demand in this section is during January, February and March, and it is to these months that the coal dealers look with the greatest interest.

Production and Transportation Statistics

Hampton Roads Piers

Coal handled at Hampton Roads piers to Dec. 9 of the present year was as follows:

Chesapeake & Ohio Ry.............	3,345,807
Virginia Ry.......................	1,908,678
Total..........................	5,254,485

The Chesapeake & Ohio Ry. Co.

The following is a comparative statement of the coal and coke traffic from the New River, Kanawha and Kentucky districts for the months of October, 1910 and 1911, in short tons:

COAL

To	1911	1910
Tidewater..............	335,655	322,779
East....................	185,168	167,219
West....................	1,025,887	886,333
Total..............	1,546,710	1,376,331
Bituminous from connections................	19,077	7,735
Anthracite from connections................	3,559	3,145
Grand total........	1,569,346	1,387,211

COKE

Tidewater..............	......	1,675
East....................	9,855	25,938
West....................	8,574	7,461
Total..............	18,429	35,074
From connections.......	487	2,735
Grand total........	18,916	37,809

firm tone for all descriptions. Approximate quotations are as follows:

Best Welsh steam coal................	$4.20
Seconds................................	4.02
Thirds..................................	3.78
Best dry coals.........................	4.02
Best Monmouthshire....................	3.78
Seconds................................	3.60
Best Cardiff small steam coal..........	2.16
Seconds................................	1.92

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days less 2½ per cent. discount.

Exports—Total exports for first 11 months of the current year were 58,805,355 tons, while for the same period last year they were 56,895,997 tons. The total exports of coal, coke and patented fuel for this period of the current year were 61,236,067 tons, and for last year 59,136,779.

Russia

Production in the Donets region for the first 8 months of the present year as compared with the same period last year was as follows in short tons:

	1910	1911
Bituminous..........	964,000	1,170,000
Anthracite............	166.000	193,000

Germany

The following is a comparative statement of the fuel production in the German Empire for the first 10 months of 1910 and 1911, together with imports and exports in metric tons:

GERMAN COAL PRODUCTION

	Production		Imports		Exports	
	1910	1911	1910	1911	1910	1911
Coal.....................	126,030,092	133,470,434	9,307,424	9,012,286	19,363,915	22,245,553
Lignite..................	56,284,894	60,292,946	6,139,200	5,813,871	50,112	48,366
Briquets.................	*16,098,545	*18,047,727	192,332	174,949	1,593,216	2,002,575
Coke.....................	19,393,499	20,818,326	531,859	497,380	3,335,579	3,718,323

*Includes subsequently reported quantities.

Norfolk & Western Ry. Co.

The following is a statement of shipments over the Norfolk & Western Ry. during November, 1911:

From	Commercial	Company	W. Va. Mines
Pocahontas field...	1,148,135	98,951	1,189,478
Tug River field....	141,914	42,320	184,234
Thacker field......	160,690	57,058	217,748
Kenova field......	70,439	11,587	82,026
Clinch Valley field.	96,198	8,023	......
Total..........	1,617,376	217,939	1,673,486

Coke shipments from the Pocahontas field were 99,339 tons.

Foreign Markets

Great Britain

The inquiry is not so active, but this is probably due to the fact that most buyers have completed their arrangements for loading before Christmas. For forward shipment the market displays a firm tone for all descriptions.

Shanghai, China

As was only to be expected under the circumstances there has been hardly any business done on this market owing to the revolution and the difficulties which have arisen on account of the inability to complete satisfactory banking and financing arrangements while the uncertainty lasts in the diplomatic situation. Prices have risen sharply in some cases.

Austria

Coal production in Austria for the first 9 months of the years 1910 and 1911 is as follows:

	1910	1911
Coal.................	10,323,734	11,008,690
Brown coal...........	18,398,089	18,710,953
Total mined........	28,721,823	29,719,643
Coke................	1,486,091	1,543,800
Briquets.............	244,408	254,882

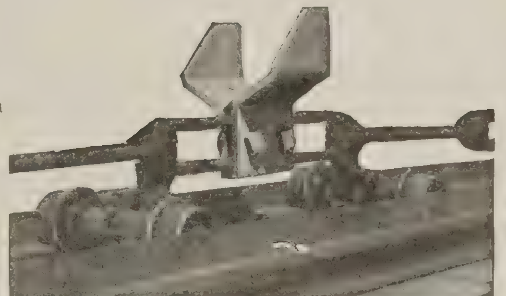
"Link-Belt" Car Hauls

Built for any capacity or to suit any conditions

"Link-Belt" Car Haul, 750-feet Centers
La Salle County Carbon Coal Company, Oglesby, Ill.

IN the installation shown the cars are automatically engaged by spring tilting hooks at shaft, carried up grade for a short distance, and then down grade to tipple. On changing from up to down grade the cars move by gravity from the tilting hooks to stationary retarding hooks placed slightly in advance. After dumping, the empty cars are automatically engaged and returned in the same manner. A single continuous moving chain, traveling in opposite directions on the same levels, handles both the loaded and empty cars. Capacity of haul, three cars per minute.

Dodge Chain
Employed for car hauls requiring both vertical and horizontal deflections.



Stationary Retarding Hook

We also Design and Build Machinery of every description for the efficient and economical handling of coal at the mine.

Write for Book No. 111 CA.

Tilting Hook for Up Hauls

LINK-BELT COMPANY

PHILADELPHIA	CHICAGO	INDIANAPOLIS
New York, 299 Broadway	Pittsburgh, 1501-3 Park Bldg.	Denver, Lindrooth, Shubart & Co.
Boston, 131 State Street	St. Louis, Central Nat'l Bank Bldg.	New Orleans, Wilmot Machinery Co.
Buffalo, 601 Ellicott Square	Seattle, 439 New York Block	San Francisco, Eby Machinery Co.

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Classified Index to Articles Advertised

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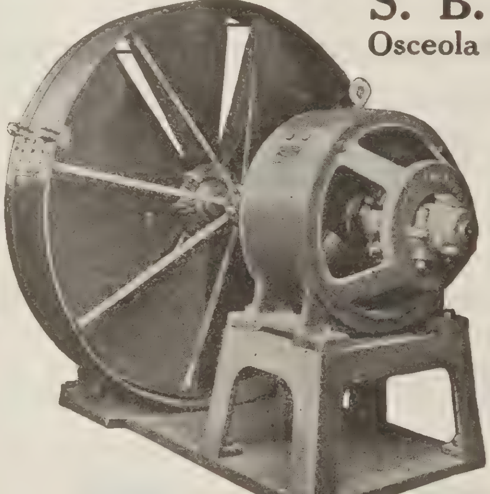
Advertisements under this heading 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Position wanted as superintendent, mine foreman or engineer; 16 years' experience in mining; eight years at mining, eight years at engineering and assistant management; have Pennsylvania mine foreman's certificate; good surveyor and draftsman; knowledge of chemistry; age 30 years; uptodate and can get results. Address Box 4, care COAL AGE. Dec. 23.

Ever Hear of the Stine "Mountain" Type Fan?

It's a special fan we build for use in very inaccessible places. It's built in one man pieces throughout. The supporting boxes are made extra large so it can easily be mounted on timbers. It is a fan of excellent efficiency, splendidly adapted to its particular work. *Write. We'll gladly send full details.*

S. B. Stine
Osceola Mills, Pa.



A Man Can Ride All Day Without Getting Anywhere

A man can be mounted on the finest steed in the country.

Yet he can keep on riding around and around the block and never arrive anywhere.

An advertiser can buy space in the best technical paper in the United States.

Yet use that space to such little purpose that it will leave him with a big doubt in his mind as to the value of any advertising.

The thing that gets the advertiser *something*, however—that brings him *results*—is very simple.

It's copy.

It's what goes into the space the advertiser buys.

It's to the advertisement as a whole what the brain is to a man.

Coal Age has a corps of trained advertising men maintained for the sole purpose of helping advertisers in its columns to get *value* from their space.

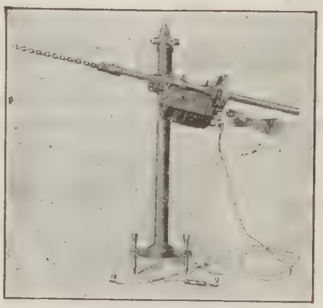
They are here solely for the advertisers' use.

When in doubt write to

The Service Department of

Coal Age, 505 Pearl St., New York

Howells Drills Bore The World's Coal



Our equipment has set the standard for 33 years. Thousands of "Howells" drills are in use throughout the World drilling into the hardest coal at the rate of seven feet per minute.

The Spry Type B Electric Drill

This drill is for circuits between 220 and 500 volts direct current. Consumes from 8 to 10 amperes and developes from 2 to 3 H.P. Weight, without post, clamp or augers, 100 lbs. Send for Catalog No. 28 showing complete line of hand and air drills.

Howells Mining Drill Co., Plymouth, Pa., U. S. A.

C A

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 12.
Issued Every Saturday.
HILL PUBLISHING COMPANY.

NEW YORK, DECEMBER 30, 1911

Ten Cents per copy.
U. S. and Mexico, $3 per year.
Canada, $4; other Countries, $5.

MAXWELL COLLIERY LEHIGH & WILKES-BARRE COAL CO.

COAL AGE

C A

COAL AGE

Vol. 1 NEW YORK, DECEMBER 30, 1911 No. 12

THE season of goodwill, kindly deeds, and new resolutions is with us. After months of strenuous endeavor, the world is weary and we all are glad that the machinery of life is momentarily stopped and the oil of charity applied.

It gives a chance to catch our breath, and besides, we can always jump farther, if we'll only stop, draw back and get a fresh start. The principal part of the balance most of us will strike when we close our ledger of accounts for the year, is experience; and if we have learned that sound discretion is not so much indicated by never making mistakes as by never repeating them, then we've capital a-plenty to start the New Year.

If any of us believe that during past months we've been dogmatic in our utterances, then let's hope kind Providence has taught us that it's possible for each one to be mistaken, and therefore how necessary is kindly consideration of views that differ from ours.

But you say,—in what way does the Yuletide directly affect coal men, and how does it concern us, aside from its strong appeal to our sentimental nature? The reply is, that this period of the year is characterized by a universal "stock-taking"; 'tis a time for making detailed inventories of goods on hand.

As foreman, superintendent, or manager of a mine, you haven't a store with merchandise on the shelves, but each of us does own and run a little shop, located just under our hair, and it's here we manufacture and sell a product known as ideas. The income and prosperity of each individual depend largely on the quality and character of the wares he peddles, although superior salesmanship will sometimes dispose of goods that are a bit shopworn.

However, since most of us are fortunate to get par for any article we sell, isn't it wise to start right now, clean off the counters, get rid of obsolete ideas and see that the stock remaining on the shelves of our shop is of modern design and recent manufacture?

Of course, there is more than one accepted style for some particular article, and it will frequently occur that two purchasers of equal intelligence will differ in their likes, but this only proves how necessary it is for the owner of the shop to be familiar with the history and development of the goods he deals in; otherwise he may sell an antiquated useless idea to a good customer, and as a result, be condemned ever after as a dispenser of ancient, impracticable information.

Therefore, in starting the New Year, let's not adhere too closely to the belief that because some one man successfully worked a particular mine by a certain method ten years ago, we can attain as favorable results today by following in his footsteps. Machines and motors have supplanted picks and mules; overcasts have been substituted for doors; steel is taking the place of wood in props and cars, and telephone connections underground are essential to modern practice.

Can't we resolve, then, at the beginning of this, another year, to hand out six-cylinder ideas instead of the two-cylinder type we've been supplying. It's also well to recognize that when we drive the same old mule down the same old furrow, day in and day out, the brain is taught to think one way, do one thing only, and even if we do that one thing well, the other powers of mind are in danger of atrophy.

No matter how great is the positive force that rests in us, complete results cannot be achieved unless some of the Christmas-spirit is carried through the year—the mantle of charity must be thrown around the faults of our fellow-beings. Too often we limit ourselves to a strictly business view of all matters, and strive for reputation rather than character. In this connection it is well to recall that character is what we really are, while reputation is only what we are thought to be. Nothing is so easy to attain, so hard to maintain, and of such all-around danger as reputation.

Electrical Symbols for Mine Maps

By H. H. Clark *

The Pennsylvania mining code requires maps showing the location of all electrical equipment in mines. These electric symbols are proposed for the consideration of electrical engineers and for the purpose of promoting uniformity of expression. Conductors are represented by a broken line with appropriate symbols showing their number and nature.

Some time ago the Bureau of Mines began the preparation of a list of symbols to be used in reporting mine examinations. This list was designed to cover electrical apparatus, and many other things as well. When the new Pennsylvania mine law went into effect, the list of electrical symbols was revised and enlarged with the idea that it might, at some future time, be of use to those interested in the preparation of mine maps for showing the location and character of electrical apparatus, as required by paragraph 14, section 1, article XI, of the new code.

Advantage of Symbols

If those interested in this matter should adopt one set of symbols for the purpose, at least two advantages would be gained: First, the advantages resulting from uniformity of practice which are too obvious to require discussion, and, second, every individual desiring to use symbols would not have to spend the time and thought necessary to develop a system of his own.

There is also another probable advantage. A system of symbols, to be of general application, must be considered from so many viewpoints and by so many different people that the resulting plan would be more complete, more flexible and more satisfactory than a list prepared under other conditions.

There is nothing absolute about a list of symbols; the characters are all arbitrary, although it is best to interrelate them when this does not involve complication. The main thing is to select characters that are distinctive, easily made and duplicated and not used for other purposes in the same field. Electrical apparatus is frequently represented by symbols in engineering work above ground, but, so far as I am aware, there is no published list of such symbols which has been formally approved by any organization, with the exception of one which has been prepared by the National Electrical Contractors' Association and approved by the American Institute of Architects. In preparing the list of symbols which is used by the bureau, certain characters were included which, in the past, have been quite generally used in electrical diagrams. As many of the National Electrical Contractors' symbols were used as seemed applicable, and the rest of the list consists of more or less arbitrary forms.

Symbolic Representation of Conductors

In making up the list of symbols it was comparatively simple to select characters for apparatus and machines, but the representation of conductors was not so easy. If there are only one or two conductors in an entry, they may be easily shown by lines of different colors or by lines made up of different arrangements of dots and dashes. If there are many conductors and the scale of the map is 200 ft. to the inch, this method is not so satisfactory.

The following method, which the bureau plans to try out, is general in its application. Although it will hardly be as clear as the line method when only one or two conductors are involved, it will probably be less confusing where several different circuits are to be shown on small-scale maps. A description of the method is as follows: Letters are used to indicate conductors; thus "T" denotes a trolley wire, "B" a bare, low-voltage conductor, etc. Figures are used in conjunction with the letters to denote the number of conductors of any kind. Thus "2 T" denotes two trolley wires and "3B" denotes three bare conductors. Other kinds of circuits are denoted by other letters. These letters are placed on the map along the side of an entry, to show what circuits are passing through that entry. Whenever a conductor is added or dropped, a new symbol is put on the map at the proper place, showing one more or one less letter, as the case may be.

Symbols for Machinery

The first figure shows the list of symbols covering machines and miscellaneous apparatus. This list shows some apparatus which is not used in every mine, while much of it is used in only a few mines. It is included, however, because it was the intention to make the list as complete as possible. The machine symbols are based upon past practice, which has become more or less standard by continued use. Explosion-proof motors are represented by inclosing in a square the symbol for the open motor. The transformer symbol is that used by the National Electrical Contractors' Association.

As to the miscellaneous list, the telephone symbol was selected as being distinctive and easily made and duplicated. The National Electrical Contractors' Association's symbol for a telephone is the outline of a telephone mouth-piece. This is suggestive, but it is not so easy to make and duplicate as the one finally selected. The old conventional symbol has

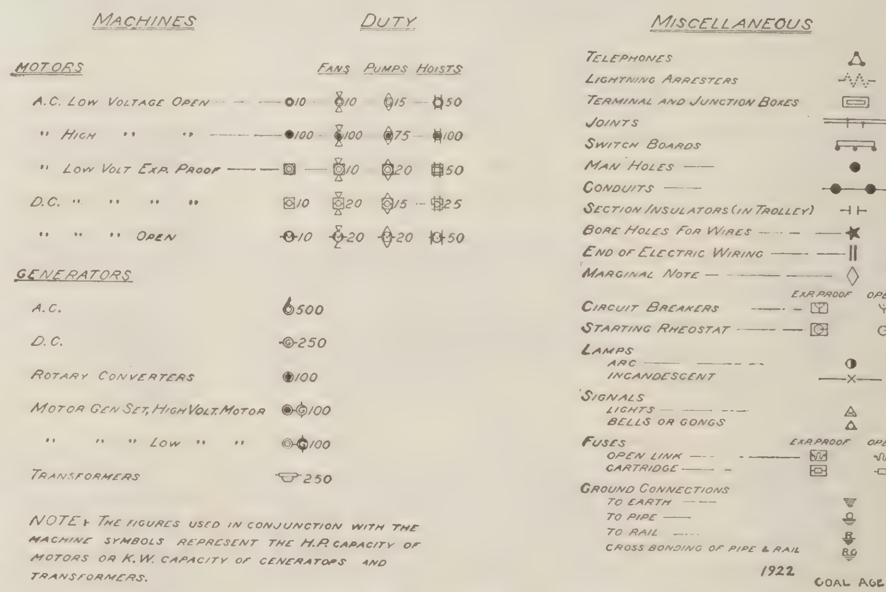


Fig. 1. Symbols for Electrical Generators, Etc.

*Electrical engineer, Bureau of Mines, Pittsburg, Penn.

Note—Paper read, Dec. 20, before winter session of Coal Mining Institute of America, Pittsburg, Penn.

been used for ground connections with the addition of letters to show the character of the ground.

The second figure shows the symbols for conductors and switches. The application of the conductor symbols will be explained more fully on the third figure. The National Electrical Contractors' Association symbol, somewhat modified, has been used to represent switches. The inclosing square is used to designate explosion-proof construction.

An Elementary Example

The third figure shows in the simplest form the method of applying the conductor symbols. Only one entry is shown, the parallel entry being omitted for the sake of clearness. It has been suggested that the use of letters to indicate conductors be supplemented by a single colored or dotted line, which should extend as far as the electric wiring. The presence and extent of electrification would then be shown by this line and the specific character and number of the circuits could be learned from the symbols.

This plan appeals to me as having decided advantages. In Fig. 3 the presence shows that two bare wires run up the crosscut.

Returning to the main entry again, the symbol "TP" shows that the signal line is dropped just beyond the first face entry, but that the trolley and telephone lines continue as far as the symbol "T," which shows that beyond this point on the main entry there is no wiring except for motors. The symbol "TP" on the first left-face entry shows that both the trolley and the telephone lines run up this heading.

Another Installation

From Fig. 5 the appearance of the symbols can be judged, as applied to an actual mine map. The layout of the mine and the installment of electrical apparatus have been prepared merely to provide a framework for showing the symbols, and not for exemplification of correct mining methods. Only the outlines of the entries are shown as it is not necessary to show the complete map in order to indicate the location of the electrical apparatus. This mine does not have much electrical development and yet may be regarded as typical of many mines in the Pittsburg district. The rep- to the various butt entries as shown. From the junction of No. 1 North with the main entry a circuit of two bare conductors and also a telephone circuit run along the main entry to the pump room. The circuit is controlled at its starting point by a double-pole switch and the return circuit is grounded to the rail at this same point. In the pump room is located a 50-hp. direct-current motor of the open type, a switchboard, a telephone, and four incandescent lamps. The circuits running up the butt entries consist of two bare conductors controlled by a double-pole switch at the mouth of the entry, at which point the return circuit is grounded to the rail. This applies to entries Nos. 6, 8, 10, 12 and 14 West and to No. 8 East. The symbol "2TP" at the beginning of the parting shows where the double trolley begins.

An Elaborate Installation

Fig. 4 represents a mine using a great deal more electrical apparatus than the mine just discussed. In this case it is necessary to use about 30 of the symbols. The arrangement of the apparatus in this mine is slightly different from that in Fig. 5. It is assumed for the purpose of illustration that the power is taken from an underground substation at which point is installed a 300-kw. rotary converter fed by transformers having an aggregate capacity of 350 kw. The symbols show that there is a high-voltage lead-covered cable going down a bore-hole to the substation. This cable receives its power from an overhead transmission line and is protected by a lightning arrester. Marginal note No. 3 gives some additional information about this cable. In the underground substation, besides the transformer and the rotary converter,

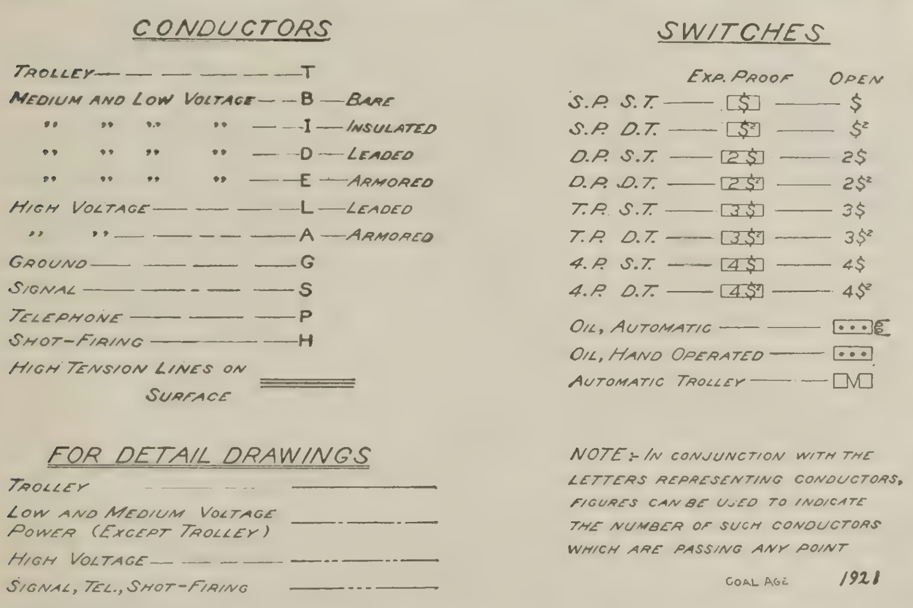


Fig. 2. Symbols for Conductors and Switches

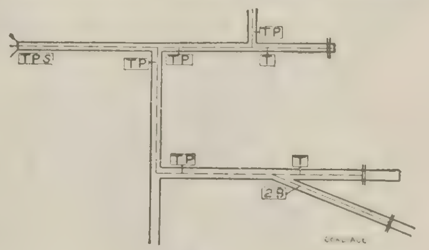


Fig. 3. Simple Electrical Equipment

of electric conductors of any sort is indicated by a dotted line, and the specific character of the conductors is shown by the letters in the rectangles alongside the entry. The letters show that a trolley wire, a telephone line and a signal wire all enter the drift mouth. All these lines run down the main entry as far as the first right face. The trolley and telephone lines run down the first right face entry as far as the first left butt entry. They turn in there and continue as far as the crosscut entry, where the telephone line is dropped, the trolley line continuing down the butt entry. The symbol "2B"

resentation of the electrical apparatus in this case requires the use of but nine of the symbols shown on the first two figures.

These symbols give the following information: A trolley line and a telephone circuit enter the drift mouth and run along the main entry as far as No. 1 North, into which they both turn, and along which they both are carried as far as the parting between No. 8 and No. 9 West, at which point the trolley and the telephone lines stop and a circuit of two bare conductors begins. This circuit runs as far as No. 14 West with branches in-

are located a switchboard, a telephone and four incandescent lamps.

The mine is shown with an electrically operated fan. At the fan house the symbols show a high-voltage transmission line and lightning arresters, a 150-hp. low-voltage alternating-current motor, a 150 kw. transformer, a switchboard and incandescent lights. Marginal note No. 2 gives some additional information regarding the motor.

The symbols show that in pump room No. 1 are located a 50-hp. direct-current motor of the open type, a switchboard, a telephone and four incandescent lights.

There is also a symbol which shows that the return circuit of the motor is grounded to the pipe line leading from the pump.

In pump room No. 2 are located a high-voltage alternating-current motor of 100 hp. capacity, a switchboard, a telephone and four incandescent lights. There is a high-tension transmission line on the surface which supplies power from a high-voltage leaded cable leading to

Wired for Signal Lamps and Shot Firing

This mine is supposed to use a good deal of miscellaneous apparatus not used in the mine just discussed; for instance, signal lights are shown at almost every junction of a side entry with the main haulageway. Automatic trolley switches or section insulators with single-pole switches are used on every side entry where motors are operating. This mine trolley wires, a telephone wire and a short-firing line running along the main entry. The second symbol shows that a signal line has been added for operating the signal light in No. 1 North. As we turn into No. 1 North at its junction with the main entry the first symbol shows that a trolley line, a signal circuit, a telephone circuit, a bare low-voltage conductor and a shot-firing circuit are running down this entry. The next symbol marks the point where the signal

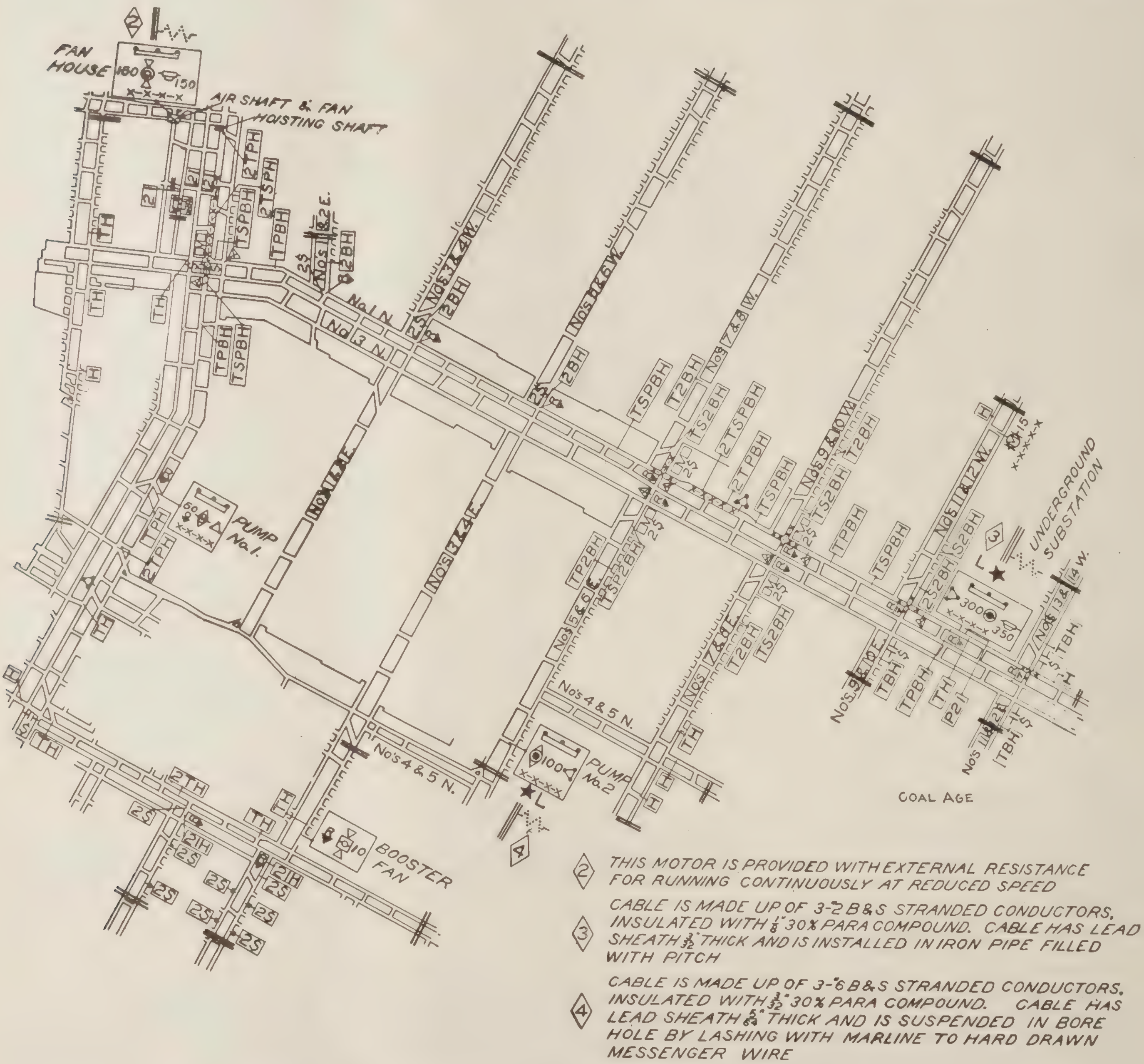


Fig. 4. Equipment with Alternating Current, Substations, Shot-firing Devices, Etc.

the pump room through the bore-hole and protected by a lightning arrester on the surface. Marginal note No. 4 gives some additional information in regard to the cable. The broken lines representing conductors have been omitted unintentionally from the drawing.

is supposed to use a system by which shots are fired from the surface and the shot-firing lines are carried to the face of all entries.

Starting from the hoisting shaft and working toward the inside of the mine, the symbols show that there are two

line is dropped. At the entrance to No. 4 West and No. 6 West the symbol "2BH" shows that two bare low-voltage conductors are installed in these entries. The next symbol on No. 1 North, which occurs between No. 6 and No. 7 West, indicates that the signal wire has been

picked up. At the entrance to No. 8 West a symbol shows that the trolley wire, a signal line, two bare conductors and a shot-firing line are carried up this entry. The next symbol shows where the signal line is dropped. The remainder of the conductors are carried up this heading. The failure to mark any further notes along the entry until the "stop" signal is reached outside the last crosscut, is evidence that the remaining conductors extend to that point without change. The next symbol on No. 1 North indicates the double trolley line at the parting, the signal line for No. 8 West and No. 6 East, a telephone line, a bare feeder, and a shot-firing line. The next symbol shows the dropping of the signal line. Following this there is a symbol which marks the end of the double trolley and the beginning of the signal line for No. 10 West and No. 8 East. Beyond this point in the following order TPBH marks the end of the signal wire, TSPBH indicates the beginning of another signal wire, which in turn is dropped at the next symbol TPBH. The symbol "TH" shows that both the telephone line and the bare feeder have been dropped. Just beyond No. 14 West the symbol "H" marks the end of the trolley while the shot-firing line is carried to the stop mark near the face.

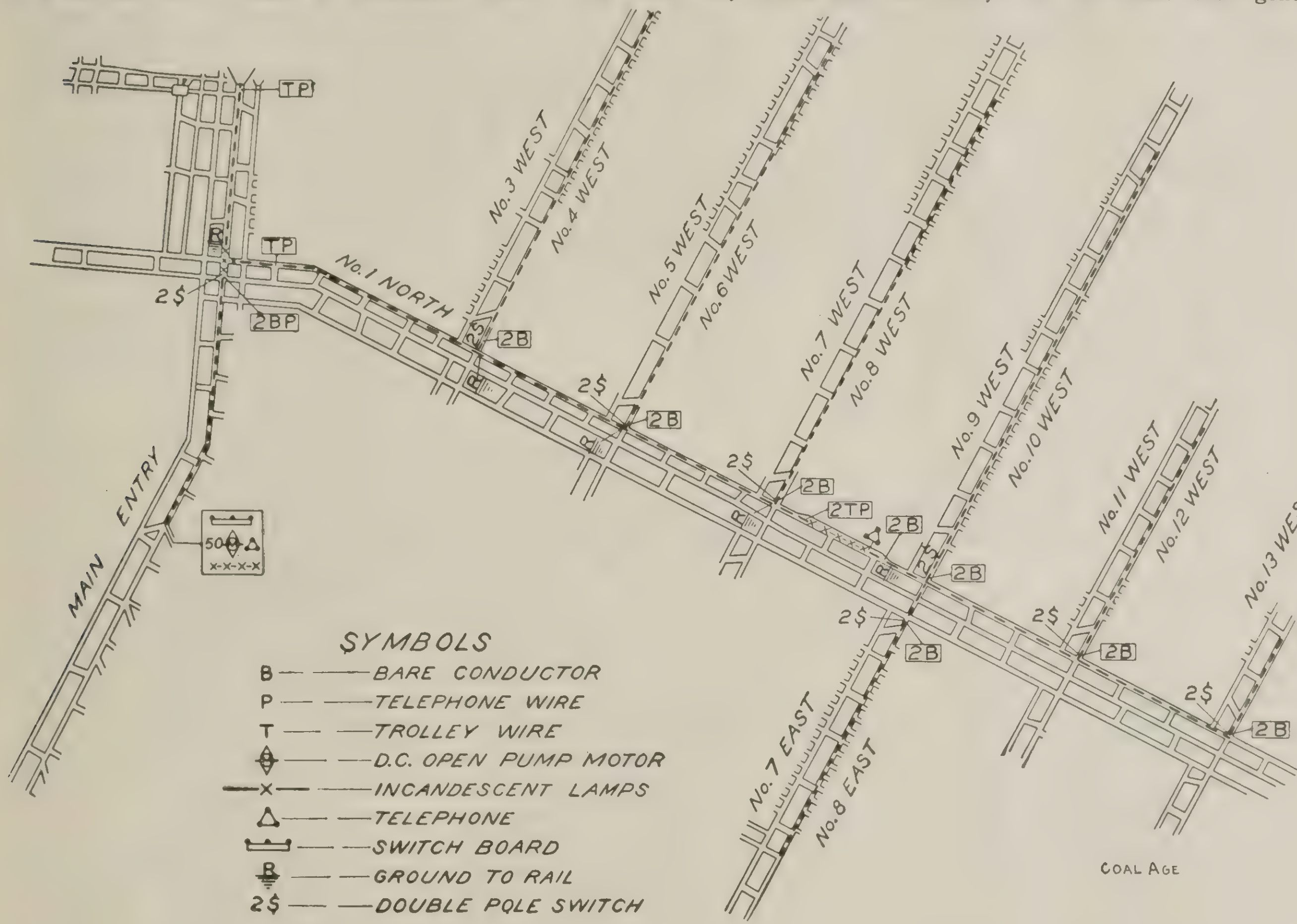


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Fig. 5. Electrical Equipment of Mine with Cutters, Motors, Telephones and Signals

Briceville Explosion

The following is the signed statement of J. F. Hatmaker.

I herewith make the following statement of facts:

"I was employed by the Knoxville Iron company as fire or gas boss, and the mines operated by them were classed 'B,' and therefore, did not require a fire boss at all. My business and instructions were to enter the mines at 6:30 p.m., after the day crew came out, to examine the ventilating apparatus and to see that it was in working condition. This I did. My duties then required me to proceed to examine the intake and return airways, to see that there were no obstructions. This I also proceeded to do and found everything O.K. I was also expected to visit such other places in the mine as in my judgment, might possibly be dangerous; which I did, as was required of me. On leaving the mine at 4:30 o'clock on the morning of the explosion, the mine in my judgment was in as good condition as it ever had been during the eight years I have been employed by the company as fire or gas boss.

Furthermore, I would refer to J. P. Woods, night foreman, who was with me in the mine that night and helped to make the inspection. Mr. Woods now holds a class 'A' certificate as mine foreman.

"I feel that some of the people of Briceville have done me an injustice, as they have caused me to leave my home, and have formed a mob to try to take my life, when I am as innocent, of the explosion, as any person on earth. I will be qualified that I had no idea that an explosion might occur because everything was in as good condition on the morning of the explosion as it ever had been, or at least those were the indications of my examining apparatus."

[Mr. Hatmaker's disavowal of responsibility will not meet with general approval. As appears in my report, the chief mine inspector required that "the mine be thoroughly inspected within three hours before each shift and before men enter the mine." This was possibly a physical impossibility for one man in such extended workings and perhaps it was not required of Mr. Hatmaker by his employers. But it would seem to be the intention of the state inspector that the inspection should cover every working place in the mine as though the fireboss had been appointed under that part of the law relating to class A mines. The men complain that the fireboss continually failed to register his visits at the face. —R. D. Hall.]

Release of Gas Accumulations

By W. H. Cunningham and C. R. Conner*

A seam of coal was worked and abandoned, the workings being allowed to fill with water. A seam above was opened by the same shaft. Later a huge column of water was thrown out of the shaft, followed by smoke and fire. Gas was removed at three points by boreholes from surface.

*Manager and assistant manager, West Kentucky Coal Co., Sturgis, Ky.

Note—Paper read before the December meeting of the Kentucky Mining Institute, Lexington, Ky.

From time to time we read or hear of some accident, due to the sudden release of accumulations of gas in abandoned mines or in the old workings of active collieries. This is usually caused by old workings being tapped unexpectedly by live workings.

There has been but little scientific research into the methods of relieving gas pockets and accumulations, and accordingly a broad field is left open for discussion; however, we will confine ourselves strictly to the method of handling one particular situation, which came under our direct supervision.

The Explosion

About 4:25 p.m. Saturday, Dec. 11, 1909, a huge column of water was thrown out of the main hoisting shaft, carrying with it the cage, which had been at the landing of No. 12 seam. The column of water was closely followed by smoke and fire, and almost instantly the tipple was enveloped in flames. As far as could be ascertained from eye witnesses, there were two explosions in rapid succession, which were heard a little after the flame was first seen shooting up the shaft, and these were later followed by some seven or eight minor explosions. As late as 8:30 in the evening two small explosions were heard.

Immediately after the explosion, relief parties were formed and hurried to the scene of the disaster; the state mine department was notified, as well as neighboring operators, who responded promptly, volunteering assistance, and by the time Assistant State Mine Inspector T. O. Long arrived at the mine (a little after 8 p.m.), the surface fire was under control, the shafts roped off and a force of men at work repairing the fan, which had been badly damaged. As soon as the fan was repaired, a rescue party was formed, which was joined the next day by Prof. C. J. Norwood, chief inspector of mines, who remained at the head of the relief party until the bodies of the seven unfortunates who lost their lives were removed from the mine.

History of Mines

The shaft had originally been sunk to the No. 9 seam, a distance of 211 ft., and after being worked for several years, the mine was abandoned, standing idle for some months, being allowed to fill up with water, the shaft also being filled to a point about 96 ft. from the top. It was then decided to make an opening in the No. 12 seam in the same shaft, a distance of 125 ft. above the No. 9 seam, and 86 ft. from the top of the shaft. This work was commenced before the writers' connection with this company. A map of the workings in the No. 9 seam, up to the time of abandonment, and a log of the hoisting shaft are shown, Figs. 1 and 2. At the time of the disaster, the opening in the No. 12 seam had been working nearly three years.

In the investigations held by the coroner's jury, county and state mining department, the coal company and its officials were held absolutely blameless. The state mining department then advised that before anyone would be permitted to reënter the No. 12 seam, it would be necessary, in some manner, to provide an outlet for future accumulations of gas in the No. 9 seam, to enable working in the upper seam with safety.

Drilling to Remove Gas

After thoroughly canvassing the situation, at a conference between Prof. Norwood, Mr. Long and the writers, it was decided that if boreholes could be drilled into the No. 9 seam, it would be the most practical means of relieving the situation and would meet with the approval of the state mining department.

The engineering problem which confronted us was not so much the drilling of the holes as the placing of them, so that they would tap points near the faces of the three rise headings in the lower No. 9 seam, and at the same time pass through solid pillars of coal in the upper or No. 12 seam. This was obviously deemed of the utmost importance in order to prevent possible leaks from the borehole casings into the No. 12 seam. The subject of escape of gases from wells into mines was ably presented by C. H. Tarleton, of the Consolidation Coal Co., of West Virginia, in his paper "Mine Explosives from Natural Gas Wells," read at the last annual meeting of the West Virginia Coal Mining Institute.

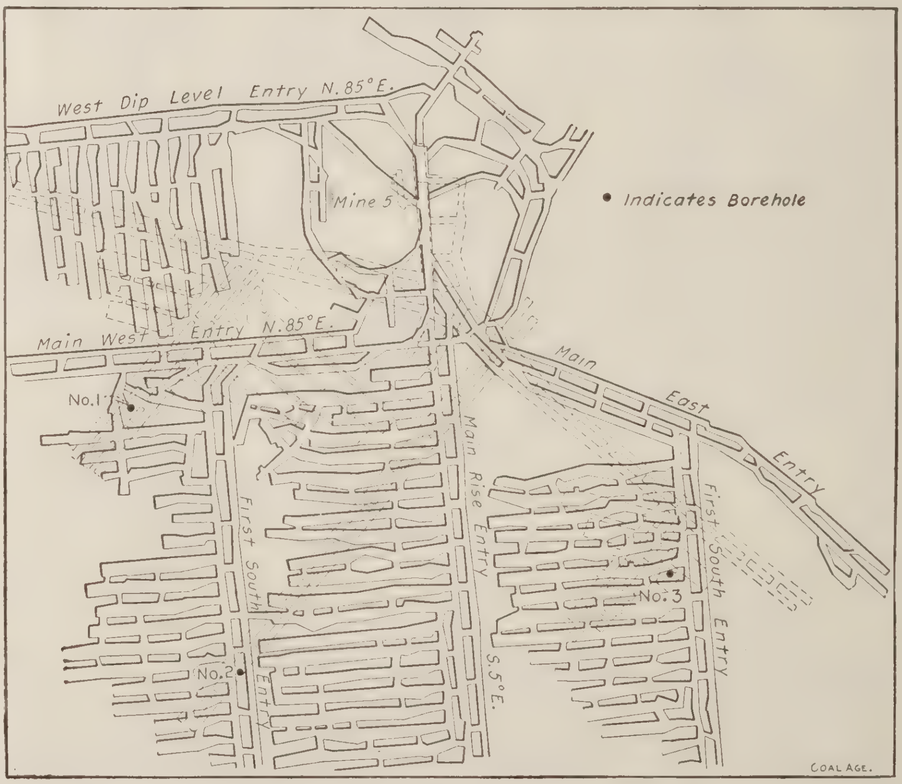

Fig. 1. Workings in Seams Nos. 9 and 12, and Location of Boreholes to Surface

Protection for Drill Holes

Old survey records of the No. 9 seam were carefully plotted, and, as far as possible, tied with and fitted to surveys in the No. 12 seam. The map, Fig. 1 accompanying this article, shows the nature of this work and the final location of the boreholes. We learned from old employees that the workings in the lower seam had been operated under considerable difficulties arising from the presence of firedamp, and we decided that when abandoned, it was quite probable that before a sufficient quantity of water had collected to fill all the workings, a considerable amount of gas probably accumulated at the faces of the three rise headings, being held in check by the pressure of the water standing in the shaft below the No. 12 seam. This was taken under careful consideration and caused the selection of the borehole locations as close as possible to the faces of the three rise headings in the lower seam, at the same time passing through good-sized pillars in the upper. The dip is 3.6 per cent. in a direction of N. 35° E., the three headings being driven directly to the raise.

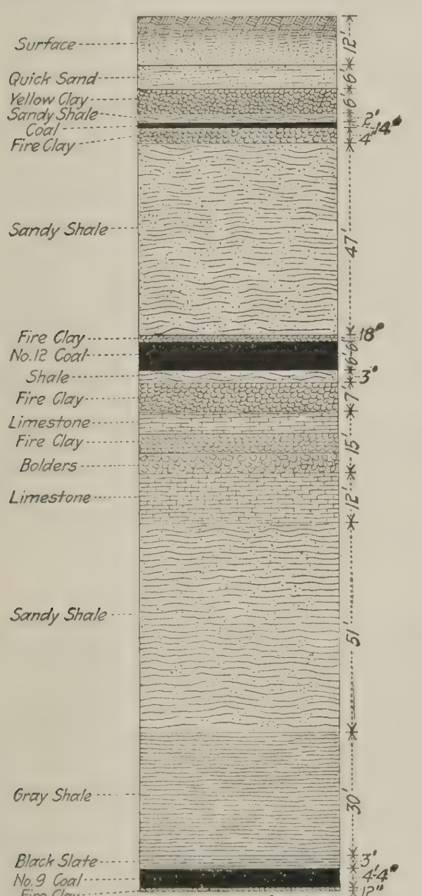

Fig. 2. Section of Coal Measures, Western Kentucky

On Dec. 18 work was started on the boreholes, using two ordinary churn-drill rigs. These put down holes to carry 8-in. casing to the rock, a distance ranging from 24 ft. in one hole to 80 ft. in the deepest. The bits were then changed, reducing the holes to a diameter suitable to carry 6-in. pipe. This was carried to a point 10 ft. below the No. 12 seam, then grouted with a mixture of one part cement to one part sand between the 6- and 2-in. casing up to the surface. The grout was allowed to stand 48 hours to set. From this point down to the No. 9 seam 5⅝-in. holes were drilled, in which 4-in. pipes were placed, the bottom 6 ft. of which were perforated in many places to permit the gas at the roof to escape while the ends rested on the bottom. From the surface down to a depth of 10 ft., grout was poured between the 4-in. and 6-in. pipe to prevent gas escaping anywhere except from the top of the pipes, which extended above the surface 20 ft. Upon the end of these three 4-in. pipes were securely fastened copper-gauze caps or hoods, 6 in. in diameter by 6 in. high, 784-mesh per sq.in., this mesh gauze being impervious to flame. The average cost per foot of these boreholes completed, including pipe, grouting and other material, was $2.75.

Further Precautions

When the holes were near completion, the fires under the drill-rig boilers were drawn and the holes completed by steam furnished from the boiler plant at the mine, this precaution being taken to protect the drillers. There was considerable pressure at the first hole for several hours after the drilling was completed, slight pressure at the third hole, and a noticeable suction down the second hole; however, an increased pressure was noticed at the first hole during the period of suction at the second hole. All three holes were successful in hitting the headings as planned.

At the completion of the drilling an inspection and test of the holes was made by Assistant State Mine Inspector Long, who also tested with a Lieler lamp around the pillars in the No. 12 seam, through which the holes passed. He found the work satisfactory.

As a further precaution, a 3-ft. concrete basin was built at the top of the shaft, into which is pumped all the water from the sump, which is the shaft below the No. 12 seam, the water being kept to a point 10 ft. below the cage landing. This enables a close watch to be kept on all water pumped out in order that any disturbance may be quickly detected. Since the mine has been in operation a watch is kept on the holes to see that they are in working order at all times, and we have found that they have well served their purpose.

Causes of Explosion

It may be of interest to members of this institute, for the purposes of discussion, to hear several of the theories advanced by mining experts as to the cause of the explosion. Several operators have advanced the idea that the explosion took place in the upper or No. 12 seam, a pocket of gas having been ignited by one of the seven men at work. The idea is further advanced that the rush of air after the explosion, in passing up the shaft, caused such a suction as to draw the column of water about 110 ft. deep up the 211-ft. shaft, releasing the pent-up gas from the No. 9 seam, the opinion being that the gas in passing up the shaft was fired at the opening to the No. 12 seam, setting fire to the shaft timbering and tipple.

A second theory was that air and gas were compressed in such volume that a heavy fall in the lower seam was sufficient to cause the column of water to be ejected from the shaft, followed by gas, which expanded through the upper seam and was ignited from the lamps of the men.

A third theory, and the one most generally accepted, is as follows: A large fall or some unusual disturbance in the No. 9 seam caused the ignition of the gas and subsequent explosion at that point, which forced out the water; the seven men in the No. 12 seam being overcome with afterdamp. From the position of the bodies when found, it appears that the men, who were the only ones in the mine at the time of the accident, were on their way to the shaft bottom, having finished work for the day. There was also little evidence of the explosion in the upper seam, and there were no lights at the cage landing, as the generator was not running that day; hence the third theory seems the most probable of those advanced, and particularly so from the fact that gas had never been found in the No. 12 seam in sufficient quantities to cause it to be mentioned in the reports of the mine inspector. This is also true since the mine has resumed operation.

It is impossible to obtain any exact information as to the origin of the explosion. The use of the boreholes has proved successful, permitting the uninterrupted operation of No. 12 seam.

In the discussion which followed, Prof. Norwood suggested that the expulsion of water was due to the natural pressure of the gas escaping from No. 9 seam. As the lights at No. 12 landing were electric, and as the generator was idle, the firedamp must have been ignited by the lamps of the miners. The doctor who attended the victims was of the opinion that the men died from the effects of steam. Mr. Cunningham explained that the pillars left around the boreholes in the upper seam were of 20-ft. radius.

Keep the electric motors and the damp spots separated if you would avoid trouble, for while they may both have their uses they make a bad combination when brought together.

Coal Mining Institute of America

Editorial Correspondence

Resume of discussion and and account of papers read at the Tuesday night and Wednesday sessions. So many papers were presented that the time for discussion was greatly restricted.

The opening session of the institute was largely recorded in the previous number. This session closed with two discussions, the first of which, "What kind of motor is safe?" developed more interest than available information, and is not elaborated on here.

Corrosive Action on Pumps

Discussion then followed on the question:

"What kind of pumping machine is best suited to withstand corrosive action?" Mr. Taylor said that the Bureau of Mines was testing the action of electric currents. He said remarkable results had been obtained relative to the immunity of materials from corrosion when protected by an electric current of the correct voltage. Mr. Affelder spoke favorably of wood and phosphor bronze, but Mr. Cameron, of Irwin, Penn., did not feel so well assured of its efficacy.

Mr. Hall explained the method of preventing corrosion by the use of a rubber composition dovetailed into valve seats. These seats could not be corroded in channels through the rubber composition: thus such channels could not be initiated and an important source of valve-seat destruction was thus removed. Mr. Taylor suggested that an electrolytic action might aid in the destructive work. Mr. Phillips said that wooden jackets in cylinders frequently buckled and caused trouble.

With the question box still unemptied, the meeting adjourned. Some communications of more than ordinary interest were of a private nature and were therefore stricken off the minutes, but these, with other arguments presented, were of considerable value and made the meeting of more than ordinary interest.

Evening Session of Dec. 19

The meeting was conjoint with that of the Engineers' Society of Western Pennsylvania, being numerously attended by members of that society. After a humorous address by Walther Riddle, president of the Engineers' Society, O. S. Lyford, Jr., of Westinghouse, Church, Kerr & Co., read a paper on "Power Plants with Special Reference to Requirements in Western Pennsylvania," which, as the author declared, neither applied to power plants generally, nor to western Pennsylvania specifically. The article related to turbo-generators of alternating current of large size scattered almost from coast to coast, and stated that the geographical location, while it might change the coal used, otherwise made no difference to the size and cost of the plant, for economy in the use of steam was to be advocated everywhere, as waste of steam involved larger boilers and turbo-generators with consequent equality in first cost.

The discussion was animated and well conducted, R. W. Stovel ably meeting all the criticisms advanced. The paper will receive much favorable consideration for it contained three tables of cost items in the installation of turbo-generator plants, which will be invaluable for reference.

Morning Session of Dec. 20

The morning session opened with a paper on "A Remarkable Coal Formation," by Jesse K. Johnston, of Charleroi. This referred to a thickening of what is generally regarded as the Upper Freeport coal, north of Pittsburg, extending from Hamarville south. The discussion seemed to indicate a doubt as to the identity of the bed, the opinion being advanced that it is an exceptionally clean bed to belong to the horizon in which Mr. Johnston and others would place it. The suggestion was made that the limestones by which that horizon was determined were unreliable and had long since been regarded as unsatisfactory keys to the identity of the measures in which they occur.

W. R. Crane read a paper on "Special Methods of Testing for Mine Gases," describing and demonstrating three European systems of determining the presence of noxious gases. An abstract of this paper will be found on another page. The paper by E. M. Weir, which followed, on "The Construction and Maintenance of Telephone, Signal and Trolley Lines in Mines," is also abstracted and appears in this issue. G. A. Burrell's paper, which created less interest than its merit demands, was printed in Coal Age last week. It is to be expected that the careful perusal of its interesting and original facts will make important changes in mining practice.

Wednesday Afternoon Session

E. N. Zern, assistant professor of coal mining, University of Pittsburg, read an article on "The Price of Coal Compared with Price of Materials Used in Mining." It was shown that the tonnage cost of coal was lower than that of most of the materials the operators must buy and which, it would seem, were not produced at any great expenditure of labor or capital. But in the absence of cost sheets of industries compared, the statement did not bring abounding conviction.

H. H. Clark's paper on "Electric Symbols for Use on Mine Maps to Indicate the Character and Location of Electrical Apparatus" is reprinted in full and it will be found of much value for reference. It is expected to figure largely in the discussion of appropriate signs by a committee which the chief of the mining department of Pennsylvania has called for that purpose.

Mr. Randolph's paper, which related to electric symbols in general, is not reproduced as such a subject is somewhat devoid of interest. However, it is understood that Mr. Randolph assisted Mr. Clark in the preparation of his symbolic dictionary and should receive full credit for his share in the meritorious work.

C. J. Griswold, assistant professor of mining, Carnegie Technical School, Pittsburg, gave a fluent and capable address on "Lignite Mining in Colorado," describing the difficulties arising from a shrinkage of 15 per cent. in the fuel between miner and consumer, the trouble between miner and operator, and the arrests by the city-scale tester. The fuel contains 23 per cent. of moisture, 8 per cent. of which evaporates within a week after mining. The roof is bad and a foot of lignite is left to support it. A pile of lignite slack 3 or 4 ft. deep will ignite spontaneously and the faces of pillars disintegrate to the depth of a foot. Royalties run about 25c. per ton, though a sliding royalty in proportion to tonnage per foot per acre worked is being put into operation.

Evening Session

The institute dinner followed at the Seventh Avenue Hotel. The flow of eloquence was clipped to the quick to permit of the address of President S. A. Taylor, who, with an excellently illustrated article on "The Coalfields of the World with Some Statistics and Data Thereon," occupied nearly the remainder of the evening. This lecture was, of course, delivered at the Engineers' Society rooms. R. D. Hall then exhibited some pictures of the Briceville explosion, accompanying them with a descriptive talk.

It was arranged that a query-box should be a feature of the summer session as it was of this winter meeting. The announcement of the subjects to be discussed is to be made a month before the institute convenes. No decision has been reached as to the place at which the next meeting shall hold session, but Johnstown has been suggested and is favorably regarded.

Pathogenic Mine Atmospheres—I

By Edwin M. Chance*

A consideration of the many methods of analyzing mine gases, with a discussion of their relative accuracy. The Fresenius-Winkler method is advocated for methane; the use of iodine pentoxide is favored for quantitative analysis of the monoxide.

The actual analysis of a sample of mine air is by no means as simple a matter as might at first appear. To begin with, the limit of error permissible in such work is of an entirely different order from that in the analysis of fuel or flue gases. The constituents to be determined, with the exception of oxygen and nitrogen, are for the most part present in extremely small quantities, while the presence or absence of one or two of these may be of vital importance. Thus the classic methods based on the selective absorption, in turn, of the various components of a gaseous mixture, the quantity of each being estimated by the decrease in volume of the gas, are unsatisfactory, except in the determination of oxygen. By this procedure such a small volume of sample is operated upon, and the substances to be determined are present in such small quantities, that the error is unpermissibly great. It is true that Haldane has devised a very ingenious apparatus working on the above principle. It has been the author's experience, however, that the apparatus is so complicated and its manipulation so cumbersome that other methods are preferable.

With these points in view, the writer has, after considerable experimentation, selected a number of methods from the literature of the subject, and has found them to give most satisfactory results. A detailed description of these methods would lie without the scope of this paper. It will suffice, therefore, briefly to touch upon their salient points.

Taking Samples of Gas

The gas samples are collected in copper cylinders of about 3 litres capacity, with conical ends, each end carrying an accurately ground tubulated brass stopcock. When a sample is to be taken, a cylinder is filled with clear water, and carried to the desired spot. On opening the cocks, the can will be filled with air as the water recedes. As soon as the can is free of water the cocks should be closed. If the sample is to be taken from a pipe or bore hole, a rubber tube of small bore, previously filled with water, is slipped over one of the cocks. The tube may then be thrust or lowered into the pipe or bore hole to the desired point. While holding the cylinder in a vertical position, with the cock bearing the rubber tube uppermost, the cocks are opened, when the desired sample will be drawn into the cylinder. It is important in using these cans to allow all water to drain out, when taking the sample, and to make the analysis as soon as practicable.

Carbon Dioxide Determination

Carbon dioxide is determined by the method of Pettenkofer or Hesse. This method has many variations. The following, however, has been found to give thorough satisfaction: A heavy litre or litre-and-a-half Erlenmeyer flask, the volume of which has been previously determined, is filled with water at room temperature, and then filled, by displacement, with the air to be analyzed. The flask is closed with a well-fitting two-hole rubber stopper, the apertures of which are closed by glass rods. A known excess of a clear solution containing 15 gm. of barium hydroxide and 1 gm. of barium chloride per litre is then run from an automatic pipette through one of the holes of the stopper. After closing, the flask is allowed to stand, with frequent shaking, for at least a half hour. At the end of this period the rods are withdrawn, the barium hydrate solution is tinted with phenolphthalein, and cautiously titrated with gas-normal oxalic acid. This solution contains 5.629 gm. of crystallized oxalic acid per litre, 1 c.c. being equivalent to 1 c.c. of carbon dioxide, measured at 0° C. and 760 mm. pressure.

While the carbon dioxide is being absorbed, another portion of the barium hydroxide solution is titrated with the oxalic acid. From this determination the ratio of oxalic acid to barium hydroxide is found. The volume of carbon dioxide in the sample operated upon is thus readily obtained by subtracting from the volume of oxalic acid, equivalent to the quality of barium hydroxide originally taken, the volume of oxalic acid required after the absorption of the carbon dioxide. In calculating the percentage of carbon dioxide, note must be made of the thermometer and barometer readings when the flask is filled with air for analysis.

From these values the volume of the air contained is reduced to normal conditions, first deducting the volume of the barium hydroxide added. Great care should be taken in adding the barium hydroxide, as well as in the subsequent titration, that there be as little opportunity as possible for the air in the flask to mix with the outside air. Most commercial samples of barium hydroxide contain some alkali metal hydroxide. In such a case alkali metal oxalate may be formed, when at the close of the titration the following reaction will occur:

$$Na_2C_2O_4 + BaCO_3 = BaC_2O_4 + Na_2CO_3$$

Under these conditions the bleaching of the color of the phenolphthalein is not permanent, the color returning after repeated addition of acid, and thus shrouding the end point in uncertainty. By the addition of barium chloride the alkali metal hydroxide is converted to chloride and rendered innocuous, the end point once more becoming sharp. As the dilute solution of oxalic acid used is far from stable, a fresh solution should be frequently prepared. The barium hydroxide solution should be protected from the carbon dioxide of the air by the usual methods.

The accuracy of this method has been demonstrated by the exhaustive researches of Letts and Blake. Its precision will become apparent when it is considered that, granting the burette may be read to 0.05 c.c. and that 1000 c.c. of air are operated upon, the error in reading should not exceed 0.005 per cent. of carbon dioxide. There is, of course, an ever-present error due to the solution of carbon dioxide in the water when filling the sample can and transferring the air to the flask. This error, however, is small with careful work. Hydrogen sulphide and sulphur dioxide, if present, must be corrected for.

Methane Determination

The determination of methane is best carried out on the residual gas from the carbon dioxide determination, although, if desired, a fresh portion may be taken. Two methods recommend themselves for this purpose. In the first, or Winkler's method, the methane is slowly oxidized by means of a heated platinum helix and atmospheric oxygen. In the second it is oxidized by contact with heated copper oxide, independent of atmospheric oxygen.

If the first method is to be pursued, the original copper is replaced by one carrying two brass rods, the transfer being made while the flask is held inverted with its mouth just under water. These rods extend within about 5 cm. of the bottom of the flask, and are joined at their inner extremities by a piece of platinum wire 0.35 mm. in diameter and 7 cm. long, bent in the form of a helix. The outer extremities are connected with a source of electricity. The flask is inverted and held in this position entirely submerged in a bath of cold water. A current of electricity is now passed through the ap-

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paratus sufficient to raise the platinum wire to a dull red heat. It is gradually increased during a half hour to about 9 amperes, or sufficient to bring the platinum to incipient whiteness.

At the expiration of this period the current is broken, the flask removed from the water, the stopper used in the carbon dioxide method substituted for the one bearing the brass rods, and the carbon dioxide formed by the combustion of the methane is determined as previously described. In this case, however, each c.c. of oxalic acid consumed is equivalent to 1 c.c. of methane, measured under normal conditions.

This method has many drawbacks. Heat enough is often generated to develop pressure sufficient to cause leakage of gas around the stopper, to blow the stopper out or to burst the flask. The flask may be subjected to such unequal heating as to cause it to crack spontaneously. It is always possible that traces of methane may escape oxidation. Moreover, if the percentage of methane be high, as in the analysis of fire damp, or if the percentage of oxygen be low, as in the analysis of black damp, it is necessary to mix the gas to be analyzed with either pure air or oxygen, an operation which is time-consuming, troublesome, and apt to engender grave errors. Should the percentage of methane fall within explosive limits, the method is entirely inapplicable, as even with dilution there is danger of an explosion. Under ideal conditions the accuracy obtainable by this method is of the same order as that in the carbon dioxide determination.

Another Method

After a lengthy trial of the first method, the writer has adopted the second, or that of Fresenius modified by Winkler. Either the flask containing the air from the carbon dioxide determination, or one filled with a fresh sample, is arranged so that the contained gas may be displaced by water. The air is led first through a soda lime tube, a calcium chloride tube, and then a combustion tube. This combustion tube is of heavy copper, 45 cm. long and 2 cm. in diameter. It is partly filled with coarse copper oxide, is heated to redness by four Bunsen burners, and is provided, at either end, with an annular copper jacket, about 5 cm. long, through which cold water is circulated. These water jackets cool the perforated rubber stoppers through which the air is led, as well as the copper gauze with which each end of the tube is packed. This gauze serves a double purpose; it holds the copper oxide in place, and, should the gas to be analyzed be explosive, acts as the gauze in a Davy safety lamp, eliminating danger from this source.

The air, on leaving the combustion tube, is passed through two 200-c.c. Erlenmeyer flasks. These flasks contain a known volume of barium hydroxide solution, of the same strength as used in the determination of carbon dioxide, and a few drops of phenolphthalein. After the sample of air has passed through the combustion train, an operation requiring about 35 minutes, the flask in which it was originally contained is removed, and air from without the building is aspirated through the apparatus for about 25 minutes. The two absorption flasks are removed, their contents combined and titrated with oxalic acid as in the determination of carbon dioxide.

This method will give accurate results irrespective of the proportion of oxygen or methane in the original sample. The copper oxide in the tube is regenerated by the passage of air after the gas sample, thus leaving the tube in good condition for the next determination. It is important that the air samples should not be passed through the apparatus too rapidly, and that a notable excess of barium hydroxide be maintained in the absorption flask. The barium hydroxide is therefore tinted with phenolphthalein to give warning of its depletion.

It might be well to review some considerations governing these methods. In correcting the volume of the sample in the flask, if the residual air from the carbon dioxide determination be used, both the volume of barium hydroxide and oxalic acid used in the carbon dioxide determination must be deducted before reducing the air volume to normal conditions. In the first method, when calculating the volume of air in the flask an additional deduction must be made for barium hydroxide added and for the volume of the brass rod electrodes. Of course, in the second method this correction does not apply.

In determining methane by the first method, on a sample of air from which carbon dioxide has not been removed, the percentage of carbon dioxide in the air must be deducted from the percentage of methane found. This correction is unnecessary in the second method, as all carbon dioxide is removed by the soda lime tube. In both methods the percentage of carbon monoxide in the air must be deducted from the percentage of methane found, as one volume of carbon monoxide burns to one volume of carbon dioxide as does one volume of methane. In the first method hydrogen sulphide and sulphur dioxide, if present, must also be corrected for.

Carbon Monoxide Determination

The accurate determination of even traces of carbon monoxide is of paramount importance. This fact, coupled with the chemical properties of the gas itself, renders recourse to special methods necessary. The well-known unreliability of the methods based on its absorption by solutions containing cuprous chloride forbids even the thought of their application here.

Haldane has endeavored to apply the well known gas volumetric method based upon the changes of volume occurring when this gas is burned and when the resultant carbon dioxide is absorbed. As has been noted, however, such methods, through inherent weakness, would seem to fall short of giving the desired accuracy. There is, moreover, nothing positive about these methods.

Blood-test Disparaged

For this reason the so called blood-test has found considerable favor. In this test advantage is taken of the pink color given to dilute solutions of blood by carbon monoxide hemoglobin. This test, when properly performed by an experienced operator, gives qualitative indications of undoubted value. The personal equation, however, plays too prominent a rôle to permit of its quantitative application, though much has been written to the contrary. If the blood solution containing carbon monoxide be examined spectroscopically the indications are said to become quantitative, however, this method having a wide application in the field of forensic chemistry. Apropos of the qualitative value of the blood-test, another well known qualitative test might be mentioned.

This consists in passing the air to be examined through a solution of sodium cuprous chloride, diluting somewhat and adding a few drops of sodium palladious chloride, when, if carbon monoxide be present, a black precipitate should be formed. This test may be varied by passing the air through a small quantity of water containing strips of filter paper moistened with palladious chloride, the paper blackening in the presence of this gas. A quantitative variation based upon these reactions has been brought forward by Potain and Drouin. The detection of carbon monoxide by any of these alternatives is, however, unsatisfactory, as too great a volume of air is required for convenience, and there are many interfering substances.

A method has been devised by Spitta, in which the carbon dioxide produced by the combustion of carbon monoxide by silver electrodes, coated with palladium and heated to 150° to 160° C., is determined by Pettenkofer's method. This method is said to be applicable in presence of hydrocarbons, and to possess considerable accuracy.

Preferred Test

Probably the methods best adapted to the determination of carbon monoxide in mine air are based upon its oxidation by iodine pentoxide, as pointed out by de la Harte and Reverdine. This reaction proceeds as follows: $5CO + I_2O_5 = 5CO_2 + I_2$, and is quantitative at from 150° to 160° C. If this latter temperature be not exceeded, methane and hydrogen have no

action on the reagent, though hydrocarbons of the ethylene and acetylene series are attacked. As the latter gases occur but rarely in appreciable proportions in mine atmospheres, their action may generally be neglected. Hydrogen sulphide and sulphur dioxide might also interfere, but may be readily removed.

Many different applications of this method have been brought forward. Gautier absorbs the carbon dioxide formed, and measures its volume after liberation by acid. The same author bases a gravimetric method upon the absorption of the iodine by spongy copper. Nicloux, working at the same time as Gautier, though independent of him, has published a procedure in which the amount of iodine evolved is determined colorimetrically after its solution in chloroform. Fillinger has described an apparatus brought forward by Molterski and Norwicki, in which, after removal of the free iodine by metallic silver, the carbon dioxide generated is determined by Pettenkofer's method.

Other Modifications

Their procedure, with slight modifications by the author, may be thus described: One of the copper sample cans containing the air to be analyzed is placed in a vertical position, and so arranged that water, at room temperature, may be admitted through the bottom tap. The air thus displaced passes through the upper tap to a U tube, the first leg of which contains calcium chloride, the other soda lime. It then passes through a small U tube, containing about 25 gm. of iodine pentoxide, mixed with sufficient glass wool or asbestos to render it porous. From this tube the air passes to a Bowen absorption tube containing about 5 c.c. of 10 per cent. potassium iodide. The tube containing the iodine pentoxide is surrounded by a sand bath, the temperature of which is held between 150° and 160° C. The sample of mine air is passed through the apparatus at a rate of about 1 litre per hour. One litre of air is the quantity usually used, though more may be taken if desired.

After the requisite quantity of air has been passed through the apparatus the lower cock of the sample can is closed, and when the bubbles cease to pass through the absorption tube the upper cock is closed and the can is removed. An aspirator is attached to the absorption tube and a slow current of air from outside the building is drawn through the apparatus for about one-half hour. The absorption tube is then removed, its contents rinsed out with distilled water, and titrated with N/1000 sodium thiosulphate, with the addition of a little starch liquor. Each cubic centimeter of thiosulphate is equivalent to 0.056 c.c. of carbon monoxide, measured under normal conditions. The quality of air which has been passed through the apparatus may be determined by measuring the quantity of water in the sample can, or by noting the increase in weight of the can. The volume of air thus determined must be reduced to normal conditions.

Kinnicutt and Sanford Method

In their paper, Kinnicutt and Sanford recommend the purification of the air before bringing it into contact with the iodine pentoxide, by passing it first through concentrated sulphuric acid and then over solid potassium hydroxide. This procedure is said to eliminate interfering unsaturated hydrocarbons. As the presence of such in mine air is problematic, as the sulphuric acid, owing to its contamination by organic matter, is apt to generate sulphur dioxide, and as the back pressure of the column of acid would have to be allowed for in computing the volume of air used in analysis, the simpler combination described has been substituted, the function of which is to remove hydrogen sulphide, sulphur dioxide, and water vapor. Should the presence of ethylenes or acetylenes be suspected, the former method may be desirable. These writers, in their work, used an oil bath.

It has been found, however, that such baths are not applicable here, as the oil creeps and on coming in contact with the iodine pentoxide liberates iodine. It is important to keep the volume of the purifying tube as small as possible, as less air is thus required to sweep the apparatus clean. It is not practicable to use the air of the laboratory for this sweeping out, as it generally contains sufficient carbon monoxide from leakage of illuminating gas to vitiate the results. The apparatus throughout should be glass-stoppered, and all connections should be of glass tubing, held firmly with glass against glass, so that there is as little contact as possible with rubber. The weak standard sodium thiosulphate is far from stable. For this reason it is best to prepare a N/10 solution and to dilute 10 c.c. of this to 1 litre as required.

Oxygen Determination

Of the many methods proposed for the estimation of oxygen, two have stood the test of long usage. In the first the oxygen is absorbed by a solution of pyrogallol in strong potassium hydroxide. In the second the slow combustion of phosphorus at room temperature is utilized. While these methods are so well known that their description is unnecessary, a few remarks concerning the applicability of each might be acceptable. The pyrogallate method gives results of unquestionable accuracy when properly carried out. The solution, however, due to its causticity, is unpleasant to handle. It, moreover, deteriorates rapidly, and there is therefore some uncertainty as to the efficiency of a previously-used solution. The advantage of the method lies in the fact that other gases do not interfere with the absorption of oxygen.

In the phosphorus method the pipette containing the reagent must have a temperature of at least 18° or 20° C., the absorption being very slow below this point, almost ceasing, indeed, at 7°. In the presence of certain gases the action of the phosphorus is prevented. Brunck states that the absorption is not rendered slower or less complete by the disturbing gases, but that if white fumes are evolved on bringing the air to be analyzed in contact with phosphorus the reaction will be quantitative. The writer has not met with a sample of mine air to which the phosphorus method was inapplicable. Should difficulties be encountered, however, the former method will be found satisfactory. The advantages of the latter method are its cleanliness, rapidity, and accuracy. An apparatus when once set up can be used for years without renewal of the reagent. The Lindemann-Winkler apparatus will be found convenient, as it is self-contained, requires little manipulation, and may be carried into the mine when desired.

Determination of Other Gases

Nitrogen is always determined by difference.

Hydrogen sulphide and sulphur dioxide are generally detected by their odor. It is better, however, in the case of hydrogen sulphide to use strips of alkaline lead acetate paper, as the olfactory organs are apt to become untrustworthy. Quantitatively it may be determined by the depth of color produced when a known volume of air is passed over lead acetate paper, or by passing the air through a solution of iodine and volumetrically determining the iodine consumed by black titration with sodium thiosulphate. Sulphur dioxide may be determined iodimetrically as just mentioned, or may be weighed as barium sulphate after oxidation with hydrogen peroxide.

The results of an analysis of mine air for ready interpretation are stated in two forms. The values found for oxygen, nitrogen, carbon dioxide, carbon monoxide, and methane comprise the first. The percentage of normal air is then calculated by multiplying the percentage of oxygen found by 100, dividing by 20.93. This value is termed "air." Methane is reported as "fire damp" and carbon monoxide as "white damp." The percentage of carbon dioxide less 0.03 per cent. is termed "excess carbon dioxide." One hundred per cent. less the sum of the percentage of "air," "excess carbon dioxide," carbon monoxide, and methane gives the "excess nitrogen." It is often convenient to term the combined values for "excess carbon dioxide" and "excess nitrogen"—"black damp." The second statement of results will therefore contain the figures for "air," "fire damp," "white damp," and "black damp."

Methods of Testing for Mine Gases

By W. R. Crane*

Recently devised methods of testing mine air for the gases it may contain are becoming more complicated and difficult. Description of a new marsh-gas detector. A suggestion of a mine signaling system to warn the officials of accumulations of gas in the mine.

The gases found in coal mines are not so many or varied in character as to lead to confusion in the methods of testing; although, as time goes on, the methods of testing for the various gases are becoming more varied and in many cases more complicated and difficult for the ordinary individual to understand. Many of the appliances and methods for detecting the presence and quantity of gases in mines are based upon well but not widely known chemical and physical laws. Their use, therefore, by the ordinary mine official, must of necessity be according to rule of thumb, rather than from any exact knowledge of the theory upon which the apparatus is based.

The three most common, and therefore, most important gases found in coal mines are marsh gas, carbon dioxide and carbon monoxide. Nitrogen will not be considered here as a mine gas since it is a constituent of air. It forms, however, a part of all firedamp and blackdamp. . . . Nitrogen is, therefore, always present in the gases resulting from the combustion of marsh gas and air. While it is not impossible to determine the presence and the amount of firedamp present in a given mine atmosphere, yet it is not readily done and consequently, unless great care is taken, the results obtained may be quite inaccurate. Furthermore, as the same result may be arrived at by numerous simple and accurate ways, it seems undesirable to employ round-a-bout means to secure possibly less accurate results. The essential thing that we wish to know is what per cent. of marsh gas is present; then knowing the percentage of gas that is well within the limits of safety, we have all the information that is necessary. Firedamp is composed of any mixture of marsh gas and air ranging between the limits of 1 volume of gas to 3½ volumes of air and 1 volume of gas and 30 volumes of air, which gives the full range of combustible mixtures of this gas and air, and shows the term firedamp is really an uncertain expression.

Carbon monoxide, though not a constituent of mine air, is often found in coal mines, in dangerous quantities. Its presence in the mine air is due to the burning of explosives or other forms of incomplete combustion. It is particularly noticeable immediately after firing a shot at the face, where it can usually be detected by a candle or safety lamp.

A Marsh Gas Detector

The safety lamp is, of course, the standard method of testing for marsh gas and its use is so well known that it will not be considered in this connection. The following method of testing for marsh gas has recently come to our attention and owing to its simplicity and accuracy it is deemed worthy of brief mention.

The action of this detector or testing device is based upon the fact that certain metals will absorb gases either on their surface or in their mass, which property is designated as *occlusion*. Platinum and palladium will absorb large quantities of hydrogen, particularly when heated to a certain temperature. Platinum will absorb four times its volume of hydrogen; iron wire 0.44 its volume of hydrogen; silver once its volume; while palladium will absorb 980 times its volume of hydrogen. Platinum occludes other gases besides hydrogen; particularly oxygen, of which 250 times the volume of sponge platinum is absorbed. While no definite figures are available as to the capacity of wire or sheet platinum to absorb oxygen, yet it is probably safe to say that fully 100 volumes of oxygen are absorbed by platinum in the solid state. . . . The apparatus consists of two pairs of strips of dissimilar metals *A* and *B*, Fig. 1, fastened rigidly to blocks at the end of each pair, the free ends of the pairs extending toward each other and slightly overlapping. The dissimilar metals are so arranged that when heated unequal expansion of the members of the pairs causes a downward-bending or deflection of the pairs. Directly below the respective pairs and in close proximity with them are placed coils of wire *C* and *D*, through which an electric current is maintained, as constant as possible, although that is not absolutely necessary to the proper and accurate manipulation of the apparatus.

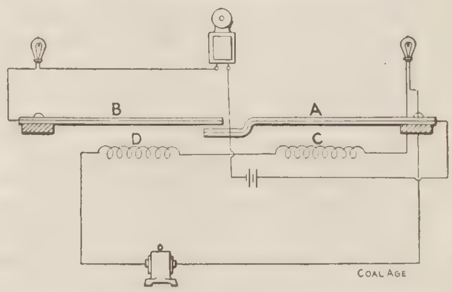

Diagram of Marsh Gas Detector for Use in Mines.

One of the coils *C* is made of ordinary resistance wire, the other *D* being platinum. A current sent through these two coils will generate, when hydrogen or compounds of hydrogen are not present, an equal amount of heat, thus causing the two pairs of strips to be deflected to the same extent. In the presence of hydrogen the conditions are quite different. The platinum absorbs the hydrogen and when the proper temperature has been reached combustion will take place between the hydrogen thus collected and the oxygen of the air. The temperature at which ignition takes place is somewhat above 500 degrees Fahrenheit.

When the hydrogen in the atmosphere is not in the free state but is combined with carbon, forming marsh gas or in fact any of the hydrocarbon series, a catalytic action takes place about the platinum and the marsh gas is probably decomposed, setting free both hydrogen and carbon, which then combine with the large quantity of oxygen present. Considerable heat is thus generated and materially increases the temperature of the platinum coil *D* above that of the resistance coil *C*. The pair of strips *B* is thus subjected to the greater heat or higher temperature and will naturally be deflected more, the result being that the two overlapping ends of the pairs will come together, thus making connection and so completing the circuit of a bell or incandescent light or both as desired.

As indicated above it is not necessary to employ a current of constant voltage, neither is it necessary to concern ourselves about the external temperature and its changes, as the apparatus is responsive to the effects of marsh gas only, which is in this case the element of danger.

Adjusting the expansion-pairs by bringing them closer together or moving them further apart, renders it possible to make the apparatus exceedingly sensitive to the presence of hydrogen. The apparatus may then be tuned as it were to suit the desires or requirements of those in charge of a mine, or if it so happens, meeting the demand of the law governing and regulating the amount of gas allowed in a mine.

The signal, be it a bell or light, will continue to respond to the presence of the danger element until it has been removed or a switch has been thrown cutting out the signal.

Another decided advantage aside from

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Note—Abstract of paper read before the Coal Mining Institute of America, Dec. 20, 1911.

the sensitiveness of the apparatus, consists in the fact that the presence of gas can be indicated at practically any distance from the point of its accumulation in the mine. Further, any number of indicators may be placed at various points in a mine, all being connected by a system of wiring to a central underground station, or office on the surface. By this means it would be possible for the official in charge to keep himself informed as to the condition of the mine, and by a slight additional expense, recording instruments could make permanent records of the condition of the mine atmosphere.

[Dr. Crane's paper further described a form of apparatus known as the Simonis carbon monoxide detector, which, he stated, was considerably more complicated in its construction and operation than the usual blood test employed to detect the presence of that gas. The paper also described Dr. Haldane's proposed method of detecting the presence of blackdamp in mine air, which formed the subject of a paper read two weeks previous, by Dr. Crane, before the West Virginia Mining Institute meeting, held at Fairmont, W. Va. This paper was published on page 281 of COAL AGE, Dec. 9, 1911.—EDITOR.]

The Maxwell Colliery

The collieries of the Pennsylvania anthracite field may in general be said to range in daily capacity from 1000 to 4000 tons of prepared coal. With an output of 3000 tons per day, the Maxwell colliery at Ashley, Penn., ranks as one of the larger operations of the Wyoming region. A photograph of the Maxwell breaker and surroundings is given on the front cover of this issue, and is presented because of its excellent portrayal of a typical anthracite plant rather than with an idea of depicting any particular phase of colliery construction or practice.

Ashley lies several miles to the south of Wilkes-Barre, Penn., and nearly at the southern extremity of the Northern anthracite field. At this point the coal measures begin to bear evidence of the violent disturbance which has resulted in the steeply pitching veins of the Middle and Southern fields; and both flat and pitching seams are mined at the Maxwell colliery. Two shafts, to the Baltimore and Red Ash veins, respectively, and a slope to the Hillman vein, bring to the surface the coal from the six seams which are worked on this property.

The breaker shown in the photograph was erected in 1895 and remodeled in 1907. In a field where the slightly varying conditions at different operations are met by distinctly different forms of construction and methods of operation at the individual plants, it is frequently difficult to distinguish between old and new practice, but it may be said of the Maxwell breaker that the tower hoist marks it at once as belonging to an older type of construction. The slanting back brace of the tower for this hoist is easily distinguishable in the photograph, as is also the front end of the engine house. The function of the hoist is to lift mine cars from the ground level to the head of the breaker; and in nearly every instance of more recent construction this arrangement has been superseded by an inclined conveyor or by a car plane.

The dry method of coal preparation is employed at the Maxwell breaker, that is to say, the coal, excepting the buckwheat sizes, is not subjected to a washing or jigging process, but is cleaned by various mechanical devices insofar as practicable. As previously stated, the colliery produces 3000 tons daily.

This property is owned and operated by the Lehigh & Wilkes-Barre Coal Co., Wilkes-Barre, Penn.

Telephone, Signal and Power Lines for Mines

BY E. M. WIER*

A great deal is heard at present in regard to standard equipment and scientific management for industrial concerns. Among railroads, manufacturing companies and other industries, these subjects are receiving, with beneficial results, the attention of those who direct the enterprises. I have had occasion to visit a large number of mines in different parts of the United States, Canada and Europe, and the one thing that has most impressed me in regard to them is the lack of standard methods for the installation of telephone, signal and power lines, and the lack of standardization of electrical apparatus in general.

This condition of electrical mining equipment is in strong contrast to the present-day practice of other large industries. At first, in all industrial lines standard specifications for electrical equipment were practically unknown, and as many different methods of installation and varieties of apparatus were used as there were companies employing electric power. But since this period of pioneer work, order has been brought out of chaos, and today we have standardized electrical equipment for practically every line of work except that of coal mining.

Lack of standardization involves greatly increased expense. The burden of this expense is borne, first, by the coal operator, and then to some extent by the manufacturer and jobber of supplies. The two latter are required to carry a stock of many different kinds of apparatus and material, and must charge enough for their supplies to offset the investment of a large amount of money in the surplus stock, whereas, if installation and equipment were standard, the amount of extra and special material which need be made and kept on hand, would be greatly reduced with a consequent reduction in the price of the individual articles.

As I see it, the benefits to be gained by standardization in the coal-mining industry of electrical apparatus and methods of installation and transmission, may be summarized as follows:

(1) The supplies could be purchased more cheaply, because they would be manufactured in larger quantities, and because the expense of selling them would be reduced.

(2) The investment for equipment would be less, because the apparatus would be designed along scientific and efficient lines, and because its installation by labor trained in the use of standard methods would be cheaper than it is under present haphazard conditions.

(3) Profits of the industry would be increased because there would be less trouble developed in the various installations; there would be less delay in making repairs and securing repair parts; and because the mine superintendent would know just what to order instead of having to guess at it as at present, and, incidentally, would have more time to devote to other matters.

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Note—Abstract of paper presented before a meeting of the Coal Mining Institute of America, Pittsburg, Penn., Dec. 20, 1911.

An Endurance Test of Roller Bearings for Mine Car Wheels

The widespread interest which has developed during the last few years in respect to the economies effected by the use of roller bearings of one type or another in mine-car wheels, has resulted in many manufacturers placing on the market a line of wheels of this type and in their making accurate tests to demonstrate the practicability of this form of bearing for mine-car service. It is, of course, conceded that roller-bearing wheels effect great power economies, but many have had doubts as to whether or not they would stand up for any length of time under the severe conditions of mine work.

The following test, which was conducted by one of the largest manufacturers of mine cars in the country, was undertaken in order to ascertain which of two forms of roller bearings would stand the hardest service, or, it might be said, the greatest amount of abuse the flexible steel spiral roller or the solid cylindrical steel roller type. A roller bearing of each of these two types was fitted in journal boxes on a 2½-in. lineshaft. One of these bearings was of the Hyatt spiral steel-roller type, 6 in. long and operating in a box similar to that shown in Fig. 1. The other was a solid steel-roller bearing mounted in a similar box.

Device for Making the Test

Between these bearings was placed a babbitted journal box 7 in. long; and on the ends of the shaft, just outside of each of the roller bearings, were placed two more journal boxes of the same type, making three babbitted journals carrying the same load as the two roller bearings. Across the tops of these two roller-bearing boxes were placed heavy I-beam levers, one end of each attached to the floor and the other end carrying a 400-lb. cast-iron weight. The weight thus brought upon each of the roller bearings was 2720 lb., which made the load sustained by each plain bearing about 1800 lb. The shaft was then rotated at a speed of 185 r.p.m., equal to nearly 10 miles per hour with 18-in. diam. car wheels. The arrangement of bearings, levers and weights is shown in Fig. 2.

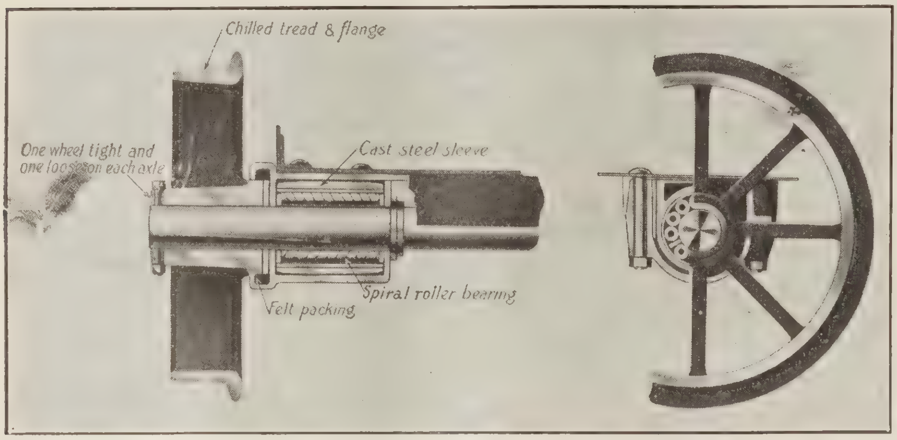

Fig. 1. Spiral Roller Bearing Applied to a Mine Car

At the end of two hours' run, or about 20 miles under this load and speed, the 7-in. babbitted bearings melted out, although a man stood by and oiled then. almost continually. They were then replaced by 2½x7-in. brass car journals. At the end of 6 hours' further run the spacing rings on the solid roller bearing had cut ridges in the rollers. The spiral roller bearings up to this time were absolutely uninjured. At the end of 17½ hours' run another examination was made, with no further developments.

At the end of 38 hours' additional run the rollers in the solid-roller box showed minute pock-marks on their surface, the metal in the rollers seeming to fall out in small granulations. At the end of 57 hours' additional run the linings of the solid-roller bearings likewise commenced to granulate and roughen.

Test Equivalent to a Year of Service

All were then allowed to run 152 hours more without further examination. At the end of this time the solid rollers were bent, the axle cut and ringed by the ends of the rollers and its diameter reduced 1/32 in. The linings of the solid-roller boxes were granulated. In the spiral-roller box the rollers were still in perfect condition. The bearings were then run 204 hours longer, making a total of 476 hours, which would be equivalent to nearly 5000 miles of car travel, or to at least a year's service in a mine. The spiral-roller bearing at the end of that time appeared to be undamaged, although it was apparent that the solid-roller bearing would last but a short while longer.

The trial was then resumed and run for 8½ hours. Before starting, the oil in the box was mixed with fine coal dust and a double handful of coal dust was poured on the rollers. The rollers in the Hyatt bearing ground this dust to powder, mixed it with the oil and took it up in their spiral hollows, no damage being done to the bearings. The solid-roller bearing ejected the coal dust from the box without further damage to the bearing, but thereafter it ran much harder. The brass car bearings became so hot that the oil in these journals reached the boiling point.

Fig. 2. Testing Device Showing Method of Applying Load

The speed was then increased to 380 r.p.m., which is equivalent to nearly 20½ miles per hour, and the weight was reduced to 1200 lb. At this speed and weight the brass car bearings could not be kept cool enough to run. They heated, cut and practically ruined the shaft. No damage, however, was done to the roller bearings.

At frequent intervals during this test the bearings were sledged on top with 16-lb. sledges, to give as nearly as possible the effect produced by violently striking the horns of a tipple dump. The load was also jostled up and down and sideways, after the fashion of the load in a mine car running at a high rate of speed. None of these measures, however, seemed to do any damage to the Hyatt bearing. It would be difficult to say just what part of the total wear of the solid-roller bearing may have been due to these latter variations of the test.

Graphite Made From Coal

Graphite, the commonest use of which is seen in the "lead" pencil, is almost pure carbon. This mineral is therefore only a step removed from coal and in fact some of the natural graphite deposits are found in coal beds where the intrusion of masses of intensely heated liquefied igneous rock has metamorphosed the coal, thus forming graphite. An example of this natural manufacture of graphite out of coal is described in one of the reports of the U. S. Geological Survey on the Raton Coal Field of New Mexico. On the other hand, large quantities of high-grade graphite are artificially manufactured direct from ordinary coal.

In making lead pencils the graphite is mixed with a clay of fine grain.

Steel vs. Wooden Mine Cars

By D. T. Evans*

> *Steel and wooden mine cars are compared in regard to their capacity, weight and cost, their life, and expense for repairs. The conclusion is reached that the longer life, lower maintenance and increased capacity per pound of tare weight of the all-steel mine car more than offset its higher first cost and will eventually show a considerable saving.*

The importance of the subject of mine-car construction to coal producers everywhere, is so great that whatever may be the relative merits of steel and wooden cars, it is to the interest of all that the matter should receive careful and earnest consideration, to the end that we may adopt without unnecessary loss and delay that style of mine-car equipment best suited to our needs and to insuring the greatest economy in the operation of our mines. We all know the wooden mine car and its many shortcomings. There are probably more different types in use than there are mines, because almost every mine has its own peculiar style, and, indeed, many mines have more than one, so that even were there time and necessity for doing so, it would be almost impossible to discuss the matter intelligently from any but a general standpoint. Therefore, I shall confine myself to a consideration of the material entering into the construction of the cars, rather than to any particular type or style of car.

For several years, I have believed that the cost of maintenance of wooden mine cars is unduly high, and their life unduly short, and have felt that, in self-defense, the mine operators of the country generally would have to either materially change the general construction of the wooden car so as to reduce the cost of maintenance and increase the life, or else resort to the all-steel car. With this idea in mind, and realizing that it was the only sure way to obtain definite information upon the subject within a reasonable time, I designed and had built, in September, 1909, an all-steel car, along the lines of the wooden car then in use.

Construction of a Trial Steel Car

The bottom was of 3/16-in. plate, in one piece, stiffened by a 1x4-in. drawbar, two longitudinal angles to which the sides were riveted, and by the angle-iron belts as well. The front end was made of 3/16-in. plate also, but the sides and rear end were of 1/8-in. material, no wood being used in the construction except the fillers or blocks for the bumpers, which latter were made of heavy 6x6-in. angle iron, riveted to the bottom of the car. This car, being the first one, cost nearly twice as much to build as the wooden cars; it weighed about 300 lbs. less and its capacity, for the same outside dimensions, was about 15 per cent. greater. We watched it carefully for nearly a year, during which time it was never off the track or required a cent's worth of repairs. It was much easier to handle than the wooden cars, and every miner in the mine wanted to load the steel car.

*General manager, the Mount Carbon Company, Ltd., Powellton, W. Va.

Note—Abstract of an article read before a meeting of the Kanawha Coal Operators Association.

It was then decided to build another car of the same general design, but slightly different in details, with a view to facilitating repairs and reducing the cost of construction. The continual use, for a little over eighteen months, of the first car, and six months' service from the second car, although not covering a sufficient length of time upon which to base definite conclusions, convince me that whatever the ultimate life of a steel car may be, it is certainly much greater than that of a wooden car, while the cost of repairs is certainly much less. At this writing, not a cent has been expended in repairs on either of these cars, and to all appearances they are as good as new, with the possible exception of a slight coating of rust on the inside of the cars. I have noticed that those portions of the outside of the car with which the "black-strap" comes in contact are as bright and smooth as when the plate came from the mill. The second car was built at a cost slightly less than 50 per cent. in excess of the cost of wooden cars, and I believe that this can be still further reduced when cars are made in quantities.

I have, in connection with this subject, communicated with a number of manufacturers of steel and wooden cars, and give below the results of my investigation. Steel cars have a much greater capacity than wooden ones of the same outside dimensions. This increased capacity varies, of course, with the design of the car, but it may safely be stated to range from 10 to 20 per cent. The following table will serve to show what this increase is in several types of car of the same outside dimensions:

RELATIVE CAPACITY OF STEEL AND WOODEN CARS OF SAME DIMENSIONS

Wooden Car	Steel Car	Increase, Per Cent.
49 cu.ft.	58 cu.ft.	18
94 cu.ft.	105 cu.ft.	11¾
53 cu.ft.	60 cu.ft.	13
14 cu.ft.	19 cu.ft.	35

The greater capacity is, of course, accounted for largely by the difference in thickness between the plates of a steel car, which never exceed 1/4 in., and the planks of which the wooden car is built, and also, in some instances, by the fact that it is possible to use a much flatter slope on the sides of steel cars, which adds somewhat to the strength of the steel car, while the same construction would weaken the wooden car.

Some Advantages of Steel Cars

For use in low veins, the steel car offers a decided advantage, because its height or general outside dimensions may be cut down considerably and it will still have the same capacity as a wooden car of larger dimensions. This increased capacity of the steel cars means not only a greater amount of coal handled in a given train load, and a consequent lower power cost per ton for hauling, but a considerable reduction in the number of mine cars needed to handle a given output.

I find a great difference in the weights of various steel and wooden cars having the same overall dimensions and it is difficult to make comparisons with any degree of accuracy. In some instances, steel cars are heavier than wooden cars of the same size, in others, lighter; but taking into account the increased capacity of the steel car, it is, I think, safe to say that its weight will average from 10 to 20 per cent. less than the wooden car. One manufacturer has kindly figured out for me the following comparative weights of cars having the same outside dimensions:

COMPARATIVE WEIGHT OF STEEL AND WOODEN CARS OF SAME DIMENSIONS

Wooden Cars, Capacity	Wooden Cars, Weight lb.	Steel Cars, Capacity	Steel Cars, Weight lb.	Gain in Capacity, Per Cent.	Saving in Weight, Per Cent.
49 cu.ft.	2010	58 cu.ft.	1800	18	11.5
53 cu.ft.	1920	60 cu.ft.	1985	13.2	(Incr.) 3
14 cu.ft.	1085	19 cu.ft.	855	35	26

For the reasons given, however, these figures can be regarded only in a general way. Some manufacturers are building steel cars as heavy as the wooden ones of similar dimensions, but of course having greater capacity, and they explain this increased weight by saying that

these heavier cars have improvements such as spring draft gear, improved axle bearings, etc., which, while adding much to the life and usefulness of the car, also add to its weight. It may and doubtless will be found that such improvements, which we must all agree are badly needed, will be of more value than a smaller tare weight, for even so, the result is an improved car, weighing no more than the wooden car and having a considerably greater capacity.

On account of the wide differences in the construction of various cars and the materials used, together with the varying styles of draft and running gear, it is difficult to offer any reliable and definite comparisons of the cost of wood and steel cars. I have, however, been building a wooden car of 49 cu.ft. capacity, without brakes, that cost in the neighborhood of $45 each and have been offered steel cars of the same outside dimensions, but having greater capacity, as follows:

COST OF STEEL CARS

Capacity	Cost Delivered	Increase, Per Cent.
7 cu.ft.	$65.00	45
1 cu.ft.	62.50	38
1 cu.ft.	75.00	66
5 cu.ft.	68.50	52

So that it seems safe to say that the cost of an all-steel car will run from 38 to 66 per cent. more than a wooden one, in some cases more, possibly, especially in case of the addition of improvements in the way of draft gear, running gear or wheels. The manufacturers themselves state the increase of cost to be from 50 to 100 per cent.

If it is fair to assume, however, that the life of a steel car is double or treble that of a wooden car, and that the cost of maintenance is less, and taking into consideration the gain in capacity, and the possible saving in tare weight, with all their attendant advantages, it would seem that the ultimate cost of the steel car will be much less than that of the wooden car.

Mine-car Life and Repairs

Steel cars have been built for more than ten years, and I am reliably informed that some of these cars are still in use with more or less satisfaction. Undoubtedly, though, these cars, as well as those more recently built, are capable of much improvement, as is still the case with wooden cars, and I am inclined to think that if these cars, built 10 to 14 years ago, are still in use, whether satisfactory or unsatisfactory, it augurs well for the coming steel car of proper design, material and workmanship. Four different manufacturers estimate the life of the steel car to be two to four times the life of the wooden cars, and from such knowledge and information as I have on the subject, it seems to me that this is a reasonable expectation.

My own experience with steel cars, limited though it is, goes to show that the repair cost on steel cars will be materially less than for wood. It is possible that new wooden cars may be run for eighteen months without repairs of any kind, though not probable. Certainly at the end of that period, they would not look practically as good as new, but this has been my experience with the steel car.

We know that in a comparatively short time the bolts in a wooden car will corrode and work loose with consequent disarrangement of the alinement of axle centers, etc., and when repairs are made, in nearly every case, the nuts have to be split or the bolts cut in order to get them out. Frequently, too, the holes in the wood are worn to such an extent that the new bolts hold little better than did the old ones. In the course of time, the bottoms, sides and ends splinter or rot out; in fact, it is my experience that a wooden car that will run for five years without rebuilding is an exceptionally good car, while most of them will not run more than two and a half to four years.

The steel cars, on the other hand, always remain tight and do not warp and shrink as the wooden cars do, and consequently the fine dust does not sift out along the haulways, requiring later on to be moistened and eventually cleaned up.

The manufacturers claim that the cost of maintenance of steel cars is only about 20 to 25 per cent. of that for wooden cars, and from what I know and from the experience of the railroad companies with their steel-car equipment, I think that this cannot be regarded as an underestimation.

General Considerations

Some manufacturers advocate the steel car with wooden bottom, claiming that the wood serves as a cushion to relieve the heavy shocks to which a mine car is subjected, especially in motor hauls. My own experience is that this argument is not well founded. I think that with proper construction, the steel bottom will meet every requirement. Personally I think that if this argument was sound, the advantage of the all-steel car would be minimized, because I believe most people have more trouble with the car bottom than any other part of the car—bumpers knocked off and broken by derailments or jacking, and disalinement of axles, due to wear of bolts and wood. In mines, however, where the coal is excessively high in sulphur, it might be found that the wooden-bottom steel car was advisable, but otherwise I am convinced that the all-steel car is greatly to be preferred.

The manufacturers of steel cars claim also cleaner and freer dumping for their cars, which would be undoubtedly true, so long as the inside of the car was reasonably free from incrustation, and while touching upon this point, I would like to call attention again to the fact that those parts of our steel cars with which the "black-strap" has come in contact are as bright and clean and free from rust as the day the iron left the rolls. I trust that in some way this may serve as a suggestion that will enable someone to evolve a plan for entirely doing away with the rusting of steel cars, though personally I fear it will not be feasible to do so in so far as the insides are concerned, because any application of preservative would soon be scraped off by abrasion in the dumping of the coal.

To briefly sum up my conclusions on this subject I would say:

1. That although the first cost of the steel car is greater, the increased life and decreased cost of maintenance, together with increased capacity, thereby necessitating a fewer number of cars to handle a given output, more than make up for the difference.

2. That the advantage of the steel car having a greater capacity with the same outside dimensions, or the same capacity with smaller dimensions, is of great value, especially in low veins.

3. The increased capacity of the steel car should materially reduce the cost of haulage, and incidentally tend to increase the output of the miner.

4. The saving it is possible to effect in the tare weight of the car itself would also be a factor in the reduction of costs by reducing the proportion of dead to live load.

5. The steel cars will not warp, shrink or split, which are advantages that are apparent to all, besides preventing the leaking of dust coal on haulways—not only a nuisance, but a constant source of danger and expense.

I am personally convinced that the steel car is here to stay. To those who anticipate the use of these cars I would recommend that they spend some time and money in the investigation and trial of a few cars that have been carefully designed to meet the conditions, before making extensive purchases. In buying, I would be careful to see that all parts of the car were made to templet so that when repairs did become a necessity, interchangeable repair parts could be kept on hand and the work of repairing done with comparative ease and speed by the repair men generally found at a mine shop.

Coke Production in W. Va.

In most of the coke-producing States, the coke output for 1910 exceeded that of 1909. In West Virginia, however, the output decreased 140,067 short tons, or 3.55 per cent. The number of coke ovens were reduced from 20,283 to 18,912, the number of idle ovens increased from 2274 to 2590. Nearly all the ovens of the State are of the beehive variety.

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Contents

COAL AGE

Discussion at Institutes

The close of the winter sessions of the various mining institutes marks a fitting time for a discussion of the means whereby their activity may be quickened and made more valuable. So far it has been customary for certain of the members to prepare papers a few hours before the institute convened, the titles of the papers being set forth on the semiannual program before the articles had been written or the illustrations prepared. The result may be foreseen; the discussion is never well considered, and to the lack of eloquence of the average technical man are added the diffidence and uncertainty of one who has given no thought to what he has to say.

It is a credit to the institutes that, at all of them, are so many men found who can say, and say well so much that is of value to the members in attendance. But what has been said, would have been uttered more correctly, assuredly and exactly had the attending member known in advance what subject would raise him to his feet. To make matters worse his redundancies, faulty wording, errors, verbiage and colloquialisms have been forever embalmed and preserved in a book, euphemistically dubbed "proceedings."

The halfday's discussion at the last meeting of the Coal Mining Institute of America revealed that there was a demand for discussion. After the stiffness wore off, the speakers needed discouragement rather than urging, and it must be admitted that the remarks made were pithy, valuable, and to the point. Some which were not given for publication, and which cannot, therefore, appear in the proceedings, were both new and valuable, eliciting much interest. It was decided to hold a discussion at the summer institute of like character, the subjects to be suggested early and to be announced at least a month before the institute convened.

But why grant the discussion of the questions in the query box an importance which is not given to the discussion on the papers? These should be printed and sent to the members a certain definite time before the date of the meeting. Those who would then read them would come primed with all necessary information, both of what was to be said and what they had to say about it. There is little question but what the prospect of discussion draws an interested audience more surely than the papers, however excellent they may be.

The members who contribute articles are as well able to prepare them for November or April as for December or May. The date can make but little difference and it is likely that regardless of the day set, the papers will be prepared just a day or two before they are needed.

The coal-mining institutes are growing. None too soon can they take on the customs of those larger institutes which cover broader fields.

The Laboratory and the Mine

Few practical men comprehend or are willing to admit the value of the laboratory to the mine. An extended practical experience unaided by an early educational training invariably develops a callousness in the mind of its possessor that is akin to prejudice.

It will be readily admitted by all that few traits of character are harder to combat than an ingrained natural prejudice of mind in favor of one's own methods and kin. Nothing but downright ignorance of men so obstructs the road to progress and improvement as a prejudiced mind.

The mine superintendent or foreman who boasts of a life-long experience in the mines of this and other countries must not fail to recognize the fact that "the world does move," and to keep up with the procession, he must advance. There is much to be learned.

The most successful men today, in all trades and professions, are the men who are touching elbows with other men—studying their ways and learning what they can from their successes or failures. Read, study, investigate, experiment, to find better ways and improved methods.

Regard no man as so inferior but that in some way he can contribute to your fund of knowledge. If nothing else, you can learn a lesson from his failure. So much for the practical side—what about the theoretical side of mining?

It is the province of the laboratory to study the nature of things; to ascertain, as far as may be possible, the laws and principles that control matter. Nature's laws are inexorable, and whether we regard them or not they act with perfect indifference to our folly or ignorance.

Too frequently, it must be admitted, the worker in the laboratory is a pure theorist. He may successfully fathom a mystery of science and define a great natural law; but, because he is unfamiliar with mining conditions and has no mining experience, he fails absolutely in his attempted application of such laws or principles to mining work. He becomes the butt of ridicule among practical mining men. He did good work in his own sphere, but he failed to adapt and apply the same to practical conditions as they exist in the mine.

There are many illustrious examples, however, that prove the value of the laboratory to mining. Foremost and chief is the never-to-be-forgotten discovery of that great English chemist, Sir Humphry Davy, who in 1815 proclaimed to the world the wonderful fact that wire gauze would not permit a flame to pass through its mesh as long as the metal was reasonably cool. The application of this scientific truth to the needs of a gaseous mine made the Davy lamp the greatest boon in the annals of mining.

There are many failures in the attempt to apply scientific laws and principles to practice. The fault is not with the science, but in the failure to understand the physical conditions. Conditions, in mining and elsewhere, are supreme; they are the first consideration in the application of scientific truth.

The attempt to apply the column formula to mine props fails because of the peculiar roof action in mines. It is well known that a uniformly-loaded beam will support a greater load than a beam loaded at the center; but this is no reason for wedging a cross-bar, in a mine, its entire length, which would be contrary to mining practice and would break the beam. It is wrong to apply a pump formula to a mine siphon—it may work and it may not.

First understand the conditions, then apply the principles and laws of science that meet those conditions. Because a ventilating fan has a certain manometric efficiency at one mine, is no reason to suppose that a fan of the same type and build will have the same efficiency, even when running at the same speed, at another mine. It may and it may not, depending on the conditions.

It is a practical failure, as was proven some years ago, to attempt to establish a mine-signal system in the mine workings by installing a device that would act to transmit an alarm from any given point or number of points in the mine, to the office on the surface, whenever an undue accumulation of explosive gas should occur. The theory is perfect; but when it is remembered that the most dangerous accumulations of gas are those that occur in the least expected places, and that the points of danger cannot generally be pointed out and are constantly changing, it is easy to see that any established system of signaling by automatic devices would present a false feeling of security in the mine, and tend to decrease that *eternal vigilance* that is essential for safety.

Treatment of Mine Timbers

It is only in recent years that coal-mining companies in America have come to realize that there is a serious side to the problem of supporting roof in mines. Not only have statistics driven home the fact that the majority of fatalities underground are due to falling roof, but attention has been called to the necessity of either economizing with our timber supply, or finding a substitute for the wooden props now so generally used.

A few of our larger companies have started reforesting in the hope of providing relief in future operation. However, the considerable increase in the cost of mine timbers that has lately occurred in many fields, has made it urgent that some practical and immediate relief be provided.

Because of an earlier and more urgent need, European operators have investigated the "preservation of mine timbers" in great detail. The subject is one that requires 15 or 20 years of experimenting before conclusive results can be obtained; as a consequence, the data submitted by our friends across the water are sure to be both interesting and valuable.

At one mine where creosoted timbers were set in 1900, the props are still in fair condition while the untreated timbers near-by have been replaced twice. It is the opinion of the owners of this mine that a set of creosoted props will last as long as three sets of untreated timbers.

It isn't alone the cost of mine timbers that an operator must consider; there is also the expense incurred when new props are placed. In fact, a record of the charges against replacement, recently calculated by the officers of one operating company, showed conclusively that the cost of setting new timbers, when estimated for a long period of years, was approximately 30 per cent. of the total charges marked up against timbering.

As to which of the various methods of preservation is most satisfactory, the data to hand seems to favor cresote as a medium of greatest merit. At a recent meeting of European mine operators where the subject of preserving timbers was discussed, the consensus of opinion favored the creosote process of impregnating timbers, and showed further that the sulphate-of-copper method was of highest annual expense.

The tabulated results of one investigator on this subject follow:

TREATMENT OF MINE TIMBERS

Process	Average Life of the Timber	Annual Cost per Cubic Meter of Wood
Sulphate of copper	11 yr. 7 mo.	$0.82
Chloride of zinc..	11 yr. 9 mo.	0.78
Creosote.........	20 yr. 6 mo.	0.58
Mercuric chloride.	13 yr. 7 mo.	0.44
Untreated timbers	7 yr. 7 mo.	1.02

An English authority on the use of safety helmets in rescue work, claims to have found, on investigation, that the oxygen cylinders sold for use in connection with breathing apparatus are often of inferior quality.

After a thorough examination, he has discovered that these cylinders contain as high as 12 per cent. nitrogen, and that most of them contain 5 per cent. It is claimed that 5 per cent. is dangerous for use in helmets, as it is liable to accumulate in the breathing bag until there is 90 per cent. nitrogen and only 10 per cent. oxygen, when the breather becomes unconscious without warning.

It appears to be possible to manufacture these cylinders with 99 per cent. oxygen, at a reasonable cost, and we believe that legislation on this point would not be inappropriate. The matter is certainly of vital importance to coal men.

COLLIERY NOTES and COMMENTS

Practical Hints Gathered Here and There, and Condensed to Suit the Busy Reader

The employment of a deputy foreman for every 50 miners employed, whose duty it should be to examine all working places at least once during each shift, to inspect all timbering, to oversee the drilling of holes and firing of shots and report on the same to the foreman, would add much to the safety of gaseous mines or mine with a poor roof.

Undercutting before firing means fewer holes required to break down the coal; less powder required; less slack; easier separation of bone and dirt from the coal; less interference with the timbering; less roof damage; easier and quicker loading; less weathering of coal during shipment; greater profit, since the coal is cleaner; and last but not least, fewer accidents.

The compulsory use of electric safety lamps, about mine stables and other buildings of an inflammable nature or containing inflammable material, would do much to lessen the danger from fire. They should also be used in very dry sections of mines where the timbering is heavy, and by timber men working in main headings and slopes. Their use by firebosses, for roof examination and such like work, would mean additional safety to miners and to the fireboss himself.

The quality and structure of coke depend on the composition of the coal and the heat to which it is subjected. A coal high in volatile matter makes a light, porous coke. A coal of high fixed-carbon content and of low volatile matter will produce a dense, heavy coke. When these two classes of coals are combined in a byproduct oven so as to give an average percentage of volatile matter, the best results are obtained, because the mixing overcomes the defects of the cokes made separately from either of the coals.

According to the United States Geological Survey the total exhausted portion of our coal supply, figuring one-half a ton lost for every ton marketed, down to the close of 1908, represents only 0.4 of one per cent. of the estimated original supply. At the present rate of exhaustion the coal supply of the United States will last nearly 5000 years, but if the rate of increase keeps up during the remainder of this century and the next century, exhaustion will be reached in less than 200 years. The average increase in the production of coal for the last 10 years has been between 6 and 7 per cent.

Hard pitch, rosin and cements make hard brittle briquets. Creosote, asphalt and coal-tar briquets are not brittle, but are easily crushed under pressure. The binder that produces briquets most capable of standing rough handling is one that can be twisted and pulled at an ordinary temperature, one that flows slowly and has sufficient elasticity not to be brittle, and stiffness enough not to be affected by the weather. Water-gas tar pitch, asphalts, wood-tar pitch and wax tailings make good briquets with the use of only 3 to 5 per cent. of binder.

At a meeting of the South Staffordshire Mining Engineers, F. B. Clark gave it as his opinion that in cases where cables have to be carried along dry, dusty, or gaseous roads, lead-sheathed and armored cables, or other double-sheathed varieties, should be adopted to prevent external arcing. Where cables have to be led along such roads, the safest method is to place them in a steel troughing filled with sand, and bury them at the side of the road. An armored cable will thus be rendered absolutely safe, for even if arcing appears outside the armoring, it is still covered by the sand, troughing and earth.

It is recalled by W. C. Blackett that about the year 1676 the Hon. Roger North referred to the "damps or foul air" of the coal mines. The suggestion of Mr. Blackett before the Institution of Mining Engineers is that Dr. H. S. Haldane's idea for the use of mice or birds in testing for carbon monoxide (and this most valuable expedient is likely to save more lives than any of the so called rescue equipment) may be said to have been to some extent forestalled by this early writer, who stated that "damps, or foul air, kill insensibly," and that "an infallible trial is by a dog." Again T. Y. Hall, in 1854, suggested the use of "some living animal" for the purpose.

It is interesting to be reminded that Lehman found that 1/1400 of H_2S, sulphureted hydrogen, in air was sufficient to cause death in an hour or more in various animals and also in man. He describes a case showing alarming symptoms produced in a few minutes by air containing 1/2000 part. He also found that one part of H_2S in 500 parts of air was sufficient to kill dogs and cats in 90 seconds. Unlike most mine gases, the symptoms of this gas on the human system are those of an irritant poison. Its characteristic smell resembles that of rotten eggs, and it has been ascertained that the presence of this gas in quantity appears to overpower the sense of smell.

In Britain the advocacy of portable electric lamps for miners is gaining ground, although only two or three collieries have employed them. It is pointed out that the advantages of this type of lamp are important. By comparison with the best safety lamp it gives a superior light. At any rate for a short time it can be held in any position without danger of extinction. Third, although it has been pointed out that an explosive mixture may be ignited from a portable electric lamp, it would be very much more difficult than with the "safety" and with a properly designed lamp almost impossible to do so. But failure to indicate the presence of gas, and the much greater expense are disadvantages of the portable electric lamps.

The Lehigh Valley strippings at Lattimer, Penn., are over half a mile long and from 500 to 900 ft. wide. Two veins have been uncovered which are estimated to contain 1,500,000 tons of high-grade anthracite. The upper or Mammoth vein has an average thickness of about 30 ft. without partings. The lower, or Warton vein averages about 9 ft. in thickness. Preliminary work on the stripping began in 1901. Coal was first won in 1904. The excavation is now down to an average depth of 80 ft. over the entire stripping. The cost of operations up to the time the first coal was taken out is estimated at $495,000. The amount of rock and clay overlying the coal is estimated to have been 5,000,000 cubic yards.

The mine foreman of a rescue station should remember that experience has shown it is impossible for men to work where the wet bulb registers 85 deg. F. without a rise of temperature and danger of being overcome by the heat. The dry bulb temperature does not much matter, but the power of the human system to regulate its temperature depends almost entirely on the humidity. Men should not be exposed for more than 30 min. if the temperature is over 80 deg. F., as in hot, wet air the temperature of the body cannot be kept down by the evaporation of sweat. Men working in such an atmosphere should dispense with as much clothing as possible, and should be supplied with apparatus having a detachable mouthpiece, so that by drinking often they may perspire more profusely.

SOCIOLOGICAL DEPARTMENT

A Bureau Devoted to the Welfare of Miners Everywhere, and Especially Designed for the Betterment of Living Conditions In Mining Communities—COAL AGE will be Glad to Print Any Suggestions or Ideas of Value to this Department

Cleanliness

By F. A. Boag

When all is said and done toward the improvement of mining towns, it will be found that cleanliness is the most uplifting force of all. We are apt to regard the unkempt appearance of mining villages as the fault solely of the tenant, and indeed many of them accomplish wonders in the soiling of their homes and of the face of nature by unsightly outhouses and fences, and accumulations of plunder and garbage. But perhaps we too often overlook the fact that the untidiness is due primarily to unfavorable conditions and secondarily to the psychological effect those selfsame conditions have on the tenant.

Byproduct Ovens and Smokeless Furnaces

It is, of course, hopeless to expect clean towns where beehive ovens are in use. Nevertheless the location of the town where the prevailing winds cannot carry smoke to the houses will materially aid in reducing the dirt caused by the effluence of smoke during the early stages of devolatilization. The use of byproduct ovens will do yet more to enable the operator to keep a spotless town.

But the unnecessary sootiness of a hamlet where there are no coke ovens is one of the deplorable facts of coal mining. Injudicious firing, by which the firemen waste the coal of the company, and begrime the houses in which they and their neighbors live can be found unchecked and often unrebuked at nine bituminous plants out of every ten. If the coal used at such plants is of such size or quality that the waste does not impose a measurable loss on the company, nevertheless for cleanliness' sake, such firemen should be admonished or removed.

Producer Gas

At many mines, a large percentage of bone coal is extracted. Part of this bone is brought to the surface either with the rock of the headings or mixed in with the coal. This bone coal is thrown in unsightly piles around the works either with rock or alone. In places where slack is not used under boilers much of it is often stored during the summer months to be shipped out in the winter. Both bone coal and slack are subject to spontaneous combustion and when fired they fill the valleys with smoke and with the pungent odors of the oxides of sulphur. It would seem desirable to install producer plants, so that the bone and slack could be immediately used for the manufacture of gas. This gas might be used in the power plant for gas engines or it might replace coal in domestic fires and oil in house lamps, the sale of this gas being made a profitable business. It would also make the town a more desirable place in which to live, bringing some of the advantages of the city to those who have hitherto not enjoyed them. But it must be admitted that to date the use of producer gas for lighting and heating has not as far as I know been pursued to a successful commercial culmination.

A Lowland Town

I once knew a superintendent who said he wanted to build his houses so near the mine that the men could crawl out of their beds into crop-holes of the workings, and after his town was laid out, there seemed considerable appositeness in his remarks. The result was apparent. The town was set down in an inaccessible hollow; the roads entering it from the hills were unsafe to travel because of their location on the stiff slopes; heavy rains washed mud onto the townsite, making the pathways impassable after a heavy rainfall, and all the dust from the tipple and passing cars, and all the smoke, soot and exhaust steam from the power house drifted in on the town. Such a town could not be clean and the miners could not possibly have promptings toward cleanliness with such undesirable surroundings. Neither trees nor gardens could thrive in such an atmosphere.

Two sites may often appear equal in desirability till after a washer and coke ovens are erected, and a rock dump begins to erect its somber head. The washer may fill up the whole valley with a dirty wash in which no tree can live. The rock dump may keep fine dirt continuously rattling down in the immediate rear-ground of the houses. New steam and electric roadways may have to be created, cutting up the back yards. These roadways destroy all privacy and quiet and in many cases the locomotives add to the general uncleanliness.

It is true that men who have wet work to perform around the mines object to long trips in their wet clothes and that in winter the "drill" from the mines to the village is a cold and chilly one, but it will probably be found that families will choose the houses which are more remote from the mines than those so near that clothes must be dried indoors and windows kept shut because of the grime with which the air is laden.

First Aid Banquet

At a banquet in Pittston, Penn., Dec. 9, held jointly by the First-Aid Corps of the Pennsylvania Coal Co., the Hillside Coal & Iron Co. and the Temple Coal & Iron Co., Dr. J. B. Mahon was presented with a gold-headed cane. The presentation of the handsome cane came as an agreeable surprise to Dr. Mahon and was one of the evidences of the high esteem in which he is held. It was in appreciation of the valuable services rendered by the doctor, who has been medical instructor of the corps since Dr. Shields resigned some years ago.

The large number of men who gathered was an inspiring sight and many words were spoken in praise of the bravery and heroism of those who risk their own lives to help their fellow men when they meets with accidents in the mines. There were all classes of workmen in the assemblage, foremen, superintendents, miners and laborers, all interested in first-aid work. About 350 sat down to the banquet. Capt. W. A. May, general manager of the Pennsylvania and Hillside Coal & Iron companies and largely instrumental in forming the First-Aid Corps, was present and spoke appreciatively of the value of first aid and of the members of the corps.

Other speakers were Dr. Newring, D. M. Howell, secretary of the Pittston Y. M. C. A., and Dr. Arnott, the new instructor, who is to take the place of Dr. Mahon. The last exhorted the men to continue in the good work and said that he felt much encouraged from the interest manifested and would give all his attention to maintaining the high standard of efficiency that the corps has held. Judge Ferris was toastmaster.

First Aid Hint

Ordinarily, do not give brandy or whisky to a person suffering from shock, though if some time must elapse before the patient can reach the surface or underground hospital, and there is no severe bleeding a teaspoonful of brandy or whisky in a tablespoonful of hot water may be given every fifteen minutes. Alcoholic stimulants should be handled with care because of the depressing effects of an over-dose.

DISCUSSION by READERS

Comment, Criticism and Debate upon Previous Articles, and Suggestions from the Experience of Practical Men

Anshracite Coal Inspection

I was greatly interested by Mr. Dorris' article on anthracite-coal inspection in the Dec. 9 issue of COAL AGE. I quite agree that the inspection of coal in this region is being greatly enlarged in its scope and has made good progress in applying general standards to the quality of coal prepared for shipment. But when Mr. Dorris says, in speaking of the inspector: "When his decision is rendered, based on actual tests, no one questions his authority or the correctness of the tests," I think there is some room for objection. I am not one of the foremen who "endeavors to convey this impression to the superintendent," and I believe the authority of the inspectors is now well established and undisputed, but it seems to me that the correctness of the tests may well be questioned.

To begin with, it is not an unknown thing around here when cars of condemned coal are sent back for repreparation, to have the boys under the breaker pick off a few lumps of slate or bone, wash the top down with water from a hose, and have all pass inspection without further ado. I don't say this is usual or that it is ever countenanced by even the foreman, much less the company's officials, but it is possible nevertheless.

It stands to reason that a 100-lb. sample dug out of a 50-ton battleship, even if it is taken from four or five, or eight or ten different places, does not represent the contents of the car. If we are unlucky enough to empty a pocket in loading a car, of course we get a lot of dirt on top of a carload of perfectly good coal. Not that a carload of this kind should go to market, but the fact serves to show that mistakes may be made even by actual tests.

The better way to take samples is usually considered to be at the loading chute while the car is being filled, but even here the inspector, by holding his pan into one part of the stream can usually get all good coal, and by holding it in another part, more directly under the lip of the chute, can get little beside slate and dirt. There is still a lot of chance for the personal element to enter into the question.

For my part, while I believe in keeping up to a standard of preparation, it still seems to me that the expense for rehandling condemned coal through the breakers is often hardly justified. The sales department is making the operating end step around pretty lively, of late, and there ought to be a limit somewhere short of wrapping each lump in tin-foil, and packing it away in excelsior. It looks to me like a case of the tail trying to wag the dog. If the alleged anthracite combination is good for anything, why don't they get together and agree to furnish only the kind of coal that can be most economically prepared, and give the consumer the benefit of a corresponding drop in price?

It costs a lot to pick a few extra pieces of bone out of a car of coal, and the public ought to be educated to the idea that fuel does not have to shine and sparkle in order to burn, and burn to good purpose at that.

Wilkes-Barre, Penn. FOREMAN.

The Explosion at Vivian, West Virginia

I was much interested in your account of the explosion in the mine of the Bottom Creek Co., at Vivian, W. Va., as I know something about the mine. I notice in the sketch you publish, that there were three breakthroughs between the room where the explosion is supposed to have occurred and the next one outside, above the point where the engineers are supposed to have fired the gas. I cannot see how such a body of gas could have been standing in that room with a current of air traveling through it. Can you explain it?

I am looking forward to your account of the recent explosion in Tennessee.

GEORGE D. EVANS.

Pottsville, Penn.

[Mr. Hall, who visited the Bottom Creek mine after the explosion, and who prepared the description that was published in COAL AGE, answers your question below.—EDITOR.]

I understand that there was, at one time, in the haulway of the 11th entry, a curtain between the two rooms mentioned, but I could not find whether or not it was still in place at the time of the explosion. Mr. Patterson informed me that it had been there. It probably was no longer in place or the gas would not have accumulated. You will understand that the rooms were abandoned with the intention of not working them for a year at least. They were standing awaiting the driving of rooms intermediate between those already driven and the drawing of the pillars further along in the large panel inclosed by the first and second diagonal headings and the 10th and 11th entries. The inspector favors the requirement that all such disconnected rooms be driven up to the airway of the entry above so that the ventilation may not be left to the chances of negligence.

Best Type of Rescue Apparatus

There is considerable difference of opinion as to whether the helmet-, mask- or mouth-breathing type of rescue apparatus is the best fitted for mine-rescue work. Some authorities claim that the helmet is best adapted for work in smoke or fumes irritating to the throat, eyes and nostrils, rather than in poisonous, nonirritating, unbreatheable gases, where mouth-breathing apparatus should be used. A leak in a helmet used in nonirritating, poisonous gas is not readily detected and may result fatally to the wearer, whereas a leak in a mouth-breathing apparatus is readily detected. The examination of roofs is easier and more quickly done with mouth-breathing device than with helmets. I would like other rescue men to express an opinion.

Trinidad, Colo. FIRST AID.

Price Cutting in West Virginia

The question of prices is the one absorbing topic at present in the West Virginia coal field and has been discussed at several recent meetings of the operators, but as yet no decided step has been taken to bring about an improvement in conditions. It is a strange anomaly that while wages and prices of all commodities and supplies have gone up, the price of coal at the mine has decreased and is now at the lowest point reached for several years.

For this fact the operators are to blame and they alone can furnish the remedy. Lack of business sense and jealousy of those who have striven to improve selling conditions on the only rational and abiding basis possible, have combined to bring the coal business in this field to the worst stage it has ever reached.

The situation has been fostered and made worse by certain of the New England sales agencies who are interested in keeping down the price of coal for their own purposes.

Charleston, W. Va. READER.

INQUIRIES of GENERAL INTEREST

A Page Devoted to Those who want Information. All Questions must be Accompanied by the Name and Address of Inquirer

A Mine Siphon

We have a problem under discussion which we wish to submit to COAL AGE for a solution. It is as follows:

There is a large pond of water, in a mine, which it is desired to drain by means of a siphon, using 3-in. pipe for the purpose. The pipe must be laid in the entry, a distance of 1000 ft. from the pond to the top of the hill, where the elevation is 24 ft. above the bottom of the pond. In this stretch the pipe makes one right-angle curve. From the top of the hill the pipe extends 550 ft. to the point where it discharges the water. The elevation of the point of discharge is 34.66 ft. lower than that of the top of the hill, or 10.66 ft. below the pond.

If a siphon will fail to operate successfully under the conditions stated above, as some claim it will; and if successful operation can be secured by making any minor changes in the proposed arrangement, will COAL AGE or any of its intelligent readers kindly suggest what changes are, in their opinion, necessary.

HOWARD L. GREGG.

Tracy City, Tenn.

Owing to its simplicity and low cost of installation and operation, the siphon, as used in mining, is of great importance. Of all the useful principles with which mining men should be acquainted, probably none are less understood than the principle of the mine siphon. The reason for this is that the flow of water in the siphon is generally assumed as being identical with the flow of water in any pipe, under a given head. This is only true when the conditions are such that the effective head that causes the water to flow up the suction leg of the siphon is sufficient to supply the water at the summit or crown as fast as it flows away from the crown and is discharged at the lower end of the pipe.

It is necessary to observe that the supply of water at the summit S (Fig. 1) is limited by the atmospheric pressure, which is partly balanced or absorbed by the gravity head h_1 and the frictional resistance in the suction leg of the pipe. The discharge, on the other hand, depends on the gravity head or fall h_2, less the friction head in that end of the pipe. It is easy to see that under certain conditions of atmospheric pressure and suction head, combined with a great length of pipe on the suction end, the flow of water to the summit of the siphon may be much less than what is required to give a full pipe under the velocity of discharge. In such a case, the water will flow away from the summit faster than it is supplied to the summit; and, as a consequence, the siphon tends to empty itself.

It is clear, also, that the effective head on the supply or suction end, may be much less than the head due to the atmospheric pressure. For example, at sea level (bar. 30 in.), the head of water due to atmospheric pressure is $\frac{30 \times 0.4911}{0.434}$ = say 34 ft. For any elevation above sea level the atmospheric head must be calculated, in this manner, from the barometer reading.

Fig. 1 shows the relation of the atmospheric head and gravity head acting on each end of the pipe. On the suction end, the gravity head acts against the atmospheric head. The difference $H - h_1$ is the head producing the flow in this end of the pipe, and must equal the friction head plus the velocity head $0.0026\,\frac{G^2}{d^4}$, as calculated, for ordinary mining conditions, by the formula

$$H - h_1 = \frac{l_1 G^2}{800\, d_1^5} + 0.0026\,\frac{G^2}{d_1^4}$$

and

$$G = d_1^2 \sqrt{\frac{800\, d_1\,(H - h_1)}{l_1 + 2.08\, d_1}}$$

G = Flow of water in pipe (gal. per min.);

l_1 = Length of suction pipe (ft.);

d_1 = Diameter of suction pipe (in.).

On the discharge end, the atmospheric head acts against the gravity head; and the difference $h_2 - H$ is the head producing the flow in the discharge pipe, which is equal to the sum of the friction and velocity heads in this end of the siphon, as found by the formula

$$h_2 - H = \frac{l_2 G^2}{800\, d_2^5} + 0.0026\,\frac{G^2}{d_2^4}$$

and

$$G = d_2^2 \sqrt{\frac{800\, d_2\,(h_2 - H)}{l_2 + 2.08\, d_2}}$$

The siphon is working to the best advantage when G is the same in each leg of the siphon. If the value of G is greater for the discharge than for the suction, the water will flow away from the summit quicker than it is supplied at that point; and the siphon tends to empty itself, which it will do, in time, whenever h_2 is greater than H. The siphon cannot empty, provided all pipe joints are tight and the ends are completely submerged, when h_2 is less than H, except by allowing air to accumulate at the summit. There should be an air-trap arranged wherever there is a high point, except in pipes where the flow is so strong that the air has no opportunity to accumulate. This is generally the case when the siphon is properly designed.

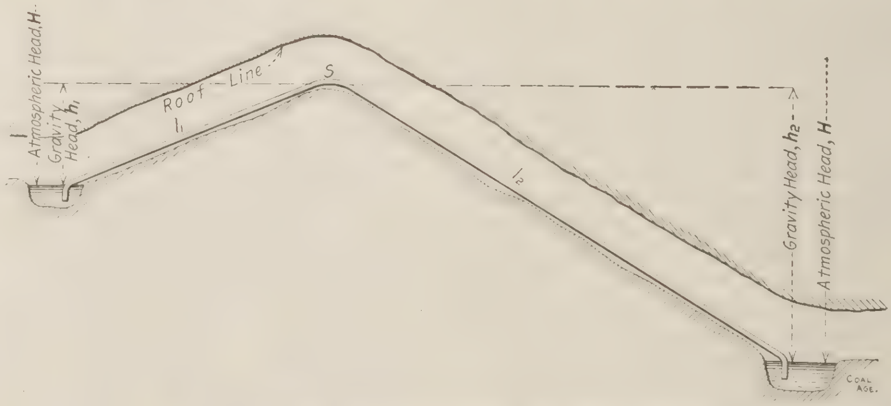

FIG. 1. SECTION OF MINE ENTRY, SHOWING SIPHON

If the value of G is greater for the suction than for the discharge end, the siphon will work satisfactorily; but it is not doing its full duty, because the discharge pipe is too small and throttles the flow, of which the suction end is capable.

A PRACTICAL SOLUTION

To show the practical application of the principles just explained, let us investigate the conditions under which the 3-in. siphon mentioned by correspondent must operate, and ascertain if there is any improvement to suggest.

The elevation of Tracy City, Tenn., where the pipe is located, as given by the

"Dictionary of Altitudes," U. S. Geological Survey, is practically 1100 ft. above sea level. The average barometer reading for this elevation ("Mine Gases and Explosions," Beard, p. 88), is 28.757 in. The corresponding atmospheric head in water column is

$$H = \frac{28.757 \times 0.4911}{0.434} = 32.54\ ft.$$

From the data given, $h_1 = 24$ ft.; $l_1 = 1000$ ft.; $h_2 = 34.66$ ft.; $l_2 = 550$ ft.; $d_1 = d_2 = 3$ in. Substituting these values in the formulas given for finding the flow for each end separately, we have

Suction flow,

$$G = 3^2 \sqrt{\frac{800 \times 3\ (32.54 - 24)}{1000 + 2.08 \times 3}}$$

$$= 40.59\ gal.\ per\ min.$$

Discharge flow.

$$G = 3^2 \sqrt{\frac{800 \times 3\ (34.66 - 32.54)}{550 + 2.08 \times 3}}$$

$$= 27.09\ gal.\ per\ min.$$

This shows that, while the siphon will work, it can be greatly improved by using a larger discharge pipe. To find the required diameter of the discharge pipe (d_2), equate the two values of G, given previously, and find the value of d_2, by trial. In this case

$$d_2 = 3^2 \sqrt[5]{\frac{32.54 - 24}{34.66 - 32.54}\left(\frac{550 + 2.08\, d_2}{1000 + 2.08 \times 3}\right)}$$

$$= 3.5\ inches$$

If 3½-in. pipe is used on the discharge end of this siphon, the entire 550 ft. from the summit to the discharge its delivery should be increased 50 per cent.

Corrosion of Pump Valves by Acid Mine Water

We have three electrically driven, triplex pumps in our mine. The one at the shaft bottom handles strongly acid water, which eats away the valve seats in from 10 to 15 days. The valve seat farthest away from the connection with the main suction pipe is eaten away the most rapidly. Why is this? We have had an analysis made of the water and from this analysis it is claimed that cast-iron valve seats should satisfactorily resist the corrosive action of the acid it contains. Our experience in this regard, however makes me skeptical. I would value highly the opinion of COAL AGE in regard to the matter.

Marion, Ill. DAVID FULTON.

Your trouble is not unusual; the presence of acid in the water is one of the chief difficulties encountered in pumping at most coal mines. The position of the valve with respect to the suction-pipe connection should have no influence on the rapidity of action of the acid mine water, provided other things are equal. However, a slight mechanical defect in the operation or seating of the valve, as failure to open the required distance or to make a tight joint when closed, might easily account for an increased wear and corrosion, in comparison with a valve that is operating properly. Increased wear assists the corrosion of the metal by exposing fresh surface to the action of the acid water. Perhaps some readers of COAL AGE have had experience in this connection, which will aid in clearing up the point in question. We would gladly have the corrosion of mine-pump valves further discussed. Few subjects are of greater economic importance in mining practice.

It may be said that while cast-iron valves and valve seats are generally superior to iron or steel, for pumping acid mine water, they are decidedly inferior to valves and valve seats made of any of the several kinds of acid-resisting bronze. The bronze is worth about 25c. per lb., which is from three to four times the cost of a finished iron casting. But, as the chief expense in connection with pump valves is usually the cost of labor and loss of time in making renewals and repairs, the use of this special material is generally found to result in a great economy in operating expense.

Acid-resisting bronze is made from various proportions of copper, tin, lead and sometimes antimony. The following composition endured for two years and three months in a pump at Hazleton, Penn., handling water that contained 21.28 grains of sulphate of iron and 31.19 grains of free sulphuric acid, per gal.: Copper, 85.1%; antimony, 6.8%; tin, 6.8%; lead, 1.3%.

Design of Centrifugal Mine Fans

In your issue of Oct. 28, page 87, there is given an example of a fan designed to pass 150,000 cu.ft. of air per min., against a 2-in. water gage, at a speed of 100 r.p.m.; and by increasing this speed to 190 r.p.m. it is estimated the same fan will deliver 250,000 cu.ft. of air per min. and the water gage be increased to 5.5 in. The size of the fan required for this work is given as 15 ft. 10 in. diameter, 5 ft. 7 in. wide with an orifice 8 ft. 11 in. diameter.

I would like to know how you arrived at the diameter of the fan, the diameter of its orifice and its width?

WILLIAM JAMES.

Ladysmith, Vancouver Island, B. C., Canada.

The calculation of the different dimensions of a mine fan, to suit the several conditions under which it must operate, is not an easy task. The diameter of the central orifice is determined by assuming that the air enters the fan through this opening, with a velocity due to the pressure of the atmosphere and against the depression established within the fan by reason of its action.

This solution is complicated; but it is assumed by different fan makers that the entering velocity of the air varies from 1200 to 2500 ft. per min., or may be even greater. Much of the successful operation of the fan depends upon how close this assumption comes to the velocity the atmospheric pressure will actually produce at the entrance to the fan, in any given case. If the velocity is assumed too high the estimated area of intake is too small and the fan is throttled; if the velocity is low the intake area is larger than should be and backlash is the result.

In general, for a double-intake fan, the width of the fan may be taken as ⅝ of the diameter of its central orifice. This rule, again, is modified by certain details of construction that can only be worked out by an expert fan engineer.

The outer diameter of the fan-wheel depends on numerous factors such as the mine potential, or the ratio of the square of the quantity of air to be circulated to the pressure producing the circulation in the mine; the sectional area of the airway or fan-drift where the pressure and velocity of the air are measured; the velocity and density of the air at that point; and the speed of the fan and a factor known as the fan-constant, which depends upon the style of fan.

These determinations can only be worked out, for any given case, by a fan engineer to whom we would refer our correspondent. The conditions in every case, in mine ventilation, demand and should receive separate treatment by an engineer who understands them, in order to insure the successful and economical operation of the fan in the emergencies that are prone to arise in mining practise.

Coal Mining in Scotland

Please state a few general facts concerning the coal industry in Scotland.

Springfield, Ill. F. R. B.

In Scotland, out of a population of 5,000,000, more than 500,000 are directly or indirectly dependent on mining for their living. Scotland has 481 coal mines in operation, which give employment to 123,214 men and 2684 women. From five to ten tons per day is the average output of a man and two boys. The miners work in three shifts of eight hours each, and upon notice can take a holiday at will. The minimum wage for men is $1.46 per day of eight hours; the maximum is $1.92. The weekly time averages less than 48 hours, giving a wage of from $9 to $11 per week. On piece work first-class miners sometimes make $15 per week.

EXAMINATION QUESTIONS and ANSWERS

To Encourage, Assist, and Instruct Those Preparing for Firebosses, Mine Foremen, and Inspectors Examinations, Selected and Original Questions Are Carefully Answered And Fully Explained

Interesting Questions

Diffusion of Gases

(*Continued from p.* 319 *of the Dec.* 16 *Issue of* COAL AGE)

Ques.—(*c*) Show the application of the law of the diffusion of gases by finding the relative volumes of marsh gas (CH_4) and carbon dioxide (CO_2) in the mixture of these gases formed under such conditions that the undiluted gases diffuse into each other without becoming, first, mixed with air.

Ans.—(c) Applying the law of diffusion to find the composition by volume of a mixture formed by the diffusion of marsh gas and carbon dioxide, the relative volumes are inversely proportional to the square roots of the densities of these gases; or, the volume ratio is equal to the square root of the inverse density ratio. Thus,

$$\frac{Vol.CH_4}{Vol.CO_2} = \sqrt{\frac{Sp.gr.\ CO_2}{Sp.gr.CH_4}} = \sqrt{\frac{1.529}{0.559}} = 1.65.$$

Then,

Relative volume CH_4	1.65
Relative volume CO_2	1.00
Relative volume of mixture	2.65

The percentage of marsh gas in this mixture is

$$\frac{1.65}{2.65} \times 100 = 62.3\%.$$

This mixture is lighter than air; its specific gravity is calculated by multiplying the relative volumes of the two gases, as found above, by their respective specific gravities and dividing the sum of these products by the relative volume of the mixture. Thus,

$$1.65 \times 0.559 = 0.923$$
$$1.00 \times 1.529 = 1.529$$
$$\text{Relative weight} = 2.452$$
$$Sp.gr.\ of\ mixture = \frac{2.452}{2.65} = 0.925.$$

This mixture is, therefore, lighter than air, and tends to accumulate at the roof, or at the face of steep pitches. It diffuses in air slowly. It contains no available oxygen, and, hence, will quickly extinguish a light. It is extremely dangerous to handle, for the reason that, by the addition of sufficient air, it may become highly explosive.

For example, suppose sufficient air be added to bring the marsh-gas mixture to its maximum explosive point, or 9.57 times the volume of marsh gas. The relative volume of air and gases would then be as follows:

Relative volume CH_4	1.65
Relative volume air, $1.65 \times 9.57 =$	15.79
Relative volume CO_2	1.00

It is clear there would then be 1 volume of CO_2 in $1.65 + 15.79 = 17.44$ volumes of firedamp, at its maximum explosive point. To render this mixture inexplosive would require $\frac{17.44}{7} = 2.49$ volumes of CO_2. This mixture of marsh gas and CO_2 is difficult to detect because it gives a cap, for the first moment only, when the lamp is raised quickly into the gas. The cap disappears at once and the flame dims and quickly goes out as the lamp fills with the gas. The mixture has been called "flashdamp."

Utah Mine Foreman Examination Questions

Gas Feeder

Ques.—How is it possible to deal with a strong feeder of gas in the middle of a ventilating district, so as to provide for continuing work in the remaining portion of the district?

Ans.—The manner of dealing with this feeder so as not to interfere with the work in that portion of the district affected by the return, will depend on the conditions surrounding the feeder and its location with respect to the intake and return air-current. The general plan of procedure, however, in such cases, is to wall in the feeder by building a substantial brick stopping about the feeder itself, or in each opening leading to the place in which the feeder is located. A pipe of sufficient diameter is built into the wall or stoppings, and arranged to conduct the gas directly into the main-return airway. In some cases, it would be best to pipe the gas directly to the surface through a drill hole sunk for the purpose.

Gas on Falls

Ques.—Upon making his rounds of inspection in the morning, say in No. 3 entry and Nos. 1, 2, 3 and 4 pillars, the fireboss finds the gas down to the edge of the roof, on the caves (falls). These pillars are being worked with safety lamps, while the remaining rooms and the entries are worked with open lights. (a) What, in your opinion, should be done? (b) Can the above system be made safe practice?

Ans.—(a) Withdraw the men from the rooms, promptly, or make them use safety lamps. (b) The question does not state the direction of the air-current. If the pillar workings are on the *first of the air*, there is grave danger in allowing open lights in the rooms beyond. Safeties should have been used in all these rooms. Even if the pillar workings in No. 3 entry are on the *last of the air*, it would not be safe practice to allow open lights in the two or three rooms next adjoining. In either case, the use of open lights in the rooms, as stated, is unsafe practice, because the heavy roof falls that may occur at any time in pillar workings are liable to drive the gas back into the adjoining rooms, where it would be ignited if open lights were in use there.

Lamp Station in Mine

Ques.—In a mine generating firedamp freely and worked with locked safety lamps, the coal is becoming rapidly exhausted. It is decided to open up another section, in the same mine, where no gas has been discovered and to use open lights in the new section. What regulation should be made and enforced in order to prevent the naked lights being taken into the fire zone?

Ans.—A lamp station should be established in the entry connecting the two sections of the mine; and a strict rule should be enforced that none could enter the fiery section with anything but a locked safety lamp that has been duly cleaned, examined, filled, lighted, locked and delivered to the user, at said station. The only exception to this rule would be the firebosses, who care for their own lamps.

The regulations should also provide that no one will be allowed to carry or have in his possession a lamp key or other device for opening a lamp, except the firebosses. Also, any lamp extinguished by accident must be returned to the lamp station to be relighted. Any lamp known to be injured must be promptly extinguished and returned to the lamp station.

Means of Detecting Gases in Mines

Ques.—(a) Could you depend absolutely on a safety lamp for the detection of all mine gases? (b) What other methods would you adopt for their detection?

Ans.—(a) No. It is best not to rely wholly on the indications of the lamp. (b) An indicator should be used for marsh gas. A canary bird or caged mouse should be carried to warn against carbon monoxide. Carbon dioxide is indicated with sufficient promptness on the lamps.

COAL and COKE NEWS

Editorial Correspondence from our own Representatives in Various Important Mining Centers, and a Record of Legislative and Other Action Affecting the Coal Industry

Washington, D. C.

Alaskan Land Fraud Case

The supreme court of the United States has reversed and remanded the case of the United States, plaintiff in error vs. Charles F. Munday and Archie W. Shields. In this case, the charge was that the defendants named, conspired with each other to secure for the Alaska Development Co., a corporation of the state of Washington, and the Pacific Coal & Oil Co., a corporation of the Dominion of Canada, coal lands of the United States of approximately 6087 acres in extent and more than $10,000,000 in value. These lands were situated in the Kayak district of Alaska. Various persons, 40 in number, each being qualified to make an entry of coal land, were induced to make entries ostensibly for themselves, but really, it was alleged, as the agents of and for the use and benefit of the two corporations named, with the purpose of securing to the corporations much more coal land than any two persons were entitled to get by entry under the coal-land laws.

There was filed a plea of not guilty, but the defendants objected to the introduction of any evidence and moved the court to direct a verdict in their favor. The court overruled this motion, but upon the sole ground that the Pacific Coal & Oil Co., being a foreign corporation, was not entitled to any coal lands under the coal-land laws of the United States and so the charge in the indictment of a purpose by the defendants to secure lands for this company was a valid charge of an intent to defraud the United States.

Case Brought to Supreme Court

Later on the case was brought to the supreme court by writ of error with reference to the decision of the circuit court to the effect that the federal statutes were not a part of the coal-land laws of Alaska and that consequently persons or associations operating in Alaska were not restricted to a single exercise of the right granted to locate coal claims and secure patents therefor. Had the ruling of the circuit court been upheld, entries of coal land in Alaska might be made by the same person or association of persons without limit as to number or even as to the time within which entries might be made.

The action of the supreme court in reversing and remanding the decision is, therefore, of great practical importance, while it also emphasizes the necessity for action by congress, which will be designed to relieve the present situation as to coal lands in Alaska.

Controller Bay Report

Reports have been filed in the so-called Controller Bay investigation which involved the conditions under which Alaskan coal lands were being held and exploited, presumably by persons who had gained the favor of President Taft's administration. The inquiry is now definitely over and the minority and majority report are before Congress. The majority report takes the view that while the investigation has developed nothing of a definite character in support of the charges made against President Taft and his administration, it has been productive of great good by assisting in preventing bad conditions from developing in Alaska. The majority report says:

"Your committee would therefore respectfully suggest that for the better development of Alaska, as well as for the general good, Congress should at an early day take action:

"(1) That will reserve to the Government in perpetuity the title to all coal land and mineral land in Alaska, the title to which has not already passed to others or in which no vested rights obtain.

"(2) That a similar course be followed as to all land containing petroleum or natural gas.

"(3) That all future land patents, deeds, or conveyances of the fee, in whatever form, shall contain provisions saving and reserving to the Government all coal, minerals, petroleum, and natural gas, on or under public lands, with the right to remove the same.

"(4) That fair and even liberal leases be made by the Government to proper parties, providing carefully for the continuous development of the lands so leased.

"(5) That a harbor and coaling station be developed for Government use and connected with one of the Alaskan coal fields by a Government-owned railroad, and we suggest Controller Bay and the Bering coal field as most convenient for that purpose.

"(6) That the Robinson bill (H. R. 13,113), now pending before the House Committee on the Public Lands, offers a satisfactory solution of the Alaskan coal-lands question, but does not cover mineral lands or petroleum or natural-gas lands, and that provision should be made for retaining the title to these also."

Alabama

Birmingham—The plan for merging the Alabama Consolidated Coal & Iron Co. and the Southern Steel Co. has been accepted, according to the official announcement of Cecil A. Grenfell, chairman of the merger committee. Mr. Grenfell declares that more than a majority of each class of securities, both of the Alabama Consolidated and the Southern Iron & Steel companies, have been deposited under the proposed plan for merging the two concerns.

The Brookside-Pratt Mining Co. will make two openings on its coal property in the near future, one at Cardiff and one at Brookside, Alabama.

The Howells Mining Co., at Blocton, Ala., on the Alabama Great Southern Ry., has abandoned its mine at this point.

The organization of a company to develop about 40,000 acres of coal land in Tuscaloosa County, Alabama, is planned by W. H. Skaggs, of Birmingham and Chicago.

Colorado

Walsenburg—The bodies of two victims of the intense cold were found here, Dec. 20. Robert Burt, superintendent of the Rocky Mountain Coal mine, who disappeared on Monday, the 18th, was found dead and half buried in a snow drift. The body of James McIntyre was found in his cabin.

Denver—The injunction which has been hanging over the heads of 2000 miners of the Northern coal fields was recently dismissed on application of the Rocky Mountain Fuel Co., so far as that company is concerned. The other companies in the Northern field did not join with the Rocky Mountain in having the case against the men dismissed. The Rocky Mountain company owns the Simpson, Vulcan and Mitchell mines at Lafayette; Gorham at Marshall, Industrial at Superior, Acme, Hecla, Rex No. 1 and Rex No. 2 at Louisville. It recently took possession of the Standard at Louisville. The mines are all in Boulder County.

Illinois

Chicago—Coal operators from practically all the bituminous producing states in the country except Pennsylvania and Ohio met in conference in the Hotel LaSalle, Dec. 18, and formed the American Federation of Coal Operators. The following officers were elected: Presi-

dent, Harry N. Taylor, Chicago; vice-president, J. C. Kolsem, Indiana.

Joliet—Miners in the northern Illinois field are enthusiastic over the preliminary lessons given them by the crew of the Government mine-rescue car. They have, as a result, formed classes at the different mines for studying the more complicated questions and phases of rescue work.

The Coal Products Co., which was recently organized, with its main office at Joliet, has increased the number of its directors from three to eleven. The company has now under construction, at a site about four miles northwest of here, a plant which will consist of 35 gas ovens of the Koppers type. Gas will be supplied to neighboring towns and the residual coke will be used for commercial purposes, there being a possibility of its qualifying as metallurgical coke.

Indiana

Bicknell—A strike of more than 500 men was inaugurated, Dec. 22, at the Tecumseh mines of the Tecumseh Coal Co., near Bicknell, as the result of the company's refusal to reinstate a machine man who had been transferred to the face to load coal because of his alleged carelessness and lack of judgment in handling the machine. The matter was referred to the arbitration board, but without avail in preventing a strike. Secretary Penna, of the Indiana Operators' Association, said: "The trouble at Tecumseh is not a small matter; there is a great principle involved. Apparently the miners are attempting to take away from us the right to protect our own machinery and our own interests."

Iowa

Oskaloosa—John P. White, president of the United Mine Workers of America, claims reëlection to the presidency by a majority of from 40,000 to 50,000 over T. L. Lewis. Mr. White bases his claim on incomplete and unofficial returns which have been received here.

Kentucky

Louisville—An organization was effected at a meeting here recently of 8 western Kentucky coal companies, operating 12 mines, under which it is planned to operate all these mines through one central company. The organization was effected chiefly by Gen. T. O. DuPont, of Wilmington, Del., who called the meeting. The tentative organization will be known as The Kentucky Fuel Co. and will have a capital stock of $1,500,000, according to present plans. When the details are completed, the merging companies will cease to exist. The 12 mines affected, lie along the main line of the Illinois Central Railroad Co., in Ohio and Muhlenberg counties, and have a total maximum output of 2,500,000 tons annually. The eight companies which are included in the agreement are as follows: W. G. Dunn Coal Co., Greenville, three mines; Central Coal and Iron Co., Central City, two mines; McHenry Coal Co., McHenry, two mines; Broadway Coal Mining Co., Simmons, one mine; Greenville Coal Co., Greenville, one mine; Nelson Creek Coal Co., Nelson, one mine; Dovey Coal Co., Dovey, one mine; the Gibraltar Coal Co., Mercer, one mine. W. G. Duncan was elected president. An agreement was reached to the effect that the proposed plans should be submitted to the various stockholders of the respective companies and a report made at a meeting to be held here Jan. 1. The organization will be incorporated under the laws of the state of Kentucky.

The Pond Creek Coal Co. with extensive holdings in Pike County, Kentucky, has completed preliminary surveying work on its properties and actual development will be started Jan. 1. A permanent organization of the company has been effected with Albert F. Holden, of Salt Lake, as president and Thomas B. Davis, Jr., of New York as vice-president and general manager.

Ashland—A syndicate of Maysville and Flemingsburg, Ky., capitalists is reported to have acquired 12,000 acres of excellent coal land in Letcher County. It is understood that 22 miles of railroad will be built from the mines to Portsmouth Blade.

Sebree—The Sebree Coal & Mining Co. has been sued for $10,500 as commissions alleged to be due for making the sale of a mine belonging to the company.

Missouri

Joplin—Coal has been discovered near the Weaver mine, about four miles north of Coal Junction in Jasper County.

Ohio

Martins Ferry—A fire at Glencoe, Dec. 20, destroyed six dwelling houses which were owned by the Pittsburg Belmont Coal Co. and occupied by miners. The loss is $5000.

Athens—The New Pittsburg mine No. 10, at Hocking, near here, closed down recently for an indefinite period, according to the officials of the company. About 500 miners are thrown out of work. The mine was closed last year from December until May.

Hamden—The Vinton-Jackson Mining Co. is making extensive preparations to open up its property at Vinton Furnace, 8 miles east of here. This property has lain dormant for a number of years. E. D. R. Sutton, of Philadelphia, with two eastern railroad contractors, is making an estimate of the probable cost of a switch from the main line of the Baltimore & Ohio Southwestern R.R. to the site of the proposed plants.

Columbus—The Grand Trunk Ry. Co. has purchased from the Rail & River Coal Co., of Pittsburg, 31,000 acres of coal land in Belmont County, Ohio, near Wheeling, W. Va., including six operating mines with a capacity of 750,000 tons of coal annually. The purpose is the shipment of the coal for use along its own lines. The capital stock of the Rail & River Coal Co. was $2,500,000, and there are $2,500,000 in bonds outstanding. It is understood that the Rail & River Coal Co. obtained about $3,00,-000 for its properties, and that the Grand Trunk Ry. Co. has guaranteed the bonds. It is said that the railway company purchased the 31,000 acres because of an impending deal to consolidate a number of mining companies in Belmont and Jefferson Counties.

Pennsylvania

Bituminous

Dubois—The new extension of the Pittsburg, Shawmut & Northern R.R. from the mouth of the Mahoning Creek to Knoxdale was officially opened for traffic, Dec. 18. The new Chickasaw mines, formerly known as the Tidal mines, were put in operation at the same time and will ship over the new road. The opening of this branch marks the completion of 28 miles of main line and a 4½-mile spur.

Connellsville—The Tip Top mine of the H. C. Frick Coke Co., near Owensdale, has been shut down and abandoned after nearly 40 years of operation. The stumps and ribs have been cleaned up and now only a little crop coal remains on the property. For the past year only 40 of the more than 100 ovens have been in use.

Reynoldsville—A fire at the Bloomington mines near Rathmel, recently destroyed the engine and boiler houses.

Lock Haven—A runaway trip of seven mine cars on the inclined plane of the Kettle Creek Coal Mining Co., near Bitumen, resulted, Dec. 16, in the instantaneous death of two men and the serious injury of two others, all of whom were riding the cars. The accident is attributed to the breaking of a shoe on the band brake of the lowering device.

Pittsburg—The Interstate Commerce Commission, by agreement with both sides, has postponed until Jan. 8 the hearing of the railroad's side in the case of the Pittsburg district coal operators against the 88-cent rate on coal to Lake ports. The original date fixed for a hearing on the side of the railroads was

Dec. 27. The postponement was made because of the desire of the commission to finish before the end of the year the hearing of the coke case from the Connellsville field, now pending.

The winter meeting of the Coal Mining Institute of America, held in this city, Dec. 19 and 20, adjourned after an interesting session at which a number of technical papers were presented and discussed. The following officers were elected for the ensuing year: President, A. W. Calloway, of Punxsutawney, Penn.; secretary-treasurer, Charles L. Fay, Wilkes-Barre, Penn.; vice-presidents, Elias Phillips, W. E. Fohl and Jesse Johnston.

An official of the H. C. Frick Coke Co. states that a number of additional ovens will be lighted by the company soon after Jan. 1, 1912, and predicts that the number of active ovens after that date will exceed the number in operation during the best part of the record year, 1907.

Manufacturers of the Mahoning and Shenango valleys have received notice that the petition for a reduction of freight rates on coal, coke and ore will not be granted. The railroads claim that the rate is as low as consistent at this time. The manufacturers will probably appeal to the Interstate Commerce Commission.

Coal operators of Pennsylvania and Ohio have refused to enter into an interstate wage agreement with the operators of Illinois. A decision was reached here Dec. 24, when the United Mine Workers of America called a meeting of the Ohio and western Pennsylvania operators in order to get them to join in an interstate agreement. The western Pennsylvania operators maintained that West Virginia had cut into their business so much by employing nonunion men that they could not afford to work under the conditions imposed on Illinois operators. The United Mine Workers of America decided to appeal to the American Federation of Labor to boycott all coal mined in West Virginia, in order to force the operators there to permit their miners to organize.

Anthracite

Scranton—The controlling interest in the New York, Ontario & Western R.R. has passed from the New York, New Haven & Hartford into the hands of the New York Central & Hudson River R.R. Co. The Ontario & Western is interested in mines near Scranton which produce about 5 per cent. of the total annual anthracite tonnage. The control of this road gives the New York Central for the first time an entrance into the anthracite field.

Wilkes-Barre—Three hundred employees of the Raub Coal Co., at Luzerne, near here, went on strike recently. No notice of the intention to strike was served upon the company, and when the men did not report at starting time an investigation was made, which showed they had well-laid plans to tie up the colliery. The men allege that the dockage boss discriminates against them and that they are unduly penalized.

At the last meeting of the Wilkes-Barre Mining Institute, two interesting papers were presented on the subject of mine haulage.

Shenandoah—Fire in the night of Dec. 22 destroyed the West Shenandoah colliery of the Philadelphia & Reading Coal & Iron Co. The colliery was one of the largest in the anthracite field and employed a great number of men and boys. The loss is estimated at $1,000,000.

The two miners who were entombed in the workings of the Packer colliery, Dec. 22, were rescued unharmed the following day from behind a fall of several hundred tons of rock.

Pottsville—The Philadelphia & Reading Coal & Iron Co. has awarded the contracts for one of two extensive stripping operations at Silver Creek, near here. It is said that these are destined to have the greatest coal output of any operations of the kind in the Schuylkill Valley.

The Beaver Valley Coal Co. has awarded the contract for a breaker, to be erected on its property in Scotch Valley, Columbia County. Work will be started at once.

Tennessee

Knoxville—A fire in No. 17 Right entry of the Cross Mountain mine, at Briceville, has proved a great obstacle in the work of rescue. The bodies of 84 men have been located, and, at last reports, all but two of these had been removed from the mine. The Federal mine rescue officials, excepting those in charge of the local crew, have left Briceville. The work of investigation has been carried on simultaneously with that of rescue and body-seeking. Both the federal and state officials have investigated conditions in the mine as they were reached and gathered data concerning the explosion. The mines of the Tennessee Coal Co. and Minersville Coal Co., near Briceville, have resumed operations, and other mines in the locality will soon start work again.

West Virginia

Wheeling—The Supreme Court of West Virginia has confirmed the decision of the lower courts in giving the Mountain Park Land Co. the right of eminent domain in West Virginia. It is also announced that the White syndicate of English capitalists has withdrawn from the fight for possession of the Cheat River, thus giving a clear field to the Kuhn interests of Pittsburg, Penn., as represented by the Mountain Park Land Co. and Pittsburg Hydro-electric Co. Power plants will be built along the Cheat River which will furnish electric power, first, to the Morgantown, W. Va., district, and, later, to the Fairmont and Clarksburg territory.

Fairmont—The Wenonah Coal & Coke Co., at Dott, W. Va., has work well under way on a second opening upon its property along the Norfolk & Western. The construction of the tipple has been started and a switch installed. Shipments will probably begin in the course of the next two months.

The recent examinations held at Grafton, Welsh and Charleston for mine foreman and fire boss, under the direction of the state mining department, were the most largely attended of any held so far. The one at Grafton, which was for this district, was tried by 118 men, and in all, the examinations were attended by 479. The papers are now in Charleston, and are being examined by the state examiners, who will announce the results before Jan. 1, 1912.

Canada

British Columbia—"Though work was resumed in the mines of the Crow's Nest Pass district of British Columbia and Alberta, only as long ago as Nov. 20, the mines, taken as a whole, are already producing between 75 and 80 per cent. of their normal output," said O. E. Whiteside, general manager of the International Coal & Coke Co., at Coleman, Alta. "Considering that the strike had lasted nearly eight months, I think it is a decidedly good record that the mines should be on so large a producing basis so soon. Plenty of labor is offering, the men seem to be willing to dig in, and the markets are in good shape. It will take the operators quite a while to catch up with the extra demand created by their long period of non-production."

The mine of the Lethbridge Collieries, Ltd., about 7 miles south of Lethbridge, has been developed and equipped during the past year. Two shafts were put down 600 ft. to the coal, a steel tipple erected, and a 1000-h.p. power plant built and equipped. About 300 men are now employed on construction work.

England

Wigan—The Cross Tetley coal pit near here was flooded Dec. 23 by a sudden inrush of water. Two hundred miners were below in the workings at the time and it was feared that many of them would lose their lives, but all were brought safely to the surface.

Germany

Dortmund—Six miners were killed Dec. 23 by a firedamp explosion in one of the pits of the Teutoburgia colliery.

Personals

E. H. Leaning has recently been appointed assistant treasurer and general manager of the reorganized Nay Aug Coal Co., of Scranton, Penn.

W. Clyde Williams has resigned as president and manager of the Camden Coal Co., Louisville, Ky., a local branch of the Monongahela Consolidated Coal & Coke Company.

Thos. Sneddon, Jr., recently of the Union Pacific Coal Co., is now assistant engineer with the Anaconda Copper Mining Co., coal department, and is stationed at Diamondville, Wyo.

James Bonnyman has resigned as vice-president of the Birmingham Coal & Iron Co., which was recently merged with the Woodward Iron Co., and has become president of the newly organized Bonnyman-Norman Coal & Iron Co., of Birmingham, Ala.

Niel Robinson, mining engineer of Charleston, W. Va., and Ed. W. Knight, chief counsel for the Virginian Ry., appeared recently before the Interstate Commerce Commission, Washington, D. C., in connection with the Pittsburg-lake freight-rate case.

Dr. J. J. Rutledge and J. T. Ryan passed through Knoxville, Dec. 22, *en route* from Briceville, Tenn., to Pittsburg. W. M. Burke, in charge of mine-rescue car No. 7, and A. R. Brown, foreman, left Briceville at the same time for Ashland, Ky., and Birmingham, Ala., respectively.

Thomas R. Henahen, state commissioner of mines for Colorado, was recently sent to the northern Colorado coal district by Governor Shafroth to make an investigation of strike conditions. Mr. Henahen has been a practical coal miner for 30 years, and has had charge of several large coal properties in Colorado.

John W. Groves, lecturer and mine-rescue demonstrator of the Tennessee Coal, Iron & R.R. Co., with six helmet men from the Pratt mines No. 1 division, and five helmet men from the No. 2 division, went to Briceville, Tenn., Dec. 12, to assist in rescue work at the Cross Mountain mine at the request of Dr. J. A. Holmes, director of the Bureau of Mines.

Thomas Graham, for several years superintendent of the Western Fuel Co.'s coal mines near Nanaimo, Vancouver, and previously superintendent of the Crow's Nest Pass Coal Co.'s Coal Creek colliery, near Fernie, East Kootenay, has been appointed chief inspector of mines for British Columbia as successor to Francis H. Shepherd, now representative of the Nanaimo district in the Canadian House of Commons. Mr. Graham is not only an experienced coal-mine superintendent, but also an active promoter of efficiency in mine-rescue work. His appointment will take effect Jan. 1, 1912.

Construction News

Louisville, Ky.—It is reported that the Pond Creek Coal Co., of Boston, Mass., will begin actual development work on its coal property in Pike County, Ky., as early as Jan. 1, 1912. A preliminary survey of the land has been completed.

The Harlan Coal Co., Harlan, Ky., is preparing to open several mines near Harlan, and will erect a power house and install conveying machinery and other equipment.

Indiana, Penn.—The Penn Mary Coal Co., of Heilwood, will in the near future extend its operations to Seldom Seen, about two miles from the present plant. Contract for grading two miles of railroad has been awarded to the Sims Co. Harry P. Dowler is superintendent.

Birmingham, Ala.—The Bryan Coal Corporation of Birmingham, which recently purchased about 800 acres of additional coal land, including a plant of 300 tons daily capacity, will invest about $50,000 in enlarging the plant and in building a new washer, with the idea of eventually attaining a daily output of 1000 tons. It is said that the company will subsequently develop 8000 acres of coal land previously purchased.

Recent Incorporations

Indianapolis, Ind.—The Lock & Key Coal Co., of Indianapolis, to lease and operate coal and shale mines. David B. Hill, president.

Louisville, Ky.—The Riverside Coal & Land Co., of Prestonburg; capital, $100,000. Incorporators: Walter S. Harkins, Joseph D. Harkins and Claude Stephens.

Maglinger Coal & Mining Co., of Owensboro; capital stock, $1000; incorporators: J. F. Maglinger, Jr., R. W. Maglinger and A. D. Westerfield.

Columbus, Ohio—The Crown Coal Co., of Wellston, Ohio; $60,000; to mine and sell coal from the Jackson district. Incorporators: Frank Chrissinger, G. L. Gugle, A. M. Goggens, C. Ims and N. M. Irwin.

Spokane, Wash.—The Palouse Coal & Oil Co., of Palouse, Wash.; capital, $500,000; to develop local coal lands. Incorporators: A. E. Sever, W. R. England, R. D. Halsey, J. C. Northrup and others.

Philadelphia, Penn.—The Columbia County Coal Co.; capital $1,000,000; to engage in mining coal. Incorporators: W. F. Miles, T. F. Taylor, G. Hauck, Philadelphia, and F. B. MacCarthy, Claymont, Penn.

Charleston, W. Va.—The Long Branch Coal Co., of Mt. Hope; capital, $50,000; to mine coal and manufacture lumber in the Fayetteville district of Fayette County. Incorporators: C. M. Lilly, T. H. Snyder, T. E. McGuire, and others, all of Mt. Hope.

New Publications

Tests of a Suction Gas Producer. By C. M. Garland and A. P. Kratz. Bulletin No. 50, University of Illinois. 92 pp., 6x9 in.; illustrated. 50c. University of Illinois, publishers.

This bulletin contains a complete and detailed account of the tests of small suction-gas producers, using anthracite coal. The tests were undertaken to obtain impartial data on the efficiency, reliability and operation of this type of generator and the results are summed up in seven valuable and important conclusions. An admirable feature of the pamphlet is the appendix. This gives in detail the forms used for recording the results of the tests and the formulas required for the necessary computations, a valuable acquisition for anyone contemplating a test of this character.

Résumé of Producer-Gas Investigations. By R. H. Fernald and C. D. Smith. 400 pp., 6x9 in.; 250 illustrations in text, 12 plates. Bulletin No. 13, Bureau of Mines.

This book is a compilation of the data that have been gathered on the subject of producer gas during the six years from 1904 to 1910 by the Geological Survey at first, and later by the Bureau of Mines. Most of the material has been published hitherto in a series of bulletins. The present volume, however, is a valuable contribution to the literature of producer gas, dealing with the subject under three general heads as follows: Gas producers and producer plants in general; investigations at St. Louis and Norfolk, and investigations at Pittsburg. Tabulated and graphical reports are given of the many and varied tests. Not the least commendable portions of the bulletin are its 20 pages of bibliography and an excellent index.

Trade Publications

The Goulds Manufacturing Co., Seneca Falls, N. Y. Bulletin No. 106. Vacuum and Stuff Pumps. 16 pp., 8x10 in., illustrated.

The Ohio Ceramic Engineering Co., Cleveland, Ohio. Folder descriptive of the Lakewood line of mine cars and contractor's equipment. 8 pp. 3½x6½ in., illustrated.

Ingersoll-Rand Co., New York. Bulletin Form No. 4108. 4 pp. 6x9 in., illustrated. Catalog descriptive of the B-104 Sergeant Rock Drill, a machine specially adapted for driving small headings, stoping or similar work requiring a light and small, but powerful machine. This drill has a 2½-in. diam. cylinder and will drill a 1 to 1½-in. diam. hole to a depth of 20 in. without change of steel. Bulletin shows duplicate parts of the drill and also gives full specifications and details.

COAL TRADE REVIEWS

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

There has been little or no change in market conditions during the past week. Reports generally state that the winter so far has been the most open for a number of years and the effect on the domestic market is being keenly felt by both the trade and operators. A slight activity due to the holiday cessation of operations, and consequent loss of output, is now evident, but the relief from this source will be only temporary.

On the Atlantic Coast supplies have greatly improved, because of the generally slack demand, although some shortage is still evident. This market has shown a slight activity due to the holidays and an advance of 25c. on anthracite has become effective at some points.

In Ohio and adjoining states the market is quiet and trade dull generally. Some price cutting has occurred, mostly on demurrage coal due to heavy overshipment. At the Hampton Roads piers unusually large tonnages are being handled. The general demand is spotty with the exception of slack, which is showing some strength.

Shipments to centers in the Middle West have fallen off considerably, which has materially improved the tone of this market. Weather conditions, however, continue adverse to an active domestic consumption, and the market remains dull and heavy with prices soft. It is reported that a number of mines have shut down in this section.

Adequate supplies are reported in the West, and on the Pacific Coast. The open winter, so far, has not interfered with transportation in the Rocky Mountain states, and no shortage is anticipated.

Boston, Mass.

The shortage of coal at Hampton Roads is expected soon to have effect here. While the tension in bituminous was halted for a few days by the mild weather, the holiday season is now on, and with further interruptions in water movement, January is likely to see some anxious days. Although proceeding quietly, shippers are still making purchases outside in order to tide over their customers, and few of the larger corporations have as much coal in sight as they would think it prudent to carry in a normal season. If we have any cold weather at all, prices are almost sure to be higher than any yet reached. The figure asked for the standard brands, f.o.b. Virginia ports, is still $2.70@2.75, and around $4@4.10 on cars Boston or Providence. Nearly all the distributors are behind on contract obligations, and it is hard to see how they can gain much ground during the next fortnight.

New York

There has been some extra activity in the trade this week, as there usually is around the holidays, due to the preparations of both the consumers and the shippers to accumulate stocks for their supplies and obligations this week. At this time of the year, railroad transportation is often tied up so badly, on account of the heavy passenger traffic, that coal and other commodities are sidetracked. This results in a shortage in this market, and both the consumers and the trade realize the importance of being well stocked at this season.

Fortunately, this year, no heavy snowstorms, such as occurred last Christmas, have been experienced, and most shippers are in a position to take care of contract obligations, which continue to be heavy. There are, however, a few who do not seem to have sufficient coal at New York tidewater to fill their orders, and these have purchased on the market, to tide them over. This demand has caused a slight increase in quotations of steam coal at New York, which now range, f.o.b. the piers, about $2.40 for West Virginias; $2.25@2.65 for ordinary Pennsylvanias, and $2.80@2.90 for the best grades.

Philadelphia, Penn.

The retail trade has gone through a rather apathetic week, due in a measure to the holidays, and also the weather, which has not been distinctly seasonable. All the predictions to the contrary, the start of this week was more like fall than winter and, as a consequence, trade has not been up to the mark.

The wholesale market still enjoys prosperity, all sizes being in demand with the exception of egg coal, which is becoming hard to handle. One of the individual operators in this market openly admitted that he was cutting the price of this size to move it off, and it is fair to assume that the others are doing the same.

If trouble should occur, there would hardly be any of this size for shipment at any price, as the stock of this coal is pretty generally cleaned up by the close of the year, and after that deliveries are to be made from the current production.

Pittsburg

Bituminous—The industrial demand for coal continues good, and retail has improved slightly. Prices are only fairly well maintained. A temporary decrease in shipments is expected for this week, as is usual after a holiday. Prices are subject to shading occasionally, being regularly quotable as follows: Nut, $1.05@1.10; mine-run, $1.10@1.15; ¾-in., $1.20@1.25; 1¼-in., $1.35@1.40; slack, 70@75c. per ton, at mine, Pittsburg district.

Connellsville Coke—There has been further contracting for furnace coke in the past week, at prices established in the early part of the buying movement. In the past two or three weeks contracts have been closed, chiefly for the year 1912, but in one or two instances for the first half only, involving between 50,000 and 75,000 tons a month, the common price being $1.60 for the half-year and $1.65 for the year, although one or two early sales, for specially desirable coke, ran up to $1.75 for the whole year, and there were one or two sales for the half-year at $1.55.

The furnaces now in blast which do not make coke of their own are consuming between 550,000 and 600,000 tons of coke a month, but more than half of this, between 300,000 and 400,000 tons, is going out on long-term contracts. There are more of these than formerly, as none expired during the past year and several fresh ones were made. In the past two months contracts for the year or half-year have been made, involving a total of perhaps 200,000 tons a month, and this leaves very little business to be closed, except with furnaces not now in blast.

A sharp scarcity of furnace coke for spot shipment developed late last week, with the result that sales of 4000 to 5000 tons were made at $1.75, with one or two small sales at $1.80, and a high price is expected to continue this week. The occasion was the demand from furnaces for extra coke to stock, against the probable interruptions in shipments this week and next on account of the strenuous manner in which the foreign labor in the coke region celebrates the holidays. We quote: Prompt furnace, $1.75@1.80; contract furnace, first half, $1.60@1.65; year 1912, $1.70@1.75; prompt foundry, $1.80@1.90; contract foundry, $2@2.25.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Dec. 16 at 318,234 tons, a decrease of 896 tons, and

shipments at 3386 cars to Pittsburg, 4931 cars to points west and 937 cars to points east, a total of 9254 cars, a decrease of 265 cars. Production last week was doubtless somewhat less, and a large decline this week is expected, but by the second week in January the output should be back to normal.

Baltimore, Md.

The buying which some of the large consumers did in order to provide stock enough to tide them over the holidays, somewhat stimulated market conditions in Baltimore during the past week, but even this new business was not sufficient to cause any undue activity in trade. What sales were made were confined to a few of the larger operating companies, as the smaller offices state that, so far as they are concerned, the demand for coal has not improved much over the preceding week.

The trade, as a whole, is awaiting further developments. The open weather conditions which have been prevailing here recently, have not had the tendency to engender any particularly hopeful feeling for the future. It has been some years since such mild December weather was experienced in these parts. What the trade is hoping for is a big drop in temperature, which will certainly bring about a much greater demand for coal than is reported at present.

During the past week, the operators also reported some inquiries for coke. This is encouraging, in view of the fact that the coke market here has been absolutely dead for months. Most of the inquiries came from the big steel mills.

Buffalo, N. Y.

The return of mild weather after only a slight turn colder has made this December about the worst the coal trade recalls. The hard-coal dealers are complaining most. Before the end of October there was a great clamor for chestnut and stove and some jobbers were so eager to get their early winter supply in that they ordered a full amount from several sources, counting on canceling the slowest responses after receiving what they wanted. Some shippers do not accept such methods and now that they are able to fill all orders they are insisting on enterprising dealers taking what they ordered.

There is about the usual strength to the bituminous market that has existed through the month, so that real winter weather ought to stiffen prices materially. Quotations remain at $2.50 for Pittsburg three-quarter, $2.40 for mine-run and $2 for slack, with Allegheny Valley about 25c. lower. Coke remains quiet at $4.25 for best Connellsville foundry and $3.50 for stock coke.

Cleveland, Ohio

There is absolutely nothing new in the coal situation in the past week, excepting the scarcity of slack coal, on which prices have advanced from 10 to 15c. in the last few days. This is owing to the fact that the weather has been so mild the domestic trade has fallen off at least 75 per cent., since people are not burning coal as the weather does not permit them to do so. The consequence is that lump coal is not being mined, hence the scarcity of slack.

The steam trade does not show any improvement, but there seems to be a belief that business will revive in that line soon after the new year. Prices on domestic, as well as steam, remain about the same as they have since winter set in. However, winter up to the present, is only in its infancy, and if we have the usual cold weather that should prevail during the months of January and February, domestic trade will certainly equalize itself, and make up for the poor business in the past months.

Columbus, Ohio

The domestic trade during the past week has been generally weak with some spots of strength showing at times, when the temperature became lower. On the whole, the market has been spotty in the extreme with the holiday rush aiding in weakening the demand for the domestic and steam grades. But prices have not suffered to any extent by the weakness and coal men generally believe that the condition is only temporary and will soon pass away with more favorable weather conditions.

There is a good demand for the fancy grades of domestic fuel and prices range from $1.85@2.35 for the especially prepared grades. Stocks in the hands of the retailers are fairly large at this time and unless the weather changes radically in the near future they are sufficient to take care of immediate wants.

Operations in Ohio fields have not been very active during the past week. The lull in the domestic trade, coupled with the approach of the holiday season, has caused a let-up in production and many of the districts are not producing more than 70 per cent. of normal for this time of the year. This is true of the strictly domestic fields more than in the Hocking Valley district and in Eastern Ohio. In the Pomeroy Bend field the production has been about as large as usual. Prevailing prices are:

Domestic lump in the Hocking Valley	$1.50
Domestic lump in the Pomery Bend district	$1.60@1.75
Three-quarter inch	1.35
Nut	1.15
Mine-run in the Hocking Valley	1.05@1.15
Mine-run in Eastern Ohio	0.95@1.05
Coarse slack	0.40@0.45
Nut, pea and slack	0.40@0.50
Fancy grades of domestic lump	1.35@1.85

Cincinnati, Ohio

The local coal market is weighed down under the same unfavorable weather conditions which have prevailed almost continuously for several weeks. Most unseasonable weather is causing an unusually light demand for domestic fuel and a large amount has accumulated on track here, so that considerable is being sold at cut prices in order to avoid demurrage charges. Since it is a case of giving it either to the railroads or to the consumers, the wholesalers are giving their customers the benefit of the situation. Not that it should be assumed that the wholesalers are afflicted with enlargement of the heart—even at this holiday season. Fuel sold to stop demurrage is not bringing a fair price, which is the case under almost any circumstances. It has almost become a settled fact in this market that the winter does not really begin until after the holidays.

Hampton Roads, Va.

Prices during the past week have been firmer, $2.70 per gross ton f.o.b. Hampton Roads being the standard. Nearly all of the selling agencies are still decidedly short of coal, and this state of affairs is sure to continue, as the production at the mines is beginning to show the usual Christmas falling-off. To make matters worse, both the Chesapeake & Ohio Ry. and the Virginian Ry. are short of motive power, and are not moving coal as it is loaded.

Dumping at the railway coal piers has been exceptionally heavy, and a large number of ships are under charter and yet to be loaded. Unusually heavy tonnages are being loaded in the United States colliers. On Dec. 20 the "Mars" was loaded at Lambert's Point and the "Hector" at Newport News. Bunker business has been exceptionally good also, 15 ships having been in for bunker coal in two days.

The coal loading on the Chesapeake & Ohio Ry. during November showed a total of 1,422,850 tons, a decrease of 9120 tons. The tonnage was divided up among the three fields as follows:

District	Daily, Tonnage Allotment	Month, Tons Loaded	Month, Tons Loaded Per Cent. of Allotment or Capacity
Kanawha	66,850	828,010	47
New River	45,750	477,330	..
Kentucky	9,400	117,510	48
Totals	122.000	1,422,850	

Louisville, Ky.

The local coal business continues to feel the effect of warm weather and the holiday season. The merchants, despite their vigorous advertising, are doing little business, but it is expected conditions will

improve after the first of the year, especially in view of the coming wage conference.

Quotations this week are as follows:

	F.o.b. Mines	F.o.b. Louisville
Best Jellico and Straight Creek Coal		
Block	$2.00	$2.95
Lump	1.85	2.80
Round	1.40	2.35
Nut and slack	0.75	1.50
Western Kentucky Coals		
Lump	1.35	1.95
Nut	1.15	1.75
Mine-run	0.90	1.50
Nut, pea and slack	0.70	1.30
Pea and slack	0.30	0.90
West Virginia Splint		
4-in. lump	1.40	2.40
3-in. lump	1.30	2.30
Mine-run	0.75	1.75

Retail Price per Ton Delivered	
Pittsburgh and Straight Creek	$3.75
Jellico	3.60
Smokeless lump	4.50
Anthracite	8.50
Western Kentucky	3.25
West Kentucky	3.50

Memphis, Tenn.

The situation in Memphis is at a standstill, owing to the extreme mild weather we are having; there is hardly a normal demand for coal throughout this district, which has a tendency to keep prices low. However, prices for the western Kentucky coals still stand at $1.50 for lump, $1.25 for mixed coal, $1.10 for nut, $1 for mine-run and screenings from 25@85c. Just at this time the screening market is up, owing to the scarcity of this grade, in addition to the slight preparation that consumers are making to take on a little surplus just prior to the holiday season.

The prices in Alabama from the Carbon Hill district are better than those from Kentucky, inasmuch as they are getting $2 for lump coal, and as much as $1.75 for their washed-nut coal, with mine-run $1.10@1.25. This coal moving through Memphis at this season of the year, always brings a good price.

The higher grades of coal, such as Jellico, Cahaba and Pittsburg, are selling for $4.75. The dealers in Memphis are all well stocked, prepared for a cold season, which they are anxiously awaiting.

Nashville, Tenn.

To say that the market in this field is completely demoralized, is but mildly expressing it. We have gone through a spell of weather in December that has been unprecedented, and instead of improving, it seems to have grown worse. Everyone is filled up with coal—in fact, quite a lot of it is in the city on demurrage.

Price is no inducement and lump coal cannot be moved at any figure. It will take two weeks of steady cold weather to put the coal business in this section in a healthy shape. Owing to these conditions, screenings have been much in demand, especially this week, because of the usual layoff of two or three days during Christmas at the mines. There are practically no screenings to be had, and a fancy price is being offered for them.

Indianapolis

There has been no perceptible change in the condition of the Indiana coal market during the past week. The trade is somewhat demoralized, owing to mild weather and a good supply of cars, which enabled the operators to overship the market.

The operators say that it is customary for a drop in the bituminous market to come at this time of the year, and that the present dullness differs from that of previous years only in the extent or severity of the winter. Except for a few weeks in November, the mild weather has dissipated the producers' hopes for a heavy business this winter.

Chicago

Recent heavy shipments have resulted in retailers, with a limited storage capacity, being fully stocked. Prices for smokeless lump and egg are about the same as those quoted a week ago. A lessening of shipments is causing the market to mend, so far as Hocking coal is concerned. The market for screenings is weaker, 55c. being the prevailing price for the lower grades. One lot of splint coal sold a few days ago at $1 a ton, instead of at the regular price of $1.50@1.60. Prices for Carterville coal are unchanged, and the same may be said of Indiana and central Illinois coals.

Coke—Prices asked for coke are: Connellsville, $4.50@4.65; Wise County, $4.50@4.65; byproduct, egg and stove, $4.95; byproduct, nut, $4.55@4.65; gas house, $4.85.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.35@2.50
Egg	2.30@2.40
Screen lump	2.10
Screenings	1.37@1.52
Springfield:	
Domestic lump	$2.07@2.32
Steam lump	1.92@1.97
Mine-run	1.82@1.87
Screenings	1.32@1.42
Clinton:	
Domestic lump	$2.12@2.27
Steam lump	2.00@2.20
Mine-run	1.82@2.02
Screenings	1.42@1.52
Pocahontas and New River:	
Mine-run	$2.95@3.05
Lump and egg	3.65@3.90

Minneapolis—St. Paul

Conditions in the Twin Cities are anything but encouraging this week, although most coal men are optimistic and are prophesying some severe winter weather after Christmas. December this year has been a record breaker for mildness. The average temperature for the month of November was far more favorable than December from the coalman's point of view. However, the average tonnage for the year 1911 will, no doubt, show up well in spite of the present conditions, and dealers are inclined to be optimistic.

The contract for furnishing the Court House in Minneapolis was awarded Dec. 19. It called for Youghiogheny screened lump at $4.60, with a guarantee of 14,800 B.t.u. This is a cut of nearly 40c. off circular price. Contract for the Minnesota State Prison showed a cut of 20c. a ton off circular. This contract called for Youghiogheny dock run and the price was $3 f.o.b. docks.

The retail trade here is not rushing, although they manage to keep all the teams they can get busy. The recent welcome snowfall has helped somewhat in making deliveries, sleds being used in suburban districts.

St. Louis, Mo.

There has been no change in the market; as a matter of fact it was a little bit worse the past week than at any time since last summer. The steam demand has practically ceased and there has been absolutely nothing doing in domestic. Several mines in the high-grade and standard fields have worked but one or two days in the past two weeks, and on those occasions it was to get out contract coal only, they having decided to place no coal on the open market. There is an indication, however, that after the first of the year business will be considerably better, for all stocks are depleted, and this applies to domestic as well as steam.

The prevailing prices are:

Franklin County	
Lump and egg	$1.25@1.40
No. 1 nut	1.2 @1.35
No. 2 nut	1.15@1.20
No. 3 nut	1.00@1.10
2-in. screenings	0.65@0.75
Carterville	
6-in. lump	$1.15@1.30
3x6-in. egg	1.15@1.30
No. 1 nut	1.05@1.15
No. 2 nut	1.00@1.05
No. 3 nut	0.90@1.00
Screenings	0.60@0.65
Mine-run	0.95@1.00
No. 1 washed	1.50@1.60
No. 2 washed	1.20@1.30
No. 3 washed	1.15@1.20
No. 4 washed	0.80@0.90
No. 5 washed	0.40@0.50
Standard	
6-in. lump	$0.90@0.95
2-in. lump	0.85@0.90
3x6-in. egg	0.75@0.80
No. 1 nut	0.70@0.75
No. 2 nut	0.60@0.65
Screenings	0.45@0.50
Mt. Olive	
6-in. lump	$1.35
3-in. lump	1.25
3x6-in. egg	1.00
No. 1 nut	$0.85@0.90
No. 2 nut	0.75@0.80
2-in. screenings	0.50@0.55

High-grade coals from the inner district, such as Trenton, are in fair demand at from $1.75@2. There is no coal coming in from the Springfield district, and shipments have ceased from the Harrisburg and Gallatin Counties. The Big Muddy mines, at Murphysboro, have practically cut out St. Louis shipments, with the exception of those on contract. A fair movement of anthracite chestnut has been coming in, but all other sizes are

moving slowly. Coke is much in demand —byproduct at $4.75, St. Louis, and gas house at $4.60.

Spokane, Wash.

The general conditions are quiet at present; as the weather is not cold the demand is small. The supply is good and can easily meet any emergency which may arise, although none is expected before spring. Mines in the Crow's Nest Pass are now up to about 80 per cent. capacity and expect soon to be back to their normal output before the strike.

Prices continue at the same level as follows:

	Wholesale	Retail
Rock Springs	$7.20	$9.00
Owl Creek	7.20	9.00
Kirby	7.20	9.00
Carney	6.70	8.50
Bearcreek	6.35	8.25
Roslyn steam	5.25	6.25
Canadian steam	5.25	6.25

Portland, Ore.

The market here is quiet because the weather continues mild. No great quantities of coal are being brought in according to reports from dealers, there being enough stock on hand to meet all demands unless extremely cold weather should set in for a prolonged period, which is not considered likely.

In the Spokane country some snow has fallen, but no low temperatures have been reported from any parts of the Pacific Northwest as yet this winter. Along the coast the weather has been mild. There is no indication of prices advancing here for a couple of weeks at least and the future will depend altogether on the weather.

Production and Transportation Statistics

Various Railroads, Rivers and Canals

Statement of coal and coke movement over different railroads, rivers and canals for October and first 10 months of the years 1910-11, in short tons:

Railroads	Month of October		Ten Months	
	1910	1911	1910	1911
Baltimore & Ohio¹	3,254,201	3,419,548	30,553,183	28,804,634
Buffalo, Rochester & Pittsburg³	774,932	749,442	6,692,296	6,747,180
Buffalo & Susquehanna³	164,683	159,475	1,410,740	1,589,460
Chesapeake & Ohio¹ ²	1,451,542	1,548,604	12,234,549	12,001,068
Huntingdon & Broadtop Mountain¹ ³	109,031	95,118	1,049,803	910,518
New York Central & Hudson River³	722,044	709,618	6,491,015	6,628,041
Norfolk & Western¹ ³	1,788,982	1,947,412	16,728,617	17,061,371
Pennsylvania (east of Pittsburg) & Erie¹ ⁴	5,748,110	6,072,901	54,300,393	52,947,301
Pittsburg & Lake Erie³	1,791,009	1,508,602	15,011,074	13,406,450
Pittsburg, Shawnut & Northern	141,925	129,612	1,018,856	1,183,651
Southern Railway²	365,356	331,513	3,185,907	2,806,398
Virginian Railway	204,727	294,052	1,270,089	2,269,711
Western Maryland Railway	271,972	222,188	2,728,754	2,185,848
Rivers and Canals				
Cheaspeake & Ohio Canal	18,010	22,095	162,770	163,872
Davis Island Dam	37,380	159,530	1,580,295	2,387,270
Kanawha River	40,520	124,940	1,020,640	1,067,340
Monongahela River	701,072	726,553	8,020,333	7,486,145

¹ Includes coal received from connecting lines. ² September and nine months' figures. ³ Includes company's coal. ⁴ Does not include company coal hauled free.

Ohio Coal Traffic Statement

Statement of bituminous coal mined in Ohio and shipped over railroads specified, October and ten months, 1910-1911, in short tons:

Railroads	October		Ten Months	
	1910	1911	1910	1911
Hocking Valley	469,674	344,099	3,836,763	2,861,983
Toledo & Ohio Central	223,599	203,866	1,788,468	1,539,136
Baltimore & Ohio	255,322	188,914	2,038,555	1,447,916
Wheeling & Lake Erie	331,121	405,244	3,103,023	2,961,495
Cleveland, Lorain & Wheeling	251,494	330,727	2,563,457	2,496,854
Zanesville & Western	100,180	122,436	978,471	924,605
Toledo Division, Pennsylvania Co	196,013	167,500	1,860,133	1,547,182
Lake Erie, Alliance & Wheeling	120,988	128,442	1,023,934	1,020,415
Marietta, Columbus & Cleveland Ry	7,470	1,449	82,944	22,293
Wabash Pittsburg Terminal Railway	9,193	3,555	54,916	52,025
Kanawha & Michigan Railway	....	12,947	....	85,644
Total	1,965,054	1,909,179	17,330,664	14,959,548

The Virginian Ry.

Coal and coke shipments over the Virginian Ry. for the month of November amounted to 288,577 short tons, as compared with 293,971 for October.

Exports

The following one-column table shows total exports for the first 10 months of the present year as compared with the same period last year, in long tons:

	1910	1911
Anthracite	2,483,413	3,016,127
Bituminous	9,105,787[a]	11,643,931[a]
Coke	715,196	777,861

[a]Does not include bunker or fuel coal laden on vessels which for 1910 was 5,417,517 tons and for 1911 was 5,578,497 tons.

Coastwise Shipments

Domestic shipments of coal from the five principal Atlantic ports for the first 10 months of the present year were as follows in long tons:

New York	20,563,382
Philadelphia	5,826,250
Baltimore	3,657,842
Newport News	2,212,036
Norfolk¹	3,791,794

¹Includes amount shipped by the Virginia Ry., at Sewall's Point, Va.

The Norfolk & Western Ry. Co.

The following is the current statement of coal and coke shipments over the Norfolk & Western Ry., in net tons:

Shipments	November		First 11 Months, 1911
	1910	1911	
Tidewater foreign coal	76,158	87,389	894,282
Tidewater foreign coke	3,709	8,489	70,154
Tidewater coastwise coal	230,783	303,873	2,790,824
Other domestic coal	1,216,140	1,444,053	13,950,269
Other domestic coke	172,086	118,351	1,317,997
Total	1,698,876	1,962,155	19,023,526

Foreign Markets

Great Britain

Delay of tonnage is still keeping business quiet for prompt, though operators are holding for firm figures, shipment immediately after Christmas. Approximate quotations are as follows:

Best Welsh steam coal	$4.20
Seconds	4.02
Thirds	3.78
Best dry coals	4.02
Best Monmouthshire	3.78
Seconds	3.60
Best Cardiff small coal	2.16
Seconds	1.92

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½ per cent. discount.

Japan

A certain amount of business was done on this market at the beginning of the fortnight but the revolution breaking out at Wuchang has absolutely paralyzed trade throughout the whole of the Yangtsze Valley: The uncertainty as to which side will eventually come out "on top" is too great and Native dealers and merchants of all classes and trades will not commit themselves.

The market in Japan is rather active and prices are firm, while in Shanghai prices are stationary on account of the stoppage of business.

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Interior of Head House.—Coal from hopper at left is delivered by Reciprocating Feeder to Shaking Screen. Slack drops into Flight Conveyor, Egg into inclined Picking Table, and Lump into outside Picking Table.

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COAL AGE

Devoted to Coal Mining and Coke Manufacture

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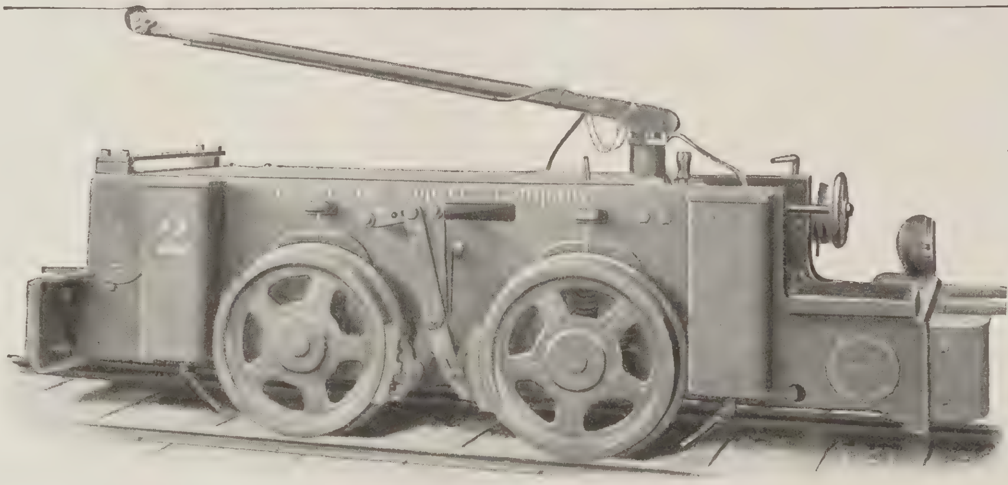

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COAL AGE

Vol. 1 NEW YORK, JANUARY 6, 1912 No. 13

One mine manager recently took exception to a statement we made that coal mines throughout the country were operating at "such and such" per cent. of their capacity. Because a local boom had struck his camp, he thought equally favorable conditions prevailed everywhere.

So it is with many people—they think only as far as they can see, and since each one's horizon is the limit of his vision, the conclusions arrived at by an individual are often wrong because they're based entirely on a local view. For this reason, it is necessary to consult figures rather than the man when we are wanting to know the nation-wide condition of an industry.

There's no denying that every other person we meet today is complaining of slack business—sort of a depression, etc. Yet, one thousand industrial companies in 1911 paid $410,000,000 in dividends, which is $30,000,000 more than was paid in 1910 and $90,000,000 more than was paid in 1909. If that doesn't indicate a healthy growth, then we're justified in the belief that prosperity is indicated by reduced net income.

And how can we dispute that coal mining has received its fair proportion of the business advance of the age? In 1825 the United States produced 100,000 tons of coal; in 1850 it was seven million; in 1875 we mined 50 million; in 1900 the production was 270 million, and in 1911, the coal output of our country totaled approximately 500 million tons, or about 40% of the world's production.

If prices are low and general conditions unsatisfactory, let's not blame business, but more properly recognize that the trouble is within rather than without. An external application of salve on the stomach won't cure pimples on the nose; it's necessary to swallow something that will reach the spot, cure the indigestion and purify the blood.

We've heard for years that our summers are getting hotter and our winters milder, but the mercury makes a new low record for some particular day each year; most every fortnight someone discovers that electricity will furnish all needed heat as well as power, but he forgets to tell us how he's going to generate electricity without burning coal; then we are disturbed by the fellow who has a scheme to pierce the depths of the earth and furnish us heat; still consumption increases, and it's safe to conclude our children's children will be using more coal in their homes and factories than we ever dreamed could be mined.

Therefore, viewing the industry in the light of fact, what is there to be discouraged about? 'Tis true wages have steadily increased and the cost of timber and other materials essential to mining has likewise advanced to new high prices, but similar conditions have prevailed at the same time in other great businesses, and still profits in the aggregate have grown each year. The rule of success today is, "For each added charge, there must be an added improvement," so if props cost 2c. more per ton of coal output, the cutting machines at the face, the haulage, the hoist, or something must be operated to effect an offsetting economy.

One operator recently showed me a cost sheet which read: Total mining, 0.4612; other costs, 0.0401; royalty, 0.05; handling, putting on cars, etc., 0.053; total cost per ton, 0.6043c., and it's needless to say he wasn't a pessimist on the situation. His philosophy was, that the chief advantage to be derived from the application of advanced methods and the adoption of improved machinery is not so much the immediate bettering of output and lowering of costs, as to place and keep your mine in position to profit in full when the periodic boom arrives.

Don't forget that in 1904 the wail of coal men was, "How can we remedy this overproduction?" in 1905 and 1906 the plaint had changed to, "Where can we get cars and men?" The pendulum is still swinging—a new year and likely a new era have dawned. People won't wear white diamonds on their bosoms till they've plenty of black ones in the cellar. Unless a man is ready for the chance, the opportunity will do him no good.

The World's Coal Production

Special Correspondence

A brief synopsis of the latest available statistics concerning the world's production, together with notes on the different fields. The total extraction is over one billion metric tons, having a value above two billion dollars. More than six million persons are employed.

A bluebook on colonial and foreign statistics, prepared by the British chief inspector of mines, and issued by the Home Office Department, supplies what are perhaps the most complete statistics in one volume, relating to persons employed, output and accidents at mines and quarries throughout the world. The volume was issued in September and gives the statistics for 1909, but owing to the want of adequate official data the figures in some cases have merely been estimated from the records of earlier years; those for the leading coal-mining nations are, however, fairly complete.

Production

It is seen that at the mines and quarries of the world, 6,004,928 persons were employed, and of these the inspector shows that more than one-half were engaged in mining coal alone. Great Britain employed over 997,000; the United States, 660,000; Germany, 688,000; France, 190,000; Russia (1908), 174,000; Belgium, 143,000; Austria, 134,000, and India, over 119,000.

These are impressive figures, and we further learn that the coal produced was 1,113,308,386 metric tons, possessing a value estimated at nearly 400 million pounds sterling, or, say, two billion dollars. These figures show an increase in production for the year of 45 million tons but a decrease in value of 46 million dollars. The three leading coal-producing countries are the United States, with over 418 million tons; Great Britain, with over 268 million, and Germany, with over 217 million. These countries are followed by Austria-Hungary, France, Russia and Belgium, in the order given, representing the seven nations having a production of 20 million metric tons or more. Japan comes next on the list with 15,058,113 tons; India, with 12,060,550 tons; China, with 11 million tons, and Canada, with 9,526,784 tons.

Mortality Statistics

Taking the coal mines for which the figures are fairly complete, it is shown that the death rate per thousand persons employed in the United Kingdom was 1.43; the British Empire, 1.48; Austria, 1.13; Belgium, 0.95; France, 1.17; Japan, 3.51; Germany, 2.30, and for the United States, 3.35. The death rate for countries outside the British Empire generally was 2.48.

Commonwealth of Australia

The Commonwealth produced 8⅓ million metric tons of coal in 1909, nearly 86 per cent. of which was furnished by New South Wales. In this state, excluding lignite and seams of the Triassic age, it is computed that the main coal-bearing rocks extend over an area of 24,000 to 28,000 square miles around the seaport of Sydney.

As yet, Tasmania supplies less than 70,000 tons *per annum*, although there are abundant seams of marketable coal in the country. These belong to the Carboniferous and Mesozoic periods, and vary from 20 in. to 12 ft. in thickness, while brown coal and lignite occur all along the North Coast.

The state of Victoria contributed 130,230 tons. Since November, 1909, this state has owned its own coal mine on the Powlett River, the output of which to Sept. 7, 1910, was 93,431 tons, valued at the mine at $203,883. At that date coal was being raised at the rate of over 1000 tons per day and over 900 men were employed in the mine and on the various development works.

The following figures show the main sources from which the fuel supply of the world for 1909 was obtained, with the value in pounds sterling and the increases or decreases on 1906:

MAIN SOURCES OF WORLD'S FUEL SUPPLY

Country	Quantity		Value	
	Metric Tons	Increase or Decrease on 1906	Dollars	Increase or Decrease on 1906
United States	448,038,000	+40,788,000	554,503,000	+22,571,000
Great Britain	268,007,000	+2,282,000	517,187,000	—50,241,000
Germany	217,446,000	+2,159,000	413,214,000	—1,119,000
Austria-Hungary	48,813,000	—153,000	74,314,000	+1,684,000
France	37,840,000	+456,000	112,110,000	—3,197,000
Russia	24,455,000	—1,448,000	(not stated)	....
Belgium	23,518,000	—40,000	65,775,000	—8,307,000

Canada

The oldest coal fields in Canada which have been largely developed, are situated on the seaboards of the Atlantic and Pacific Oceans. On the Atlantic side of the continent, bituminous coal is being mined from thick seams of true Carboniferous age at the Sydney (Cape Breton), Picton, Inverness and Cumberland coal fields, in Nova Scotia. The coal of the Pacific Coast, generally bituminous, belongs to the Cretaceous age, and is derived from collieries at Nanaimo, Extension, and Comox in Vancouver Island. The thick seams of bituminous coal, which exist in the vicinity of the Crow's Nest Pass, are now being worked on an extensive scale, and a large quantity of the coal mined is converted into coke for use in the smelting industry in British Columbia. All these coals are of Cretaceous age.

Natal

In this colony in 1909 about 9000 persons were engaged, the coal produced being 1,815,253 metric tons, valued at $3,229,400. There were 25 electrical coal-cutters and 97 worked by compressed air in operation, nearly 62 per cent. of the coal being obtained by machine-mining—perhaps the highest percentage for any single country in the world.

New Zealand

The output here was 1,941,918 tons, valued at $5,055,000. The most important collieries are situated near Westport, on the West Coast of the Midland Island. More than one-third of the total output is brown coal or lignite, and many of the workings are open-cut. The coal from the West Coast bituminous fields is of a high class and used by the Admiralty. From the Point Elizabeth State coal mine, 207,450 tons were produced, and the amount from the Seddonville State mine was 74,180 tons during the year ended Mar. 31, 1910. The profits of both state mines during the fiscal year amounted to $23,900.

Austria-Hungary

In Austria the principal workings for brown coal are in the Brux-Dux-Teplitz and Falkenau-Elbogener basins. In the former, seams of Miocene age occur up to a thickness of 98½ ft. (30 m.), while in the latter, seams of Miocene and Oligocene* age are worked. In the Schalltal district there is a seam which in places is over 100 m. (328 ft.) in thickness.

*Abstract of report issued by the British Home Office Department.

*The Oligocene is the transitional period between the Eocene and the Miocene of the Tertiary.—Editor.

Austria produced 13,713,042 metric tons of coal in 1909, nearly one-half of which was obtained from the Upper Silesian coal basin which is a continuation of the Prussian and Russian coal field. In this basin there are numerous rich seams of excellent coking coal.

Belgium

In this country, coal mining is the most important mineral industry, and there are six different regions; the most productive is the Charleroi district, yielding about one-third of the total output. The average production per underground worker in 1909 was only 228 metric tons, due probably to the small size of the seams, which on an average are only 2 ft. 1.59 in. (65 cm.) thick. In Belgium the average daily wage per underground worker is less than a dollar a day.

German Empire

Deposits of brown coal are found in more or less abundance over nearly the whole of North Germany. The deposit of *Vorgebirge* near Cologne in the Rhine Province consists of a large, continuous bed extending about 25 km. (15½ miles) from north to south with an average width of 6 km. (5¾ miles). A preparation called *Kaumacit* has attracted some interest. It is brown coal rendered transportable and imperishable by a process of dry distillation, reducing the coal to from 35 to 50 per cent. *Kaumacit.* The process yields an additional 3 per cent. of tar, 17 to 26 lb. of ammonia, and 2500 cu.m. of gas, per load of 10 tons.

There are three principal coal-mining districts in Prussia: (1) The Lower Rhine and Westphalian Basin, by far the most important; (2) Silesia, and especially Upper Silesia; (3) the Rhenish district in the neighborhood of Saarbrucken and Aix-la-Chapelle. Most of the coal is derived from seams of the Carboniferous age; near Hanover there are extensive workings in the Wealden beds. In 1909 Germany exported 23,350,730 metric tons of coal.

Japan

The coal-bearing formations of the Japanese Islands range from Mesozoic to Tertiary. The coal, which occurs in 43 of the 49 prefectures, is mainly bituminous and most of the seams belong to the Tertiary period. The principal coal fields may be divided into five groups as follows: Kyushu, Hokkaido, Honshu (the main island), the Southern Islands and Karafuts. More than two-thirds of the total output is produced in the island of Kyushu. In 1874 the output was less than a quarter of a million tons, and in 1909 it reached over 15 millions. A large part of the coal produced in Japan goes to supply the Chinese markets.

Peru

All the different varieties of fuel exist in Peru, viz., peat, lignite, coal and anthracite. Lignite is found in the Tertiary rocks on the coast and at the summit of the Cordillera at Cajamorca. The true coal and anthracite are found in the Cretaceous rocks in various places, and a solid hydrocarbon which is neither coal nor anthracite occurs in veins, and is likewise worked and sold as mineral fuel. There are large areas of coal in the department of Ancachs, in the Santa Valley, at Jatunhuasi, near Jauja, in the department of Junin, in the neighborhood of Cerro de Pasco, and in the departments of Huanuco, Cajainarca and Libertad. The bulk of the output is obtained from the province of Cerro de Pasco.

Philippine Islands

Coal occurs in the Tertiary shales and sandstones on nearly every island, with the greatest development in the Visayas. The most promising coal fields at present are situated in the provinces of Albay, Cebu, Tayabas, Sorsogon, Mindovo and Moro. Four coal seams have been found in Cebu having thicknesses of 2, 5, 10 and 13 ft. The total output in 1909 was obtained from two mines on the island of Batan in the province of Albay.

Russia

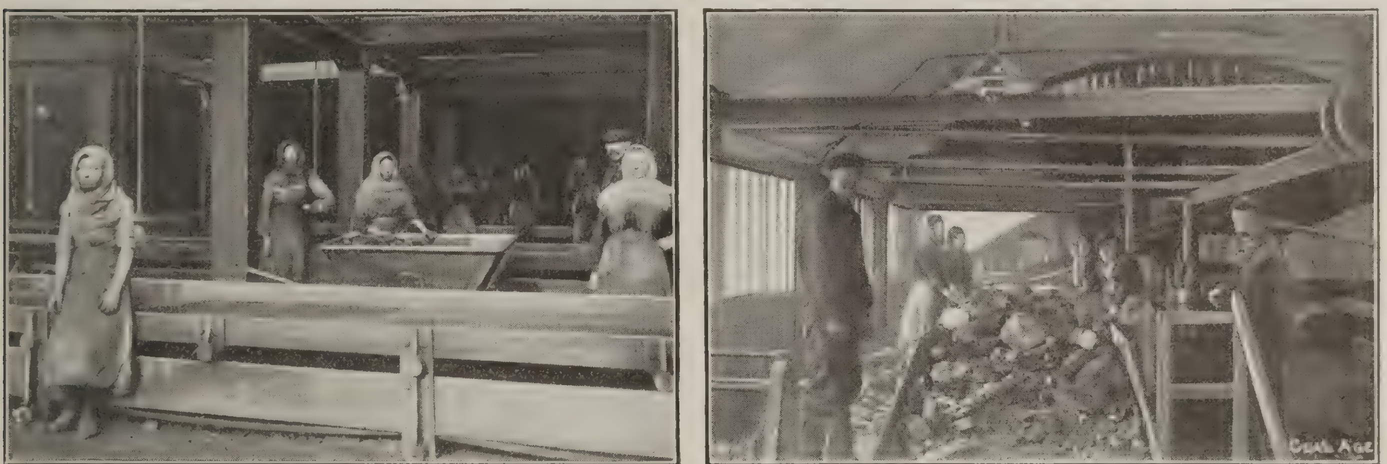
The most productive coal region of Russia is the Donets basin in the province of Ekaterinoslav, which covers an area of 16,000 square miles, the seams varying in thickness from 1 to 7 ft. The output of this basin in 1909 was 17,779,-863 metric tons. Next in importance comes Poland, with an output of over 5⅔ million metric tons of true coal and brown coal. The Dombrowa Basin, in Poland, is a continuation of the great Silesian coal basin. Coal is abundant in Siberia, both east and west, and even along the line of the Trans-Siberian Ry., but the quality is poor. In the island of Saghalien, coal is worked by Russian convicts; the present output is small and is used by steamships.

Servia

Most of the coal in Servia lies near the Danube, the workings of chief importance being at Dobra. The coal occurs in the Liassic formation, which belongs to the lower portion of the Jurassic. True coal, said to be almost as good as English coals, occurs and is worked in the Timok Valley, near Urska Tschuka. In the Boljevac district a coal basin extending over a large area has been discovered. Servia is rich in mines of brown coal and thick beds of Tertiary brown coal occur at Senje, Sisevac, Resava, Jelasnica, Koaljevac and in many other parts of the country. The revenue from the state mine at Senje in 1909 was $183,000 and the expenditure $180,000. It is explained by the Mining Department that 60 per cent. of the total production from the state mines is delivered to the Servian State Ry., and charged at their own cost price; otherwise the working of the mines would result in a large profit.

Sweden

All the Swedish coal obtained in 1909 was produced from the provinces of Malmohus and Kristianotad in the southern part of the kingdom. The seams, which are of Rhodanian age, are inter-



In Many European Mines, Girls Are Employed in the Screen Houses to Push Cars and Pick Slate

stratified with beds of fireclay, and the two minerals are worked together. The thickness of the coal seams, including the partings of shale, varies from 3 to 5 feet.

Italy

In this country the development of the deposits of fossil fuel, which mineral is stated to be abundant in the provinces of Arezzo, Pisa and Grosseto in Tuscany, is hindered by the cheapness of imported coal from the United Kingdom. The total output in 1909 was only 555,073 metric tons, of which 552,136 tons were lignite, 2055 tons anthracite and 882 tons bituminous shale. Most of the lignite came from Tuscany; the anthracite from the provinces of Cagliari (Sardinia) and Turin, and the bituminous shale from Vicenza.

Turkey

Although coal is known to occur in nearly all the provinces of the empire, the only mines deserving mention at the present time are those at Eregli. Important deposits of lignite or brown coal exist in the region of Lebanon, and near Lampsacus on the east side of the Dardanelles. Coarse lignite has been found in several places near Sparta, Karaman, and in the Bulghar Dagh which may prove useful for smelting purposes. Coal deposits are known to exist in the Van district in the province of Erzeroum.

Summary

The tabulated statement in the next column shows the separate outputs, in 1909, of the various coal-producing countries of the world, as given in the report of the British Home Office. The figures for Brazil, China, Korea and Mexico are estimated from those of the previous year, and, in the case of Peru, Romania and Bulgaria, the totals given are for 1908.

It will be noted that the United States, with an output of 418 million tons in 1909, produced something over 37½ per cent. of the world's coal for that year, or 1½ times the amount mined by Great Britain and 1.9 times that produced by Germany, the two countries ranking second and third, respectively, in point of individual output. The annual production of coal in the United States has since increased by nearly 75 million tons.

WORLD'S PRODUCTION OF COAL

Country	Metric Tons
Great Britain and Ireland	268,007,257
Australia	8,316,452
British Borneo	127,944
Canada	9,516,784
Cape Colony	93,695
India	12,060,550
Natal (including Zululand)	1,815,253
New Zealand	1,941,918
Orange River	426,913
Rhodesia	155,032
Transvaal	3,287,328
Austria-Hungary	48,812,901
Bosnia and Herzegovina	696,114
Belgium	23,517,550
Brazil	15,000
Bulgaria	162,992
Chile	898,971
China	11,000,000
Ecuador	4
France	37,840,086
Indo-China	384,053
German Empire	217,445,656
Greece	3,873
Holland	1,120,852
Dutch East Indies	508,771
Italy	555,073
Japan	15,058,113
Formosa	183,412
Korea	60,000
Mexico	919,338
Peru	313,122
Philippine Islands	30,336
Portugal	6,274
Roumania	160,783
Russia	24,455,340
Servia	213,308
Spain	4,125,894
Spitzbergen	2,316
Sweden	246,808
Switzerland	5,000
Turkey	771,203
United States	418,038,117
Total for the world	1,113,308,386

Coal Mine Mortality Statistics

By Frederick L. Hoffman*

Carefully compiled and accurate statistical data on the death rate in North American mines. The rates are computed on the basis of the number of men employed, and show an almost continual advance, being especially rapid during the past decade.

*Statistician, Prudential Insurance Co., Newark, N. J.

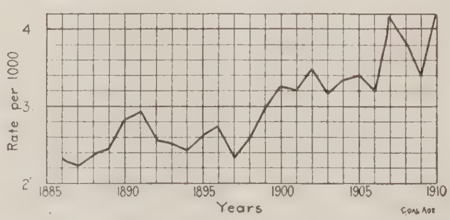
The production of 514,392,000 short tons of anthracite and bituminous coal during 1910 involved the loss of 3051 lives in 21 states and provinces of the United States and Canada. The loss of life exceeded that for the corresponding period in 1909, when, according to the corrected returns, there were 2417 fatalities. The actual excess of deaths during 1910 over 1909, was, therefore, 634, showing an increase of 26.23 per cent.

The fatality rate for 1910 was 4.18 per 1000 persons employed, against 3.39 for 1909. The fatality rate for 1910 was therefore, 0.79 per 1000 higher than during the preceding year, an excess equivalent to 23.3 per cent. The rate for 1910 was the highest on record during the last decade, the nearest approach thereto having been 1907, when the rate was 4.15 per 1000.

Bureau of Mines Contradicted

This comparison of the record for 1910 with 1909 is upon the basis of the official returns furnished by the mine inspectors of the different states. The facts derived from trustworthy sources, therefore, contradict the statement made in the program of the National Mine Safety Demonstration under the auspices of the U. S. Department of Mines that:

> The coöperation of inspectors, miners, mine owners and the Bureau of Mines in the effort to reduce loss of life has resulted in a decrease of 25 per cent. in fatal accidents in 1908 and 1909, the last two years for which figures are available, and with continued earnest coöperation it is hoped that the succeeding years will show a still further lessening in loss of life, and a corresponding increase in efficiency in mining methods and mineral utilization.



Increase in Mortality Rate 1886-1910

It is true, of course, that the rates during 1908 and 1909 were lower than during 1907, when the rate was materially increased by a number of disasters of exceptional magnitude. The decrease, however, did not justify the assumption that the reduction was the result of the coöperation of inspectors, miners, mine owners and the Bureau of Mines, except in certain well defined and strictly limited directions, which do not require to be considered at this time. The chief object for calling attention to the glaring inconsistencies of the statement referred to, and the facts which are a matter of official record, is to emphasize the lamentable truth that whatever has been done during recent years to bring about a reduction in the fatality rate does not justify the belief that measurable results of material importance have been thus far secured.

As is well known, the year 1907 was an exceptionally disastrous one in American mining. A comparison of 1908 and 1909 with the record of 1907 is obviously misleading when it is assumed that the lower fatality rate during these two years was brought about by deliberate measures for accident prevention. Comparing 1908 with 1907, there was an actual reduction in the number of accidents equivalent to 22 per cent., and comparing 1909 with 1907, there was a reduction of 23 per cent. But comparing 1909 with 1908, the actual number of accidents was almost the same, and the reduction in the rate, making allowance, of course, for the number employed, was only 12 per cent.

Comparing the record for the last two years with every other year in the history of American mining except 1907, the actual loss of life has been greater, and the corresponding fatality rate has been in excess of the rate for any other year. The record for the two years, 1908 and 1909, is not one to be proud of, or to be referred to as showing evidence of a material reduction in the loss of life as the result of deliberate efforts or coöperation between existing agencies for that purpose. The loss was exceedingly high actually and relatively, and the details do not furnish proof of a perceptible influence as the result of the agencies referred to in the quotation.

Comparison of Roof Fall and Explosion Fatalities

It is true that, comparing 1909 with 1908, there was a decrease in the number of deaths due to gas or dust explosions. This decrease was from 396 to 341, but it may have been purely accidental and not the result of the coöperative efforts referred to. As a matter of fact, in the fatal accidents due to powder explosions, missed shots, etc. (which are particularly subject to reduction by education, improved methods of shot firing and handling of explosives), there was an increase from 73 in 1908 to 108 during 1909.

We may, therefore, take the two groups of causes, which are especially related to the present-day efforts toward accident reduction. According to the official statistics, as published by the U. S. Geological Survey, there were 469 deaths from these two groups of causes during 1908 against 449 in 1909, or an actual reduction of 20 deaths, equivalent to only 4.26 per cent. The corresponding facts for 1910 are not as yet available.

Far more significant than the foregoing comparison is the fact that, while in 1908 there were 1080 deaths due to falls of roof or coal, the number of deaths from this group of causes during 1909 was 1191. So the actual reduction in fatal accidents due to explosions, etc., during 1909, as compared with 1908, was only 20, or 4.3 per cent., while there was on the other hand an actual increase in the deaths from falls of roof of 111, equivalent to 10.3 per cent. It requires to be said that there was a reduction in the miscellaneous causes. This may or may not have a relation to the efforts to reduce casualties in mining; only the detailed analysis could bring out the facts.

Fatalities during 1901 to 1910

The number of persons killed by accidents in the coal mines of North America during the decade ending with 1910, is shown in detail in Table I. The table has been corrected for previous years and is, therefore, not strictly comparable with the table published in the *Engineering and Mining Journal* for Dec. 31, 1910. Such corrections are inevitable in the present state of mine inspection and the methods which prevail in giving publicity to the facts.

All tabulations of this kind are impaired by the lack of precise definitions of terms. What is considered a fatal accident in one state is not necessarily

(TABLE I)

NUMBER OF PERSONS KILLED IN THE COAL MINES OF NORTH AMERICA, 1901-1910

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1901-1910
Alabama	41	50	57	84	185	96	154	108	129	238	1,142
Colorado	55	73	40	89	60	88	99	61	99	319	983
Illinois	99	99	156	157	199	155	165	183	213	406	1,832
Indiana	24	24	55	34	47	31	53	45	50	51	414
Iowa	27	55	21	31	24	37	35	38	28	39	335
Kansas	10	30	36	16(*a*)	36	30	52	31	35	25	301
Kentucky	21	19	25	19	31	40	32	40	33	84	344
Maryland	12	11	16	12	16	13	5	12	19	17	133
Michigan	6	6	8	7	8	6	7	6	9	6	69
Missouri	15	10	17	11	11	16(*b*)	8(*a*)	10	21	16	135
Montana	7	12	5	9	8	13	14	21	12	13	114
New Mexico	9	17	17	15	5	9	31	34	18	14	169
Ohio	72	81	124	118	114	126	153	112	115	162	1,177
Oklahoma	44	60	33	30	44	39	32	44	23(*b*)	46	395
Penn. anthracite	513	300	518	595	644	557	708	678	567	601	5,681
Penn. bituminous	301	456	402	536	479	477	806	572	506	539	5,074
Tennessee	44	226	26	28	29	33	31	34	31	38	520
Utah	9	8	7	9	7	7	8	8	16	15	94
Washington	27	34	25	31	13	21	37	25	39	43	295
West Virginia	134	120	159	140	194	269	356	625	364	320	2,681
British Columbia	102	139	42	37	12	15	31	18	57	28	481
Nova Scotia	14	19	31	19	20	28	35	39	33	31	269
Total	1,586	1,849	1,820	2,027	2,186	2,106	2,852	2,744	2,417	3,051	22,638

(*a*) Six months only.
(*b*) Eight months only.

(TABLE II)

FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA, 1901-1910

RATE OF PERSONS KILLED PER 1000 EMPLOYED

	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910	1901-1910
Alabama	2.90	2.79	2.94	4.77	10.75	5.23	7.61	5.75	6.40	10.81	6.15
Colorado	6.88	8.11	3.89	8.26	5.05	7.32	7.67	4.25	7.53	21.60	8.39
Illinois	2.24	2.15	3.13	2.87	3.36	2.49	2.47	2.58	2.93	5.44	3.05
Indiana	1.98	1.83	3.64	1.91	2.63	1.58	2.79	2.36	2.64	2.41	2.38
Iowa	2.05	4.23	1.59	1.90	1.36	2.20	2.05	2.20	1.56	2.17	2.09
Kansas	1.05	3.22	3.61	3.09 *a*	2.97	2.95	4.35	2.74	2.83	2.26	2.92
Kentucky	2.15	1.58	1.85	1.37	2.06	2.39	1.82	2.15	1.76	3.97	2.19
Maryland	2.23	1.89	2.82	2.11	2.57	2.10	0.85	2.00	3.34	2.93	2.28
Michigan	3.26	4.24	2.54	2.58	2.16	2.83	2.43	1.94	3.04	2.43	2.62
Missouri	1.63	1.09	1.85	1.69	1.06	1.65 *b*	1.70 *a*	1.06	2.31	1.55	1.48
Montana	3.24	6.19	2.32	3.59	3.67	5.43	5.12	6.68	3.11	3.16	4.19
New Mexico	4.81	10.11	7.26	7.61	2.35	3.82	10.13	9.26	5.57	4.89	6.71
Ohio	2.15	2.16	3.00	2.57	2.58	2.71	3.20	2.23	2.45	3.32	2.66
Oklahoma	8.35	9.62	5.42	3.63	5.76	4.81	4.15	3.02	2.78 *b*	5.43	4.90
Penn. anthracite	3.47	2.03	3.41	3.69	3.83	3.35	4.19	3.89	3.31	3.57	3.49
Penn. bituminous	2.56	3.36	2.65	3.44	2.90	2.76	4.40	3.15	2.72	2.79	3.09
Tennessee	5.23	25.80	2.69	2.81	2.76	3.07	2.79	3.06	2.62	3.40	5.03
Utah	5.06	3.24	3.21	4.06	3.57	3.69	3.07	2.99	5.36	4.38	3.89
Washington	5.59	7.83	5.13	6.69	2.61	4.08	6.05	4.68	6.81	7.15	5.67
West Virginia	4.14	3.41	4.03	3.08	3.88	5.20	6.33	10.35	5.85	5.00	5.39
British Columbia	25.67	34.65	9.85	8.31	2.72	3.12	5.12	2.95	8.88	3.61	9.21
Nova Scotia	1.83	2.36	2.79	1.63	1.86	2.31	2.89	3.02	2.73	2.82	2.46
Average	3.21	3.48	3.16	3.33	3.40	3.20	4.15	3.84	3.39	4.18	3.56

a Six months only.
b Eight months only.

considered as such in another. A uniform definition of a fatal accident on the part of all the mining bureaus is desirable. It should not be difficult to come to an understanding on this point and secure, if necessary, the required changes in the mining laws of the several states. It would seem a reasonable compromise to insist that all mine accidents terminating in death within one week after their occurrence should be returned as fatal, since a longer period would involve many uncertainties which would tend to further impair the accuracy of the results.

During 1910 there occurred 3051 fatal accidents in the coal-mining operations of North America, against 2417 during the previous year. In the aggregate there have been 22,638 fatal accidents in coal mining during the decade ending with 1910, or an average of 2264 a year. West Virginia with 320, and Colorado with 319.

Fatality Rate per 1000 during 1901 to 1910

Table II shows the fatal accident rate in coal-mining in the United States and Canada, calculated in the usual manner, upon the basis of the average number of persons employed in mining operations. For certain purposes it would perhaps be more useful to calculate the fatality rates upon the basis of the average number employed underground, but since this would require a separation of underground and outside fatalities, an element of uncertainty would be introduced in the calculations which is eliminated by the use of the returns as a whole.*

During 1910 the fatality rate was 4.18 per 1000 against an average rate of 3.56 for the decade. The highest previous rate occurred in 1907, when it reached 4.15 per 1000, and the lowest rate occurred in 1903, when it was 3.16. Even the minimum rate is decidedly above the average fatality rate of foreign countries, which, during the ten years ending with 1908, was only 1.53 per 1000.

During 1910 the highest rate prevailed in Colorado, where it attained to the extraordinary proportion of 21.6 per 1000. The only higher rates reported for any one state and year of the decade under review were for British Columbia, 25.67 for 1901 and 34.65 for 1902; and for Tennessee, 25.8 for 1902. Next to the State of Colorado the highest rate during 1910 is reported for Alabama, where it attained 10.81 per 1000. Other states with rates above the average for the year were: Illinois, with 5.44; New Mexico, with 4.89; Oklahoma, with 5.43; Utah, with 4.38; Washington, with 7.15; and West Virginia, with 5 per 1000. The lowest rate for the year was reported for Missouri, or only 1.55 per 1000. The states with the next lowest rates were: Iowa, where the rate was 2.17; Kansas, with 2.26; Indiana, with 2.41; and Michigan, with 2.43.

The highest average fatality rate for the decade ending with 1910 was for the province of British Columbia, or 9.21 per 1000, followed by the State of Colorado, with an average of 8.39. The lowest averages were reported for Missouri, where the rate was only 1.48 per 1000, followed by Iowa, with a rate of 2.09.

(TABLE III)

FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA

COMPARISON OF 1910 WITH THE FIVE PREVIOUS YEARS

	Number of persons killed Yearly Average		Rate per 1000 Employed		Increase or Decrease of Rate
	1905-1909	1910	1905-1909	1910	
Alabama	134	238	7.09	10.81	+ 3.72
Colorado	81	319	6.33	21.60	+15.27
Illinois	183	406	2.76	5.44	+ 2.68
Indiana	45	51	2.39	2.41	+ 0.02
Iowa	32	39	1.87	2.17	+ 0.30
Kansas	37	25	3.18	2.26	— 0.92
Kentucky	35	84	2.03	3.97	+ 1.94
Maryland	13	17	2.17	2.93	+ 0.76
Michigan	7	6	2.44	2.43	— 0.01
Missouri	13	16	1.52	1.55	+ 0.03
Montana	14	13	4.75	3.16	— 1.59
New Mexico	19	14	6.71	4.89	— 1.82
Ohio	124	162	2.63	3.32	+ 0.69
Oklahoma	36	46	3.93	5.43	+ 1.50
Penn., anthracite	631	601	3.72	3.57	— 0.15
Penn., bituminous	568	539	3.20	2.79	— 0.41
Tennessee	32	38	2.86	3.40	+ 0.54
Utah	9	15	3.79	4.38	+ 0.59
Washington	27	43	4.94	7.15	+ 2.21
West Virginia	362	320	6.44	5.00	— 1.44
British Columbia	27	28	4.79	3.61	— 1.18
Nova Scotia	31	31	2.58	2.82	+ 0.24
Average	2,461	3,051	3.60	4.18	+ 0.58

(TABLE IV)

TWENTY-FIVE YEAR RECORD OF THE FATAL ACCIDENTS IN THE COAL MINES OF NORTH AMERICA 1886-1910

	Number of Employees	Number Killed	Rate per 1000 Employed
1886	222,029	514	2.32
1887	230,834	514	2.23
1888	278,175	659	2.37
1889	278,361	681	2.45
1890	301,295	873	2.83
1891	326,684	959	2.94
1892	343,564	883	2.57
1893	384,249	970	2.52
1894	394,146	962	2.44
1895	404,553	1,061	2.62
1896	409,320	1,123	2.74
1897	409,830	956	2.33
1898	407,536	1,056	2.59
1899	421,489	1,250	2.97
1900	464,235	1,507	3.25
1901	494,287	1,586	3.21
1902	530,624	1,849	3.48
1903	576,365	1,820	3.16
1904	609,001	2,027	3.33
1905	643,225	2,186	3.40
1906	658,880	2,106	3.20
1907	686,460	2,852	4.15
1908	715,355	2,744	3.84
1909	712,550	2,417	3.39
1910	730,707	3,051	4.18
1886-1890	1,310,694	3,221	2.46
1891-1895	1,853,196	4,835	2.61
1896-1900	2,112,410	5,892	2.79
1901-1905	2,853,502	9.468	3.32
1906-1910	3,503,952	13,170	3.76
1886-1910	11,633,754	36,586	3.14

These totals do not exactly correspond to the figures published by the Bureau of Mines, since for certain states, in the present tabulation, the returns are by fiscal years and not by calendar years. The recommendation frequently made, that the returns should all be for calendar years, may be repeated, for unless the returns are made on a monthly basis it will be impossible to secure an accurate and complete annual tabulation.

It is a significant fact that, during 1910, the number of reported fatal accidents in the twenty-one states and provinces is, for the first time in our mining history, in excess of three thousand. The highest previous records had been for 1907, when there were 2852, and 1908, when there were 2744 deaths. On the basis of actual numbers, the loss of life was greatest in the Pennsylvania anthracite region, where 601 deaths occurred, followed by the bituminous region of Pennsylvania with 539, Illinois with 406,

Rate for 1910 Compared with the Previous Five Years

Table III exhibits the fatal accidents in coal mining in 1910, compared with the average for the preceding five years, both upon the basis of actual numbers and the rates per 1000 employed. Many of the states and provinces show an increase in the rate during 1910 over the average for the preceding five years, the exceptions being Kansas, Michigan, Montana, New Mexico, Pennsylvania (anthracite and bituminous), West Virginia and British Columbia.

The net increase in the rate during 1910 was 0.58 per 1000 over the average rate for the five years ending with 1909. The record shows that the rate increased in 13 out of the 21 states and provinces, but this increase was largely the result of a few disasters of exceptional magnitude. However, the record for nearly all of the states and provinces is not one

*For an extended discussion of fatal accidents in coal mining, by occupation, nativity, causes, etc., see Bulletin No. 90 of the Bureau of Labor, Washington, D. C., 1910.

which warrants the assurance that material progress is being made in the reduction of the preventable loss of life in coal-mining operations in the United States and Canada.

STATISTICS FROM 1886 TO 1910

Table IV affords a means of convenient comparison of the fatality rate in coal mining during 1910 with the corresponding rates for the previous 24 years. The quarter-century review is extremely interesting and peculiarly suggestive, in view of the unwarranted assertions that the rates during the last few years have considerably declined, due to the intelligent coöperation of government and state officials, mine managers, miners and others interested in the subject.

The accompanying profile shows graphically the fluctuations in and gradual increase of the death rate during this period. It will be noticed that the low rate in 1887 of 2.23 per 1000 has never since been even closely approached, with the exception of 1897, when it dropped to 2.33. Immediately after this the profile shows a rapid and uniform increase, crossing the 3 per 1000 line for the first time in 1900, since which date it has never been below this point. The comparatively level line during the period 1900 to 1905 may have given rise to false hopes, which were, however, quickly dispelled by the most abrupt and erratic fluctuations yet in evidence, during the period 1905-1910. During this time the rate has twice crossed the 4 per 1000 line, and the general average has been higher than for any previous existing record.

The total number of lives lost, as far as reported, during the 25 years ending with 1910, was 36,586. If allowance is made for accidents not reported, and for the small mining states not included in the present review, it is safe to assume that during the last 25 years not less than 40,000 lives have been lost in coal-mining operations in the United States and Canada.

American vs. English Mine Fatalities

By J. T. Beard

Conditions affecting death rate peculiar to American mines. Two methods of estimating death rate. Estimation on a tonnage basis more nearly approximates what death rate should show. Pennsylvania death rates, 1908-1910, lower than those of Great Britain. Output per man double that in England.

Numerous comparisons have been made, from time to time, during the past few years, of the fatalities of coal mining in this and other countries. These comparisons have, in many instances, shown a comparatively high death rate in the United States. In other instances, in spite of the modifying influences that operate to increase the death rate here, a comparatively lower rate of fatality has been shown.

Briefly stated, some of the more important influences at work in this country and which all will admit are peculiar to the United States, are as follows: the large influx of foreign labor seeking employment in any capacity; the unprecedented demand for coal, incident to a new and rapidly growing country of large area and resources; the rapid development of the coal industry in the United States within less than half a century. Other conditions might be mentioned that imperil our mining and require the most thoughtful consideration on the part of all, in order to reduce the list of fatalities in mines to a standard that will comport with our aims and aspirations as a nation.

For the purpose of this article, however, the conditions named—influx of foreign labor; demand for coal; and rapid development of mines—are sufficient. We desire to be fair and make no unjust claims for ourselves; but we feel, rightly, that much has been spoken and written, in this regard, tending to cast unwarranted reflections on American mine management.

American institutions have always embodied the highest ideals, sought out the widest knowledge and experience, and studied to adopt the most approved methods. American mine management has supplemented its own careful study of mining conditions here and elsewhere by calling to its aid mining men of other countries, hoping to glean from their observations in our mines some enlightenment on the questions mining men, the world over, are studying today. Some have sharply criticized this action as undignified and productive of no practical good, inasmuch as conditions in American mines differ widely, not only from conditions prevalent in foreign mines, but in mines in different parts of our own country.

The study of conditions must ever be supreme in the solution of all important mining problems. The broadest and most capable minds will always study closely not only the conditions of their own environment, but that of others. History is the only sure interpreter of the future when the application of past experience to present conditions is made intelligently. To consult others and study their experience does not imply that the student or inquirer has no experience of his own, or that such experience is any less valuable than that of others. It rather shows wisdom and intelligent foresight with a desire to improve.

But to return to the question of comparative death rates in mining, it has long seemed to me that the manner of estimating the fatalities per 1000 men employed is not an equitable basis. It would seem that in order to make a full and equitable comparison of the fatalities incurred in mining, the estimation should be based on the number of men employed in the mine, the number of hours employed, and the degree of danger, which varies, being different in different mines, and for which the mine management is in no way responsible.

A little reflection will make clear the injustice of classifying in the same category a mine in which 350 inside men are putting out 1000 tons of coal each working day, with another where twice that number of men produce but 800 or 900 tons a day. At once the question is asked: "Wherein lies the difference; are not these mines equally dangerous?" According to the present accepted basis, the mine last named, employing more men and producing less coal, would show a lower death rate on the number-of-employees basis, but a higher death rate on a tonnage basis, for the same number of fatalities, than the first mine where fewer men put out more coal.

It will be generally conceded that, for the same efficiency of mine management, the number of fatalities may naturally be expected to depend on three principal factors; namely, number of men in mine, number of hours worked, and degree of danger to which the men are commonly exposed in the particular mine in question. The number of fatalities would increase with the number of men and hours of employment and the danger. The last named factor—the particular danger of the mine—though dependent on physical conditions that are impossible to forecast, may be gaged more or less correctly by the output per man per hour, varying inversely as such unit output or tonnage. The hours of employment will evidently vary as the tonnage of the mine and inversely as the number of men, or as the tonnage per man.

Writing these factors out, or expressing their relation algebraically, they reduce as follows:

$$\textit{Fatalities vary as } (\textit{men}) \times (\textit{hours}) \times (\textit{danger})$$

$$\textit{Hours vary as } \frac{\textit{tonnage of mine}}{\textit{men employed}}$$

$$\textit{Danger varies inversely as } \frac{\textit{tonnage of mine}}{\textit{men} \times \textit{hours}}$$

or

$$\textit{Danger varies directly as } \frac{\textit{men} \times \textit{hours}}{\textit{tonnage}} = \frac{\textit{men}}{\textit{tonnage}} \times \frac{\textit{tonnage}}{\textit{men}}.$$

Hence,

$$\textit{Fatalities vary as } (\textit{men}) \left(\frac{\textit{tonnage}}{\textit{men}}\right) \times 1 = \textit{tonnage}$$

If the foregoing analysis can be taken as representing with a fair degree of approximation the relative number of fatalities that may justly be expected in mines operated under various physical conditions beyond the control of the management, it would follow that the degree of efficiency with which the mines are managed would be properly represented on a tonnage basis. In other words, the death rate should then be expressed as the ratio of the number of fatalities to the tonnage of the mine, and not to the men employed. This seems to me a more fair basis of comparison.

The following table is interesting as showing the production, number of men employed inside and outside the mine, total number of fatalities, and the death rate, per 1000 men employed below and above ground and per 1,000,000 tons of coal mined, besides the average annual output per man in the mine, for the past three years, 1908-1910, inclusive, in the anthracite and the bituminous mines of Pennsylvania, as compared with the same data in the mines of Great Britain, as compiled from the mining report of the Department of Mines of Pennsylvania, 1910.

Referring to this table it is interesting to note the large average annual output per man in the Pennsylvania mines, both anthracite and bituminous, as compared with that of English mines, the former being practically double the latter. This item alone serves to emphasize the urgency of the demand for coal in American mines, or the tendency of the miner to increase his tonnage, as it cannot be assumed that any physical condition operates in both the hard- and soft-coal mines here to increase the average output per man so as to make it double that in English mines.

It is also interesting to note, after what we have remarked in reference to the true basis for estimating the death rate in mines, that, in the table, the English death rate per 1000 men employed is lower, for each year, than the corresponding rate for the same respective years in Pennsylvania. On the other hand, the English death rate per million tons of coal mined is higher, year by year, than the corresponding rates in the American mines. The question naturally is suggested, which of these is the proper rating as indicating the relative efficiency of the mine management; for that is what we expect the death rate to show.

TABLE SHOWING PRODUCTION OF COAL, NUMBER OF MEN EMPLOYED, FATALITIES AND DEATH RATES, AND AVERAGE ANNUAL OUTPUT PER MAN 1908–1910, INCLUSIVE, PENN. ANTHRACITE, PENN. BITUMINOUS AND GREAT BRITAIN

Year	Production (tons)	Employees: Inside	Employees: Outside	Employees: Total	Total Fatalities	Death Rate: Per 1000 Men	Death Rate: Per 1,000,000 Tons of Coal	Average Annual Output per Man (Tons)
	Pennsylvania Anthracite							
1908.....	83,543,243	124,233	50,270	174,503	678	3.88	8.12	672
1909.....	80,223,833	123,272	47,923	171,195	567	3.31	7.07	651
1910.....	83,683,994	121,542	46,633	168,175	601	3.57	7.18	689
	Pennsylvania Bituminous							
1908.....	114,937,375	152,536	29,304	181,840	572	3.15	4.98	753
1909.....	136,205,695	152,424	33,497	185,921	506	2.72	3.72	893
1910.....	148,770,858	159,671	33,817	193,488	539	2.78	3.63	932
	Great Britain							
1908.....	261,512,214	796,329	191,484	987,813	1,306	1.32	5.01	329
1909.....	263,758,562	818,381	195,617	1,013,998	1,453	1.44	5.51	323
1910.....	264,292,588	848,381	201,026	1,049,407	1,769	1.68	6.69	314

Taking the tonnage basis as the proper method of estimation, which I believe is a nearer approximation to what it is desired to show, the death rates for these years are lower in the American than in English mines. It will be observed also that the death rate, on this basis, has uniformly decreased in Pennsylvania during this period, year by year, while in English mines the rate for the same years shows a uniform increase.

Electric cables for mine use should be incased in iron pipes or well tarred wooden troughs. All jointing should be most carefully done or serious accidents resulting in loss of life may follow. Wrap all joints with tape and ram in with bitumen. In gaseous mines all electrical machinery should be inclosed so as to be flame-proof.

Leased and Owned Coal Lands

A preliminary statement of the statistics of tenure of coal lands by operators in the United States for the year 1909 was recently issued by Director Durand of the Bureau of the Census of the Department of Commerce and Labor.

In regard to these statistics, it should be noted that they cover the holdings of none but coal-mine operators, and for these operators include no acreage but that of mineral lands, that is, other acreage held by operators, some of which may or may not contain coal, and the surveyed lands of nonoperators are not included in these figures. The total number of acres controlled and the total anthracite holdings of the United States and of Pennsylvania are exclusive of 10,975 acres of anthracite coal land sublet by operators to each other and reported twice.

It is significant that the only increase in the acreage of anthracite lands has been made in the division of lands owned by the operator, while the number of acres of land developed under lease has decreased. This is explained by the fact that the larger producers of anthracite bought large areas of coal lands several years ago to hold as reserve supplies. Since royalty must be paid continuously on coal land held under lease, whether coal is mined or not, the leased lands are not conserved, but are mined out steadily. This, in part, accounts for the decrease in the acreage of anthracite lands held under lease, and it is in part accounted for by some occasional purchases of leases by large operators, thereby changing the form of tenure from held under lease to owned property. The increase in the number of acres of mineral land reported as owned is due not only to lands acquired, but also in part to the classification as mineral lands of lands previously held by large producers, but not determined as coal-producing areas.

COAL LANDS OWNED AND LEASED BY OPERATORS IN PRINCIPAL COAL-PRODUCING STATES DURING 1909

	Acres Controlled	Acres Owned	Acres Held Under Lease
United States.	(1) 6,906,088	4,782,170	2,134,893
Anthracite..	(1) 274,870	183,144	102,701
Bituminous.	6,631,218	4,599,026	2,032,192
Pennsylvania.	(1) 1,927,829	1,509,425	429,379
Anthracite..	(1) 274,010	183,044	101,941
Bituminous.	1,653,819	1,326,381	327,438
West Virginia.	1,147,527	590,885	556,642
Alabama.....	612,026	538,122	73,904
Illinois.......	553,711	398,090	155,624
Ohio........	408,413	260,423	147,990
Indiana......	141,272	104,938	36,334

(1) Exclusive of 10,975 acres of anthracite lands reported twice in totals for acres owned and acres held under lease.

Reviews of Coal Industry for 1911

Reports from state mine inspectors, special correspondents and others with estimates of the year's production and outlook for 1912.

The coal industry during the year now closed is remarkable rather for what did not occur, than because of any new features developed. No important departures in the science of mining or in mining appliances have been made, nor has the country been visited by such an extended series of holocausts as caused a veritable reign of terror in several previous years. That it has met with many troubles and disappointments cannot be denied, but it has acquired confidence in meeting and overcoming these and has gathered new strength.

In common with a number of recent years, 1911 witnessed further consolidations of corporate interests in which the coal industry figured prominently. The economies possible to effect by such consolidation are fully appreciated by capital and the ensuing years will no doubt bring forth larger and stronger combinations along these lines. An entirely new development, in this direction, has been the organization of a National Coal Operators' Association, only yet in its infancy.

In production, this year has been a good one, since the output has nearly equaled that of 1910, but this, unfortunately, does not bespeak an entirely satisfactory business, because of the low coal prices that prevailed. It is true also that general industrial conditions are all below normal, and the heavy tonnages, thrown on an already weakened market, have produced a condition bordering on demoralization. With the productive capacity of our mines far in excess of the average normal consumption, such conditions will continue to prevail until some system of regulation is inaugurated, and it is such problems as these that have made necessary the operators' organization.

The export shipments for the year show an unprecedented increase which is, however, hardly normal because largely due to the labor troubles in British Columbia. That the United States is forging to the front as a fuel exporter is becoming clearly evident, and that this may eventually become an outlet for our over-production seems reasonable to believe.

Labor troubles during the year of 1911 have amounted to practically nothing. During the present year, however, the industry will face the most important wage conference in the history of the country, when the present agreements all expire simultaneously April 1.

The present year will inherit some of the problems of the old one, and no doubt develop new ones of its own, but the confidence gained in overcoming the difficulties of 1911 will do much to engender a spirit of optimism in the coal industry.

Coal Industry of Alabama in 1911

SPECIAL CORRESPONDENCE

The production for the year 1910 was 16,139,228 tons, but is not expected to go so high in the present year, the chief mine inspector estimating it at about 14,500,000 tons.

The labor supply has been fair all year, with the exception of a temporary shortage toward the latter part of the summer when mines which had been closed down were started up and other mines put in more regular operation. The year has been free from strikes or other disturbances of like nature.

The production of coal was low during the spring and early summer as the market conditions were not as good as during that period of 1910, for during that year, strikes in the coal fields of Illinois and Oklahoma helped conditions here greatly. Also furnace requirements have not been as large this year as in 1910.

In regard to the labor supply, it should be said that as far as actual numbers on the rolls are concerned, there is little or no difficulty. We have usually had a sufficient number of men enrolled to operate our plants, but many of these are inefficient workmen, who work so irregularly that it is impossible to rely on them. Mining is rendered hazardous by the employment of a shifting force of men, and profits are curtailed when the daily output is liable to be reduced by the unforeseen absence of some of the men.

Colorado Coal Industry in 1911

BY JAMES DALRYMPLE*

The coal business in Colorado for the year 1911 has not been quite so lucrative as it was in 1910, although the output has been normal and satisfactory, all things considered.

The larger production of last year was due to the demand from markets which were affected by the miners on strike in Illinois, Kansas, Arkansas and Oklahoma; the needed supply being drawn from the Colorado fields.

Then, too, the adverse financial condition and business lethargy of the entire country have had considerable bearing on the coal industry. The disturbed industrial condition in Boulder and Weld counties where lignite is mined has continued uninterruptedly since last year, with no prospect of an immediate settlement. Otherwise coal production has been steady and found a brisk market. Prices have advanced from 25 to 50c. per ton on domestic coals.

Operators have had to cope with the usual shortage of cars in the last four months of the year, which always hampers the production materially and retards the meeting of the market's demands. The working force for 1911, which was 13,813, shows a reduction of 955 men, as compared with 1910, when 14,768 men were employed. There is a decrease in the tonnage of coal produced during 1911 of 2,029,026 tons.

*Inspector of coal mines, Denver, Colo.

The death rate is low, being 6 per 1000, which compares favorably with other years in Colorado. The nonfatal accidents number 248, as compared with 146 in 1910. Surface fatal accidents numbered six, and underground fatal accidents totaled 82.

A dust explosion, augmented by powder, occurred at the Cokedale mine, owned by the Carbon Coal & Coke Co., of Las Animas County, on February 9, 1911, in which seventeen lives were lost. This was the only catastrophe during the year.

The mining laws of Colorado are faulty, but after the Governor appointed a commission to amend and improve the present laws, which commission worked faithfully for five months, the Governor felt it incumbent upon him to veto the bill, as it was mutilated beyond all recognition.

The following is a summary of the coal production in Colorado in 1911:

SUMMARY OF THE COAL PRODUCTION OF COLORADO IN 1911

Number of mines in operation	158
Tons of lignite coal produced	1,676,975
Tons of semibituminous coal produced	761,526
Tons of bituminous coal produced	7,502,981
Tons of anthracite coal produced	64,379
Tons of unclassified coal produced, estimated	70,000
Total number of tons produced	10,075,861
Decrease in 1911	2,029,026
Total number of tons of coke produced	946,284
Total number of coke ovens in operation	2,764
Total number of employees in and about the mines	13,813.3
Total number of days worked	188.7

The Illinois Coal Industry in 1911

Special Correspondence

The fiscal year which ended June 30, 1911, showed only 53 counties producing coal in Illinois as against 55 in the previous year. The number of mines and openings had also reduced from 881 to 845, a drop of 36 mines. In the fiscal year 184 mines were newly opened or reworked, but in the same time 217 were closed or abandoned. Though there was a slight reduction in mines working, the whole tonnage produced rose from 48,717,853 tons in 1910 to 50,165,099 in 1911 or 2.97 per cent. There was a reduction of only 3 shipping mines in 1911.

Of the mines operating 458 engaged in local trade only. There were 33 less of these mines operating in 1911 than in the year before, the tonnage from them declining from 1,492,652 to 1,406,442. The total tonnage shipped in railroad cars was 44,578,400 tons as against 43,007,015 tons in 1910, but this gain was not equal through the range of sizes. Thus the amount of mine run gained largely. In 1910 only 10,220,456 tons were shipped; in 1911 the tonnage was 13,025,663 tons. There was consequently a loss in many of the sizes of screened coal. Lump coal declined from 20,769,930 to 19,588,409; nut, from 2,845,693 to 2,425,712 tons; slack, from 1,372,038 to 1,131,784. On the other hand, two sizes much shipped from Illinois mines showed increased use. Egg mounted from 3,334,059 tons to 3,725,073 tons, and pea coal similarly from 10,174,677 to 10,268,458.

The locomotive tender trade as supplied to the tenders at the mines fell with the decreased railroad business from 886,217 tons to 877,793 tons. The local trade also fell from 2,867,871 to 2,617,977 tons. There were consumed or wasted at the plants 2,090,929 tons whereas in 1910 the amount reported aggregated only 1,956,750 tons. The average operating days of shipping mines declined from 179 to 169 and all mines, shipping and domestic averaged only 165 days of work as against 171 days on the previous year.

Price Little Changed by Wage Increase

The price per ton rose from an average of $1.016 to $1.101, or $0.085. The gross selling value at tipple totalled $56,064,494 as against $50,204,207, an increase of 11.7 per cent. Motor haulage took a further advance. There are now 316 motors used, whereas in 1910 there were but 229, a significant increase of 38 per cent. Mining machines were used in 126 mines, whereas in 1910 there were 114 mines in which they were to be found. The mining machines accordingly increased in number from 1289 to 1430. The number of tons undercut by machines was 19,998,259, whereas in 1910 it was 18,176,254 tons. In 1911 the number of tons hand-mined declined from 30,541,599 tons to 30,166,840 tons.

Men Employed

In 1911 the miners employed numbered 39,912, having increased since 1910, when the number was only 39,069. In Illinois the number of other employees underground is large. In 1911, 30,052 persons other than miners worked in the mines and the number increased more than the number of miners. In 1910 there were but 28,137 not actually engaged in the mining of coal. The number of boys working underground dropped from 1154 to 1009. Above ground the boys employed rose from 47 to 71. The number of other employees above ground in 1911 was 6366; in the previous year there were 6227 of such operatives. The total number of employees above and underground increased from 74,634 to 77,410 persons. Thus the employees may be divided up as follows roughly: Miners, 51.6 per cent.; other underground adult employees, 38.8 per cent.; boys underground, 1.3 per cent.; boys above ground, 0.1 per cent.; adult employees above ground, 8.2 per cent.; total, 100 per cent.

Of the whole number of adult employees, 74,508 were employed at shipping mines in 1911, and 71,520 in 1910. The local mines employed 2902 in the last fiscal year. In 1910, 3114 men were thus employed. There were 70,973 working below ground in 1911 and in the year before, 68,360 were thus employed. The corresponding number for workers above ground in the coal mining industry of the state were 6437 and 6274.

Mining Rates and Consumption of Powder

The average rate for hand-pick mining in the shipping mines per gross ton was $0.627, an increase over the year before of three cents. Machine mining also cost 3.2 cents more, the price so advanced averaging $0.494 per gross ton.

The number of kegs of powder used for coal blasting was 1,240,293; in 1910 1,254,095. Powder was used for other purposes to the extent of 3568 kegs last year; in the previous years, the use reached 3128 kegs. Permissible explosives were used to the extent of 243,099 lb.

Fatalities and Injuries Not Decreasing

The Cherry mine disaster was so abnormally severe that it does not seem well to include it in making comparisons between the two last years. That disaster is omitted therefore from the 1910 calculations. Last year 157 men were accidentally killed, 7 men more than in the previous year. Of these 149 men were killed inside and 8 outside the mines. The deaths made 87 wives, widows, and left 245 children, fatherless. Injuries entailing the loss of a month or more totalled 709. In the previous year such accidents were more numerous, 742 men being so incapacitated. There were 319,523 tons mined for every life lost. In 1910 the record was a trifle more favorable, 324,786 tons. The number of employees per life lost was 493, whereas in 1910 the number was 498, so that if it had not been for the Cherry mine disaster, 1910 would have had a little better record than the past year.

For convenience in figuring, it may be well to add that deaths per thousand men employed ran 2.03 in 1911, and 2.01 in 1910, with the reservation referred to. In 1911, 70,754 tons were mined for every man severely injured and in 1910 only 65,657 were produced at the same loss and suffering. Out of every 109 men last year one man was injured. In 1910 that proportion was only 101 to 1. The number killed for each million tons produced was 3.1 in both the years considered. The number injured for every thousand men employed was 9.9 in 1910 and 9.2 in 1911. It will be observed that the figures for tonnage, activity and injuries, fatal and otherwise, are not materially changed. The compensation to labor has increased 5 per cent. for hand-pick work and about 6 per cent. for machine work.

The increase in the price of coal is probably due to the conditions obtaining after the strike and that price may decline in the following fiscal year. It will be seen that the operator made an increased gain of about 5c. on an increased product of 2.97 per cent.; not such a bad record for the year 1911, which has not appeared bright in other states. Moreover, improved haulage methods and increased machine mining should have added largely to that profit.

Note—From report of State Mining Board.

Indiana Coal Industry in 1911

By Frank I. Pearce*

Beginning with January, and slightly before, the demand for coal became less brisk and many of the mines that had been operating nearly full time, previous to and for a considerable time after the settlement of the strike in Illinois, were unable to work more than half time during January, February and March.

With the approach of milder weather, market demands grew weaker, competition stronger and selling prices took a drop. As a result of this condition many mines that had been working about half time were unable to operate more than one or two days a week and a number were closed down indefinitely, or to make repairs.

This condition continued through April, May, June, July, August and the first half of September resulting in considerable suffering among hundreds of idle employees depending upon the mines for their livelihood, and in many instances a considerable outlay of money to the companies to keep their mines in repair. Even where this was done property in many instances suffered a certain depreciation in value, that is, a fixed loss.

Demand for Coal Improved

The latter part of September the demand for coal began to improve somewhat and from this period until Dec. 15 the mines averaged about half time, and a number that were closed down earlier in the year resumed operations. Market conditions grew a little stronger and selling prices advanced.

The coal production of any state is governed by the demand, number of days worked and number of persons employed. The demand for coal has been poor for the year 1911 as compared with 1910 resulting in a greater loss of time, a larger number of employees being idle, and the production proportionately reduced.

*Deputy Inspector of Mines, Indianapolis, Ind.

Production

The condition of the coal trade being somewhat similar to that of the year 1909 the production will be about the same, or possibly 14 million short tons, slightly in excess of what it was that year. However, this is only an estimate as the state's production has not yet been compiled for the year.

There were a number of strikes during the year but most of these occurred at a time when the demand for coal was such as to not seriously affect the state's output.

Coal Industry in Iowa

By L. E. Stamm*

In reviewing the coal industry of this state for the year just drawing to a close I am pleased to note that the conditions for the most part have been good and that the tonnage has reached the highest mark in production since coal mining first began in this state during 1840. In recent years the annual coal production of Iowa has increased steadily, except in the years 1908 and 1910, when a slight falling off in the production was noted, caused possibly by a suspension of the mines for a period of thirty days during each of those years, pending an agreement between the miners and operators relative to a wage agreement.

Largest Tonnage Ever Produced

Under the laws of the state of Iowa, statistics relating to the production of coal in the state are gathered for the fiscal year ending June 30. These statistics gathered for the last fiscal year show a production of coal amounting to 7,574,919 tons. This is the largest tonnage ever produced in this state, and while these are figures for the fiscal year, it would be safe to say that they will approximate those for the calendar year. In the production of the tonnage noted above, 16,571 persons, both miners and others, were employed in and around the mines, and the work of mining was fairly good during most of the year. The coal industry of Iowa, while not of such magnitude as in a number of states, still has much to do with the general prosperity of the state.

Coal was first discovered and mined in Iowa in 1840, and at that time was mined in but one other state west of the Mississippi river. Only 400 tons were produced in 1840, while in 1857 the production had reached 1,231,547 tons. In 1882 it had reached 3,920,000 tons, while for the year 1899 more than 5,000,000 tons of coal were mined. Since then the output has steadily increased. As stated above, the tonnage for the fiscal year of 1911 was 7,574,919 tons.

Coal Mined in 22 Counties

Coal is mined in 22 counties in Iowa. The product is bituminous and of good quality. Some coal is shipped from this state into Nebraska, Minnesota and the Dakotas, but most of the coal produced is consumed within the borders of the state. Its manufacturing industries provide a market for most of the coal produced in Iowa, and on account of the absence of friction between the miners and operators of the state the coal industry has made a steady growth. Owing to the mild weather which has prevailed in Iowa from September onward, the coal production has not been quite so good as is usually the case at this time of year, but with the coming of cold weather we look for a steady demand for coal; one that will keep the mines of the state running on a fairly steady basis.

*Secy. to Mine Inspectors, Des Moines, Iowa.

Owing to the extension of the Rock Island System from Des Moines south, a new coal field will be developed in Marion County during the coming year. Already the Rock Island company is starting the development of a new mine near Dallas, Marion County, and this mine will be equipped for a daily capacity of two thousand tons or more. Other mines will be developed in this section, so the outlook for the year 1912 seems at this writing to be bright for an increased coal production. However, the coming April marks the time for a new agreement between the operators and miners of the state and, judging from past years, there is likely to be a suspension of mining for thirty days or more at that time. This will affect the output for the coming year to some extent.

But Few Labor Troubles

There have been but few labor troubles affecting the production of coal in Iowa during the past year. A few local strikes have occurred, caused by a difference of opinion as to the terms of agreement between the operators and miners. For the most part these disagreements or strikes were of short duration, and did not affect the coal output to any great extent. Judging from past years, it would seem at this time that there will be an increase in the coal production of this state in 1912.

Coal Production of Kansas 1911

By Leon Besson*

The coal production for the year 1911 will be approximately six million tons. It will be greater for the year 1911, than it was for the previous year, owing to the fact that in the year 1910 there was a long suspension of work, extending from April 1 to Sept. 22. On the other hand there have been few local labor troubles in the present year, and these not of any importance. An average of about 11,500 men were employed in the mines of the state. There have been a few mine explosions this year, causing the death of five shot-firers and two rescuers. I am of the opinion that the coal production will be steadily on the increase, for there is a tendency to go back to coal, as natural gas seems to be approaching exhaustion.

Maryland Coal Statistics for 1911

By J. H. Donahue†

From all the available data at hand, it appears that the coal production of Maryland for the year just closed will show an appreciable falling off. The production for 1911 as estimated, will be 4,500,000 short tons, as compared with nearly 5,000,000 tons in 1910 and 4,524,112 tons for 1909.

*State mine inspector, Pittsburg, Kans.

†Chief Mine Inspector, Frostburg, Md.

Maryland was particularly fortunate during the past year with respect to labor troubles, having experienced no inconvenience from this source whatever. It is estimated that the average days worked will be about 240, and the number of fatal accidents during the year will not total more than 15. The non-fatal accidents have not yet been reported.

North Dakota Lignite in 1911

By J. A. Bliss*

During the year 1911 there were ninety-eight coal mines in operation in North Dakota, producing about 395,000 tons of lignite. Over a thousand men were employed during the busy season which begins in October and closes in January. During the summer months the demand for lignite falls off, and as a result part of the mines are closed down. North Dakota mines are entirely free from explosive gases, and the list of fatalities and injuries has been low during the past year.

The demand for lignite is gradually increasing and several new mines have been opened up, while some of the larger operating mines have added to their equipment. Although the estimated amount of lignite within the state exceeds that of any other state in the Union, the demand for it is largely of a local nature, and because of its abundance the selling price is so low that the margin of profit is small.

The question of timbering the mines is a serious one, as dependence has to be placed on timber shipped in from Minnesota, largely, though some is obtained from the Western states.

The state legislature has wisely seen fit to lend active support to the furthering of its lignite industry, and all public institutions are required to use coal mined within the state. An appropriation has been set aside for the purpose of establishing and maintaining an experiment station. This has been located at Hebron, where a mine has been purchased by the state and an excellently equipped building erected. This station is under the direction of the State School of Mines at Grand Forks, and its efforts are largely directed toward perfecting the briquetting process and of making commercial use of the volatile gases which run high in all lignite.

The successful development of a process of briquetting on a commercial basis and of making use of the volatile gases for illumination, heat and power would create at once a demand for lignite and open a large field for investment.

The recent advent of several new branches of railroad in the western part of the state has made accessible a new portion of the coal fields, and a greater gain in production is anticipated for the ensuing year than heretofore.

*Asst. Mine Inspector, Bismarck, N. D.

Montana Coal Industry in 1911

By J. B. McDermott*

The capacity of Montana's mines has been materially increased during the year now closed. The first coal dust explosion in the history of the state occurred and important laws, governing the operation of mines, were enacted.

*State Coal Mine Inspector, Helena, Mont.

Montana is the third largest state in the Union and contains more square miles area, than New York, New Jersey, New Hampshire, Maine, Massachusetts, Maryland, Rhode Island, Connecticut, Delaware and Vermont combined. It is underlain with coal, ranging in quality from lignite to sub-bituminous, semi-anthracite and anthracite; the latter has not been found in workable quantities.

Production for 1911

Legislative action, in creating the county of Musselshell out of portions of Fergus, Meagher and Yellowstone Counties, has not decreased the production of coal, but Fergus and Yellowstone are, for a time, reduced from large producers by the change of county lines.

The following is the production by counties in short tons for year ending Oct. 31, 1911:

PRODUCTION BY COUNTIES

	Tons
Carbon	1,226,783
Cascade	948,823
Mussellshell	643,648
Park	54,760
Choteau	14,127
Gallatin	10,801
Fergus	6,670
Custer	5,044
Valley	2,741
Total	2,913,397

The new county of Musselshell, includes the rapidly growing camps, Roundup and Klein. This county is now the third largest producer in Montana.

There has been an apparent dullness in the Montana coal trade during the year just closed due to a heavy increase of capacity and consequent overproduction. At Stockett, in Cascade County, the Great Northern Ry. Co., coal department, have installed independent haulage engines for each of their new Nos. 5 and 6 mines. The Northern Pacific Ry. Co., at Red Lodge, in Carbon County, have, under their new management, increased their output from 1500 tons per day to 5000 and have even reached as high as 6000 tons. In Musselshell County, the Republic Coal Co. have increased the capacity of their No. 2 mine at Klein from 1500 tons, the record last year, to 2000, now their average daily run; this mine is now sufficiently developed to produce 3000 tons in 8 hours. In this same county, at Mine A, of the Roundup Coal Mining Company (subsidiary of the Chicago, Milwaukee & Puget Sound Ry. Co., at Roundup, the production is now 1500 tons per day. Mine B of the Davis Coal Co. is producing from 500 to 700 tons per day. Mines in the Bearcreek district are also doing considerable development in anticipation of a heavy future output.

Dust Explosion

The first dust explosion in the history of the Montana coal industry occurred on Apr. 15, 1911, at the No. 2 mine of the

Republic Coal Co., Klein, Musselshell County.

The coal seam here is between 5 ft. 9 in. and 6 ft. thick, has a hard sandrock roof, and the coal is friable and frozen to both the roof and bottom. An average analysis of the coal is: Moisture 12.7 per cent.; volatile combustible, 28.7 per cent.; fixed carbon, 50.9 per cent. and ash, 7.7 per cent.

Mining is paid for on the mine-run basis and is mined by shooting off the solid, tamping being done with fine coal and slack. The mine generally is wet, although dry in places, and fuses are used in both wet and dry holes. Shooting is restricted generally, although not entirely, to the periods between shifts.

The trouble occurred in a series of five rooms, in three of which there had been no crosscuts driven. From the testimony offered, there appears to have been about 50 in. of black powder fired at practically the same time in these five rooms. In the No. 3 room one shot had been laid parallel to the face of the room and pointed toward the left-hand rib, and another on the right-hand rib, parallel with the room pillar, and directly opposite the mouth of the other hole. It appeared that both holes were overcharged and the result was that windy shots occurred.

After the explosion No. 3 room was the only one which could not be entered until some provision was made for removing the smoke and gases. The flame burned the sight-strings in front of all five rooms, and also scorched brattice cloth on the entry further out, traveling against the intake air current some 500 ft. Fortunately, the brattice between the intake and the return (a board-stopping) gave way which short-circuited the flame into the return airway where conditions for propagation were less favorable.

No one was seriously hurt, although some where scorched slightly. The property damage was practically nothing, although this cannot be credited to good judgment or management. At present all the miners use their own discretion as to the placing of their holes, the number, and the amount of powder to use. Will we, like many other mining states, require the usual disaster and consequent loss of life, to force us into the adoption of safe laws for the blasting of coal?

Labor troubles in Canada proved of considerable help to Montana operators during their usually dull season in the spring and summer. Some coal was also shipped into Canada later in the season.

Accidents in 1911

During the year just closed there have been 13 fatal and 50 non-fatal accidents in the Montana coal mines, as follows:

TABLE OF MINE ACCIDENTS

Causes of accidents	Killed	Injured	Total
Falling roof	6	11	17;
Falling coal	2	12	14;
Moving cars	5	15	20;
Powder burned and blasted	0	5	5;
All other causes	0	7	7;

OCCUPATIONS OF VICTIMS

Occupation	Killed	Injured	Total
Pick miner	12	31	43;
Driver	1	9	10;
All others	0	10	10;

During 1911 the Montana State Legislature enacted a law providing a fund for the relief of miners injured in coal-mine accidents. The law required all operators to contribute one cent per ton of gross tonnage mined toward the support of this fund. Due to the fact that the miner, besides deriving the benefits from this fund, also retained privilege of bringing action at law for additional damages the act was declared unconstitutional by the Supreme Court of the State.

The growing sentiment in favor of some form of compensation for the dependents of those injured or killed in mine accidents, has made desirable the enactment of some such law, and it is with regret that we record its failure. From the inquiries received, applications for copies and comments made upon this law, together with words of commendation spoken at different institute meetings I have attended in Scranton, Chicago and Charleston, W. Va., I feel that this law would have come nearer filling the bill than any previous efforts along this line.

In common with all new departures, the law met with opposition from both operators and miners, which was, I think, due to a misunderstanding of its purposes. The funds were to be handled by the State Auditor, who, on proof of death or total disability, was required to make payment of $3,000; loss of eye, arm, leg, etc., was compensated for proportionately.

Examination of Mine Officials

Since the law requiring the examination of mine foremen and firebosses became effective (in the year of 1909) there has been issued 62 certificates. Twenty-six of these were issued without examination to parties presenting like certificates issued by competent authorities in other states. Forty-five were given service certificates without examination for having served continuously in the capacity as foreman for one year prior to the enactment of the law.

Prior to the meeting of the twelfth session (1911) of the Montana State Legislature, the operators and miners, at a joint meeting, agreed upon what laws they wished enacted. They were passed as presented and have now become a part of our statutes.

It is interesting to note that fully 20 per cent. of the coal produced in Montana during 1910 was mined on a royalty basis. The prices varied from 5 to 25c. per ton. In some of the Western States, as for instance Colorado, large revenues are obtained from this source. During the last two years Colorado has derived $50,000 annually from approximately 18,000 acres.

Review of Coal Trade in Ohio

The coal trade in Ohio during 1911 was not as active in many ways as that of the previous year which was the best in the history of the Buckeye State. Advance reports from the several mining districts indicate that there will be a decrease of from three and a half to four million tons in the year's production as compared to that of 1910. In some of the districts the loss was only slight and may even be turned to an increase but other districts have to report a suspension of from four to six months.

While there was a decrease in the tonnage mined, the most important feature of the coal trade was the unsatisfactory and unremunerative prices which prevailed during the greater part of the past twelve months. Prices as a whole were unsatisfactory and did not respond to the influence of weather as much as in former years. The large tonnage of 34,424,951 in 1910 was partially caused by the long lay-off in Illinois and the increased demand for lake tonnage. Taking it all in all the tonnage of about 31,000,000 in 1911 was not a bad output and if it had not been for the low prices that prevailed would have been fairly profitable to the operators.

Domestic Grades

During the year, prices did not advance above the $1.50 mark for domestic grades excepting in rare instances. Of course, the prices in the Pomeroy Bend district were higher because of the differential in freight rates but in that district $1.75 @ 1.85 was the highest point reached. Generally speaking the circular figure remained at about $1.50 during the entire time but this was not well maintained during the late winter and early spring months. The year opened with prices rather firm (somewhere about the $1.50 mark) but they remained at that point only a short time.

Under the influences of warm weather and poor steam trade, prices slumped soon after the first of the year and it was not until the middle of July that they were again pretty well maintained at the circular quotations. The stocking period produced considerable business for a short time and then followed another period of inaction during the fall months although prices did not slump to any great extent.

During the winter period weather conditions were not at all satisfactory. Up

until Christmas there was no cold weather to cause a flurry in the trade with the possible exception of one week. It has been a sort of a hit and miss proposition during the greater part of the year and will continue to be so unless conditions change to a radical degree. The Chicago market has not been such as to absorb any great amount of coal and this has had the effect of causing congestion in the domestic trade.

Retail Business

Retail business has not been as active as formerly. Dealers stocked up considerably early in the fall and the first run of orders was fairly satisfactory. Second purchases were not as numerous as usual and this caused the dealers to cancel their orders with the operators and jobbers. Good roads in the country districts of the state have had the effect of steadying the retail trade because farmers are enabled to haul coal at almost any time during the winter and consequently need not buy in large quantities in the fall.

The steam trade has been rather quiet. Requisitions on the part of manufacturing establishments were not as large as usual and business conditions in manufacturing circles have not been the best. There was a falling off in fuel requirements for iron and steel plants and also in fact in many other lines. However, prices on steam business have probably been more satisfactory than in any other branch of the trade and renewals of contracts have been made at about the same figures that have prevailed for some time.

In the department of railroad fuel the worst situation is seen. Railroad consumption fell off hundreds of thousands of tons from previous years. One large producing company reported a drop of over 400,000 tons in railroad fuel alone. Neither have prices for railroad fuel been satisfactory, as one large contract was taken at 85 cents, an extremely low figure.

Lake Trade

The lake trade was fairly active although a number of things interferred with an increased activity in that direction. The slack ore movement caused a falling off in lake shipments early in the season, which had opened auspiciously. This feature had the effect of making the boat supply rather short and later a freeze-up in the early fall caused many boats to put in for the winter sooner than usual. But on the whole the tonnage was rather satisfactory even if the prices were not the best. Congestion on the docks of the upper lake ports also interfered with a free lake movement.

In the fine-coal market peculiar conditions prevailed. The removal of demurrage charges on track storage cars permitted Ohio operators to hold up the prices to a considerable extent. The lowest price of the year was probably 30c. and the average was above that figure. The active lake season caused a large production of the small sizes.

The outlook for 1912 is not particularly promising. The one great uncertainty is the renewal of the wage scale which expires April 1, 1912. Business conditions generally are not bright and the tonnage will probably remain comparatively small.

The Ohio Coal Industry for 1911

By George Harrison*

The year's production will fall several million tons short of that for 1910. A substantial decrease is reported in the number of fatal accidents. The new state mining laws are in successful and satisfactory operation.

According to advance reports from the various coal-mining districts of Ohio for the year just ended, the production in this state will be materially reduced as compared with that for the year 1910, which reached a total of 34,424,951 tons, the greatest amount ever recorded in the history of the state mining department.

While there are no official figures at hand on which to base a correct estimate, it is believed the year's tonnage will show a decrease of from 3½ to 4 million tons. Although the loss may not be so great as at present indicated, it is true that in many districts work was unusually light during the year, while in others there was a suspension amounting to from 5½ to 6 months. Several causes led to the large tonnage in 1910 that will not obtain for this year, notably the long strike in the state of Illinois and the suspensions in other districts; also, the increased demand for lake shipments.

District Output

The tonnage of the Hocking Valley district as a whole, will fall off about 15 per cent. as compared with 1910, and that of eastern Ohio will probably show a loss of 10 per cent., or a total decrease of about 1,000,000 tons. The loss in Jackson County will be about 40 per cent.; in Meigs County, the same; in Mahoning County, 10 per cent.; Columbiana County, 20 per cent.; and in Tuscarawas County the decrease in tonnage will amount to about 200,000 tons, this being due to the enforced idleness of from 5½ to 6 months on account of the 1910-1911 strike.

*Chief mine inspector, Columbus, Ohio.

Labor and Working Time

No shortage of labor has been noted during the year; in fact, it will probably develop that the number of men employed was smaller than during the year 1910. While the decrease in the number of employees may not be particularly evident, the average working time per man will be seen to have been perceptibly reduced, with a consequent loss in earnings. The larger coal-producing counties will show no appreciable loss in the time worked, although the splendid record for the year 1910 will by no means be equaled. Other counties will show the working time as being about two-thirds and in some cases only one-half of that for the previous year, while in the districts of smallest production, the working time will scarcely reach half of that for 1910.

Prices for Ohio coal during the year were not particularly high and were subject to considerable fluctuation. A shortage of cars was reported on the Toledo & Ohio Central Ry. in the Hocking Valley. This is, however, usually the case during the latter months of the year when there is an increased demand for fuel. The lake trade for the year, it is believed, will not compare favorably with that for 1910, when the greatest tonnage ever shipped to the Lakes was recorded.

Accidents

The number of fatal accidents in Ohio will show a great decrease as compared with the preceding year. In 1910, 161 accidents were recorded, while up until Dec. 15, only 107 accidents have been reported for this year. Of this number 81 were due to falls of roofs; 10 to falls of coal; 7 to mine cars; and 3 to electricity. Particularly gratifying is the notable decrease in the number of persons killed by mine cars, from 19 in 1910 to 7 in 1911; also the decrease from 97 to 81 in the number killed by falls of roofs, and from 7 to 3 in the number killed by electric shock. So far no fatal accidents have been reported from the use of mining machines since the new law has required that the machines shall be properly shielded and has imposed a fine as penalty for removing such shields.

Belmont County reported the greatest number of fatal accidents, 36 in all, of which 32 were due to falls of roof; Jefferson County reported 21, of which 16 were due to the same cause. In these two counties the No. 8 seam of coal is

worked. This seam has a dangerous top, and in many instances the miners become careless and neglect to take it down; the result is seen in the large number of deaths from this cause. Guernsey County reported 16 killed, 10 deaths being due to falls of roofs. Three other counties each reported only two fatal accidents. Seven counties had but one fatality apiece, and thirteen counties reported no accidents at all which resulted fatally.

Violations of Mining Laws

The number of violations of the mining laws shows a decrease from 52 cases in 1910 to 37 in 1911. This latter number includes two prosecutions which were not reported to the state mine inspector's office last year until after the year's record had been closed; it also covers one case carried to a higher court and disposed of during the year. So far as it is possible to learn, all the prosecutions instituted both by the state mining department and employers of labor, have resulted in convictions. These results seem particularly favorable in view of the fact that the new code did not go into effect until June, 1910, and it required some considerable time for all persons connected with the mining industry to familiarize themselves with its provisions and the penalties for non-compliance. On the whole, operators and miners alike show a commendable disposition to respect the laws.

Prosecutions Were Undertaken

The fines for violations of the state mining law amounted to $400 and prosecutions were undertaken for the following causes: Burning impure oil, 10; employment of a minor, 1; violation of the breakthrough law, 5; not properly shielding a mining machine, 2; crossing a danger signal placed by a fireboss, 2; entering a mine before it was examined by a fireboss, 2; entering a mine generating firedamp, with an open light before mine was examined by a fireboss, 1; failure to supply sufficient ventilation, 1; failure to provide safety catches on a mine cage, 1; using acetylene lamps, 2; failure to supply proper timber to miners, 2; riding on haulage trips, 6; and selling inferior oil, 1.

Outlook for Year 1912 not Promising

The outlook for the year 1912 is not considered to be particularly promising, and it is not expected that any material improvement of conditions will be shown over the present year. One reason for this is the expiring wage contract, which will have to be considered and renewed. Nevertheless there seems to be no reason why 1912 should not be a reasonably prosperous year for both employer and employee.

The Coal Industry of Oklahoma, 1911

By Ed. Boyle*

Suspension of work, competition and other influences have combined to restrict the year's production in Oklahoma to less than half what it normally should be in view of existing developments. The coke industry is at a standstill. Accidents are gratifyingly few.

Oklahoma's coal deposits are extensive, but the state has labored for many years under serious difficulties in connection with the production of her natural resources. The coal-mining industry has been retarded for a number of reasons, and the first among these is the fact that practically all the mines of the state are worked under lease from the Federal Government. For several years past the Interior department has refused to lease any coal land in the belt segregated by the U. S. Government, and consequently there have been no new developments in the Oklahoma field, except such as have taken place on an extremely small scale, where coal has been discovered on the lands allotted to the Indians. These lands have, in some cases, been leased by individuals or small companies, and, in the aggregate, have added materially to the total output.

Mining Cost and Competition

The coal in Oklahoma outcrops on the prairies with a pitch of from 5 to 45 deg. The seams are usually worked by slopes in the vein and where development was started a number of years ago these slopes have, in many instances, now reached such a depth that mining has become much more expensive than it was when carried on closer to the surface. Along with this condition, coal production has been retarded by the competition of cheaper fuels, such as oil and natural gas, of which there seem to be inexhaustible supplies in this state. The only system by which Oklahoma coal can be put on the market at a price to meet the competition from adjoining coal fields and other fuel supplies, involves sinking shafts to reach the vein which is being worked at present. These shafts would, in many instances, have to run down to a depth of 500 or 600 ft., and, under present conditions, the coal operators do not feel disposed to undertake any measures which will require so large an outlay of money or capital as would thus be involved.

Coke Industry

There are a number of seams of coal in Oklahoma, varying in thickness from 24 to 72 in., which are of exceedingly good quality. Some of this coal makes an excellent grade of coke and a large number of ovens have been built in this field. At one time large quantities of coke were supplied to the smelters of Mexico, but this trade has been lost on account of the prohibitive duty, since imposed by the Mexican government. It has been found unprofitable here to attempt to manufacture coke in competition with the Colorado field for furnishing this grade of fuel to smelters throughout the West, and, therefore, the coke ovens of Oklahoma now stand idle almost without exception.

The total coal production of Oklahoma for the year 1911 will reach approximately 2,800,000 tons, which is an extremely small output for this field. If there was a market for the coal, the present openings and development should be producing, with steady work, 6,000,000 tons per year, but it seems that during a suspension of work in 1910, the operators lost most of their contracts to competitive fields and have been unable to regain them up to this time.

Wasteful Methods

The system of mining in general use in Oklahoma is criminally wasteful. Leases have usually been secured with but one object in view, which is that of getting out the cheapest coal and leaving the balance to go to waste. It is now time that the people should become aroused over this unwarranted waste and demand mining methods and conditions which will conserve the resources of the state.

Mining conditions in this state differ from those found elsewhere, chiefly by virtue of the peculiar character of the roof. This contains a large proportion of limestone, which is easily slacked by the air current and requires great care and an unusual amount of timber to keep it secure. Nearly all the mines of this field are generating large quantities of gas and have to contend with a particularly combustible form of dust, but thanks to competent management and supervision and a strict enforcement of the mining laws, there has been a great decrease in the number of fatal accidents, which is especially gratifying when compared with the number reported in other fields operating under similar conditions.

*Chief mine inspector, State of Oklahoma, McAlester, Okla.

Bituminous Mines, Pennsylvania, 1911

Editorial Correspondence

The operators of the northern part of the bituminous coal field are being driven southward by the rapid depletion of lands in Mercer, Tioga, Elk, Jefferson and Clarion counties, and have invaded Indiana and Armstrong.

Improved extraction methods are not spreading. New mining law subjected to much criticism.

There has not been a large amount of development in the bituminous regions during the past year owing to the small profits in recent mining. The great advances of the past few years have been in the center of the state, where large developments have ben made in Indiana and Armstrong Counties.

The Buffalo, Rochester and Pittsburg Railway has not been slow to realize that the depletion of the resources in Jefferson and Clearfield Counties must be met, and more than met by developments elsewhere, in order to provide traffic for the road on which they are continuing to make large and expensive improvements. These developments, their allied interests have sought to make in Indiana, where the same beds which they have mined in the past, to wit, the Lower and Upper Freeports are situated so far below the water-level, that the area they cover is almost co-terminus with the boundaries of the County. These coals are situated about 75 ft. apart, and are therefore both workable, the extraction of the one not interfering with the later extraction of the other.

This year large developments have been made at the Lucerne plant including the placing of steam turbine generators, and the erection of a large steel tipple, capable of handling several thousand tons a day. The mines are in the Upper Freeport, as are those also at Ernest, but at both mines it is the intention to sink to the lower bed, so that a large tonnage will be available. A branch has been built to Jacksonville, and a big mine is under development at this point.

Armstrong County Development

The receivership of the Buffalo & Susquehanna Coal and Coke Co., has prevented any important developments, and the main interest has been centered around the abandonment of a well-equipped shaft at Onondaga near Big Run. The Allegheny River Mining Co., has profited by the extension of the Pittsburg Shawmut & Northern R.R. from the village of Knoxdale in Jefferson County to the Allegheny River. This extension has a low gradient for a road which crosses several summits and it is well fitted for handling a large tonnage. The Allegheny River Mining Co., an allied corporation, has two mines locally known as Oakland and Tidal Mines. The latter is ready for operation and has been renamed Chickasaw. The Oakland operation will also soon be shipping coal.

The extension of the "Shawmut" line down to Nicholson Run below Kittanning, has been largely graded and can easily be prepared for traffic. Several mines have been opened and much work done on Limestone, Brunner and Nicholson Runs. It is understood that what little work remains to be done to complete the extension to Nicholson Run will be completed, to the end that a large acreage of coal lands lying adjacent to the proposed route, and owned by the Allegheny River Mining Company may be developed. It is proposed to erect a large central power station at Glade Run for the use of these mines. A line of road has been surveyed toward Butler, and if this line is completed a large undeveloped part of Butler County may be open for operation.

Along the Allegheny River

Travellers passing along the Allegheny Valley by the Pennsylvania R.R., formerly the Buffalo & Allegheny Valley Ry., have long wondered that the left bank of the stream was well developed, while the right bank showed few houses and no mines. The work of the "Shawmut" interests give assurance that the right bank will now be well occupied and even more prosperous than the other, because the mines will be in the hands of larger and more adequate financial concerns, having a steady market for their coal.

From Parkers Landing southward, the coal measures are continuous, yet to the point (Kiskiminetas), where the West Penn R.R. crosses the Allegheny River, no shipping mines were formerly to be seen, though just over the ridge near Red Bank an exception might be found in the mines of the Great Lakes Coal Company at Caylor, these mines being tributary to the Allegheny and Western R.R., an extension of the Pittsburg, Bessemer & Lake Erie R.R.

Change of Working Seam

The bituminous area under operation will soon be measurably constricted unless coal is discovered in the Kittanning measures over a large area where it is now believed to be of little value But little coal remains in Elk County. The two principal holders of coal in that county, the Shawmut Mining Company and affiliations, and the Northwestern Mining & Exchange Company, have both made their more recent extensions in other counties, owing to the restrictions in their home county. Clearfield County may hold its own for a while, and perhaps even increase, but this increase will largely come in the lower measures especially in the Lower Kittanning Bed in which—and in a lower seam—nearly all the operators along the Moshannon and its branches are now working.

The Lower Freeport Bed, the stand-by seam of Jefferson County, and an important seam in Elk, Clearfield, Clarion and Armstrong is marked by extensive "wants," sometimes reaching a width of two miles. These wants which are erroneously called faults, and which are the channel beds of streams existent in the carboniferous period, have reduced the available area of Freeport coal considerably. As the beds lie high on the hills, modern erosion has combined with ancient to make the area to be mined limited. In Elk County, no Freeport coal is being mined, and in Clarion County but few mines are working it. In Jefferson County the depletion is very rapid and exhaustion is drawing near. In Armstrong and Butler Counties a large amount still remains.

The ratification of the plan by which the Pennsylvania Coal and Coke company was reorganized promises a new life for that company in Cambria and Clearfield counties. The slack watering of the Allegheny River beyond the mouth of the Mahoning, as recommended by Major H. C. Newcomer, if completed, will enable coal to be loaded in barges and shipped south from many mines, which have so far been tributary entirely to the Buffalo market. This overstocked mart should feel this relief, should the much desired plan ever advance beyond the Newcomer report.

Methods of Coal Extraction

Though as far as the United States is concerned, careful and conservative methods of coal extraction originated in the Connellsville region of Pennsylvania, yet it cannot be said that Pennsylvania is leading other states in this matter. Other sections seem prepared to let Connellsville have proud preeminence, and mining is generally by the primitive advancing room-and-pillar methods providing a great number of short, unreliable lines of roof fracture. There does

not seem any disposition to improve methods except in the leaving of larger pillars and in more speedy pillaring. In the Freeport beds there seems to be no great loss apparent from such primitive methods, because the roof breaks easily and the cover is light. But in the Lower Kittanning mines, the roof is quite strong, and the cover heavier. The coal and development lost in this bed is often large, and in Cambria county an attempt has been made to avoid this by strengthening the weak spots which, unfortunately, may be expected to occur in headings on that side where the rooms are turned off. This is effected by driving rooms with long distances between centers, in fact double the ordinary distance, other rooms being started from the cross cuts out of these first rooms as soon as a sufficient pillar, of about 100 feet, has been left to support the heading. Thus every room approaching the heading serves as the roadway of two other rooms.

First Costs of Complete Plants

Operators have, for many years, been of the opinion that as coal was cheap there was but little economy in saving steam by any of the approved methods recommended where coal costs $5 per ton delivered. Till recently all economies have been directed solely to saving labor by the use of coal-feeding devices at the furnaces with the commend able idea of reducing labor costs and making steam with inferior coal. Some still argue volubly for the belief that coal which is a drug on the market, as is slack most of the year, should not be saved at the expense of any outlay on equipment.

For this cause, uncovered pipe lines, leaky furnaces and bad pipe joints remain unregarded at small plants. Even in larger plants, noncondensing and reciprocating engines still hold their own. But there is gradually working the idea that it is cheaper to conserve fuel not for its own sake, however cheap it may be, but because the conservation saves labor in firing, makes a better plant, and above all one that costs no more. It is an undesirable practice to increase boilers and engines in size and number of units above the call of prudent necessity, when with economy in using steam by means of superheaters, feed water heaters, turbines, condensers, electrical high pressure transmission, and careful upkeep of details the plant could be kept down to normal size. It is being realized that a good plant burns less and poorer fuel, gives a steadier power delivery, saves labor the year around and costs at the first outlay but little if any more because the price of economical devices is offset by the reduction in size and in number of the large units. These factors, whilst they do not make great headway at the older plants are receiving more consideration where new mines are opened. The older mines must eventually be reequipped and it is not infrequent to find the dates of power development marked plainly by the new mechanical designs in the power house.

The New Mine Law

The new Pennsylvania Bituminous Mine Law was approved June 9 of this year. It has occasioned no little unfavorable comment. Before it was finally framed a vigorous protest was made to all the new provisions, but at length the law was enacted and the whole Code fills 136 pages. It is one of the most complete mining codes on record. Its principal fault is its obscurity. There is evidence of the stress of conflict out of which it emerged, but it is probable that the conflict alone is not responsible for its illogical arrangement. Article XI is entirely new. It deals with the installation of electricity in the mines at length, devoting 24 pages to the subject. The uncertainty of the meaning of the law made some operators make the declaration that they would remove their firebosses from the mines. This was perhaps not stated in real earnestness. But the Chief of the Department of Mines wrote a strong letter to them urging the retention of all the firebosses employed. It remains to be seen whether a code specifying exactly what shall be or shall not be done is as good as one leaving larger power of control in the hands of the inspectors.

The Pittsburg District in 1911

By B. E. V. Luty*

The financial results of the year 1911 in the Pittsburg district coal trade were unsatisfactory. Demand was lighter than in the previous year, but with ample car supply and increased capacity the production was only a few per cent. less than in the previous year, with the result that prices suffered throughout the year.

In 1910 the $1.15 price for mine-run was maintained practically throughout the year, but there was an advance to $1.20@1.25 after the wage increase accorded for the biennial period beginning Apr. 1. In 1911, on the other hand, the $1.15 price scarcely prevailed at any time, and was frequently shaded by as much as 10c. per ton on important contracts, while occasionally odd lots forced on the market brought less than a dollar. Large operators were slightly helped in their year's average, however, by the existence of long-term scale contracts, based on the mining rate. These, while on the whole calling for low rates gave a fixed price equal to that of the last nine months of 1910, and above that of the first three months of that year. The average realized price on all the coal mined in the district probably fell between 5c. and 10c. below the average of 1910, which with a slight decrease in the total tonnage made the year an unsatisfactory one.

Definite steps were undertaken in the year to improve the position of the Pittsburg district in the lake coal trade, the case of the 88c. rate from the Pittsburg district to the lakes being brought forcibly to the attention of the Interstate Commerce Commission. The contention was based on a comparison of ton-mile rates with West Virginia and other districts having much longer hauls but only slightly greater total rates to the lakes. A reduction to 50c. was asked, and the Commission is expected to order some redress, though hardly as great as asked.

Early in June the United States Steel Corporation purchased the entire coke operations and coking coal holdings of the Pittsburg Coal Co., involving about 7000 acres and 956 ovens, paying a flat price of $1450 per acre. Making allowance for the value of ovens and other improvements the price was computed at about $1,000 per acre for the coal land alone. At the same time the steel corporation purchased the coking coal of the Monongahela River Consolidated Coal & Coke Co. paying $850 an acre for about 9000 acres of undeveloped land. In each case payment was made by bonds on the properties, guaranteed by the steel corporation. These operations put the Pittsburg Coal Co. in position to retire some of its debt, at the same time undertaking to absorb the outstanding stock of the River Coal Co., in which it had previously owned only a controlling interest. The intention is probably to ultimately absorb the properties and divert much if not all of the output to the rail instead of the river trade.

Production of coke in the Connellsville and lower Connellsville region was about 16,000,000 net tons, a decrease of

*Bessemer Bldg., Pittsburg, Penn.

about 15 per cent. from the preceding year and of 20 per cent. from the record year 1906. This was partly due to decreased consumptive demand, due to lessened output of pig iron, but it was also due in part to development of other fields, and in part by reason of the adoption of byproduct ovens. The Connellsville region shows no indication of ever adopting byproduct practice, though it has rapidly been making improvements in recent years by the adoption of the rectangular push oven, involving a slight decrease in cost of operation.

Coke prices in 1911 were altogether unsatisfactory. The market price for spot furnace coke occasionally ranged above $1.50 at ovens, but as frequently below, and an average of monthly quotations indicates an average for the year of $1.50. Contracts made for the year, chiefly in December, 1910, were mostly at from $1.55 to $1.65, a number of scale contracts (coke to be settled monthly at a stated fraction of the prevailing price of pig iron) being made with minima of about $1.60, the minimum prevailing throughout the year. Contracts for 1910 had been made quite largely during the boom in the closing months of 1909, and showed a much higher average.

The monthly prices for Connellsville coke during the year just closed were as follows:

PRICES OF CONNELLSVILLE COKE.

	Furnace.	Foundry.
January	$2.60	$3.05
February	2.25	2.75
March	2.00	2.60
April	1.80	2.40
May	1.70	2.25
June	1.65	2.20
July	1.65	2.15
August	1.65	2.15
September	1.60	2.15
October	1.55	2.10
November	1.45	2.00
December	1.50	2.00

Coal and Lignite in Texas

By William B. Phillips *

The production of coal in Texas will be about the same as last year and may be taken at a million tons, an equal amount of lignite also being produced.

The coal producing counties are: Erath, Jack, Palo, Pinto, Parker, Wise and Young in the North Central coal field and Maverick and Webb in the Rio Grande coal field. The north central coal field is of the Carboniferous and the Rio Grande coal field of the Upper Cretaceous or Tertiary period.

Most of the coal mined in Texas is for railroad purposes, not much of it being sold for domestic use. The total coal area is probably about 13,000 sq. miles, with an original supply of 8 billion tons. As a rule the seams of coal are comparatively thin, less than 30 in., and the usual ash content is 16 per cent., with sulphur 2 per cent. The heating power of these coals is, on the average, 11,000 B.t.u. and the weight per cu.ft. 87.5 pounds.

Lignite

The production of lignite will be about one million tons, or nearly the same as last year. Workable beds of lignite occur in 43 counties and the total area is about 60,000 sq. miles, or one-half of the total known lignite area in the United States. The deposits run in thickness up to more than 15 ft., and every variety of lignite is represented.

Production of Gas From Lignite

There is now much interest being taken in the production of gas from lignite, especially for power purposes. There are 56 gas producers in Texas and 47 were in active operation during the year. some of them, however, only intermittently. There are 23 establishments making producer gas from lignite and the consumption of lignite for such purposes is about 80,000 tons a year.

In this state 11,490 engine horse power is derived from lignite gas. Most of these installations are of small size, as two establishments alone represent 7,700 horse-power. Producer gas made from lignite is in successful competition with natural gas. No briquets are made in the state and there seems to be but little interest in this matter. Some of the Texas lignites make an excellent briquet without artificial binder.

A Central Power Station

Certain interests have considered the practicability of making producer gas from lignite at some central station, near regular supplies of this fuel, and transforming the power into electric current for distribution to cities and towns. In this direction there might be opportunity for a considerable business, as the price of lignite, at the mines, is about 90c. a ton. From a ton of good lignite there can be produced from 60,000 to 70 000 cu.ft. of producer gas, with a heating power of from 125 to 150 B.t.u., per cubic foot. As byproducts, there would be tar and ammoniacal liquor, the former yielding light oils and paraffin, the latter yielding sulphate of ammonia.

*Director Bureau Economic Geology and Technology, Univ. of Texas.

Utah Statistics for 1911

By J. E. Pettit*

The production of coal for this state for 1911 is 2,501,472 short tons, a decrease of 24,622 tons when compared with production for 1910. The reason for decrease is attributed first to the open winter of last year and the falling off of orders during the first three months of the year. Later during the fall a continual shortage of railroad cars has been experienced.

The production of the hydrocarbon mines is 37,050 tons, an increase of 9501 tons over 1910. The production of coke was 212,368 tons, an increase of 66,304 over 1910, attributed to the fact that the Utah Fuel Co. secured some of their old contracts from the Amalgamated Copper Co. that were rescinded two years ago.

The amount of explosives used was: Black powder, 398,285 lb.; giant powder, 301,792 lb., which includes Monobel, Bental No. 2 and other permissible powders, a total of 700,067 lb., or one pound of powder for every 3.57 tons of coal mined. This shows a decrease in the amount of black powder used during the year, and a corresponding increase in the permissible powders.

Nearly 4000 Men Employed

The total number of men employed inside and outside in both the hydrocarbon and coal mines and coking plants was 3798, an increase of 499 over the preceding year. The average number of days worked at the various mines was 252, and the average amount of coal produced per man was 712 tons.

There were 84 accidents in and around the coal and hydrocarbon mines, of which 16 were fatal, 18 serious and 50 nonserious. There was one fatal accident occurred outside of the mine. Seven wives were left widows and 21 children fatherless. The per cent. of fatal accidents for the year 1911, both inside and outside, was 4.21 per 1000.

The amount of coal mined for each life lost was 156,342. The causes of the fatal accidents were: Falls of rock, 4; falls of coal, 8; runaway cars, 2; boiler explosion, 1; loaded trip of cars, 1.

*State coal mine inspector, 501 Dooly Block, Salt Lake City, Utah.

Virginia Coal Output increasing

Coal mining in Virginia has made important increases within the past generation. Although not a great coal State Virginia produced over six and a half million tons in 1910. The State is one of the earliest producers, the figures of the United States Geological Survey showing a small output as far back as 1822. In 1850 the production was 310,000 tons and at that time only two States stood above Virginia. While other States were forging ahead the increase in Virginia was slow until about 1895, when 1,368,324 tons were produced. In 1900 the production was 2,393,754 tons; in 1905 it was 4,275,271 tons; and in 1910 it was 6,507,997 short tons, the greatest in the history of the State.

Washington State Coal Statistics

The table shown below gives the detailed statistics of the coal industry in Washington for the fiscal year ending June 30, 1911:

Coal in West Virginia

With the close of the present year and the coming of a new one the coal men of West Virginia find conditions greatly improved over those of a year ago. In fact, it was only at the close of the year that conditions changed and brought hope for better things. The spurt in prices, of course, is the real blessing the holiday month brought, and even something a little better is predicted for the months of January and February.

For the calendar year the output has been above that of any previous year, but it is believed that statistics will show that the cost of production will be greater than previous years, while the price received for coal has been exceedingly low. These estimates are based on facts as found by some coal men in their own operations and are believed to hold generally throughout the state. With the increase in the price of smokeless and the expected increase in other coals, the new year presents a cheerful outlook as compared with the beginning of the one now closing.

Imports of Coal in 1911

The total imports of coal for the first ten months of the year just closed amounted to 998,795 tons, as compared with 1,628,111 tons for the same period in 1910. The total estimated imports for the current year will be about 1,198,500 tons as compared with 1,991,943 tons for 1910. By far the largest percentage of this coal comes from Canada, only about one-tenth being imported from other countries, of which Australia and Tasmania are the leaders. The imports are confined almost entirely to bituminous coal, no anthracite being imported in 1910 and only 42 tons during the first ten months of 1911.

Because of labor troubles in the British Columbia field, the figures for 1911 are not representative of the normal condition of this trade. Canada is by far the largest exporter into the United States and the shut-down of the British Columbia mines during two-thirds of the year, has made an appreciable difference in these figures.

COAL STATISTICS FOR THE STATE OF WASHINGTON, FISCAL YEAR ENDING JUNE 30, 1911

Compiled by D. C. Botting, State Inspector of Coal Mines, Seattle, Wash.

Name of Company	Name of Mine	Town	Tons of Coal Shipped	Sold to Employees	Used for Power	Total Coal Production	Days Operated	Inside Employees	Outside Employees
KING COUNTY									
Carbon Coal and Clay Co.	Carbon	Boyne	13,058	207	1,416	14,681	128	28	31
Carbon Coal and Clay Co.	Daly	Boyne	15,062	......	....	15,062	150	34	1
Central Coal Co.	Grand Ridge	Issaquah	17,472	614	1,242	19,328	114	29	19
Denny Renton C. and C. Co.	Kummer	Kummer	....	59	1,630	1,689	119	2	1
Denny Renton C. and C. Co.	Renton	Renton	....	......	12,825	12,825	150	20	2
Denny Renton C. and C. Co.	Taylor	Taylor	....	1,102	41,679	42,781	148	60	8
Fleet Coal Co.	Fleet	Cumberland	1,400	......	....	1,400	22	2	1
May Creek Coal Co.		Coalfield	550	252	675	1,477	140	8	7
Northwestern Imp. Co.	Ravensdale	Ravensdale	85,670	1,078	5,712	92,460	127	223	58
North Coast Colliery Co.	Danville	Ravensdale	....	......	....	....	...	.....	14
Occidental Coking Coal Co.	No. 1	Occidental	5,216	69	235	5,520	60	45	13
Pacific Coast Coal Co.	Gem	Franklin	19,965	319	2,507	22,791	98	70	15
Pacific Coast Coal Co.	B.	Black Diamond	1,616	......	51	1,667	171	16	6
Pacific Coast Coal Co.	No. 11	Black Diamond	114,014	......	10,055	124,069	129	240	91
Pacific Coast Coal Co.	No. 12	Black Diamond	442	......	60	502	163	14	13
Pacific Coast Coal Co.	No. 14	Black Diamond	61,679	1,633	2,992	66,304	135	145	29
Pacific Coast Coal Co.	New Castle	New Castle	111,895	419	5,821	118,135	132	128	83
Rose Marshall Coal Co.		Cumberland	9,638	79	505	10,212	126	32	19
Superior Coal and Imp. Co.	Superior	Issaquah	2,443	107	122	2,672	69	13	9
The Independent C. and C. Co.		Sec. 33 Twp. 21 R 7 E.	....	......	....	....	...	.....	2
Seattle Electric Co.	Renton	Renton	70,218	2,305	5,456	77,979	134	234	51
KITTIAS COUNTY									
Busy Bee Min. and Div. Co.	Busy Bee	Beakman	9,500	304	110	9,914	188	30	13
Northwest Coal Co.	Lakeside		1,454	......	....	1,454	61	10	4
Northwestern Imp. Co.	Cle Elum	Cle Elum	91,471	1,868	5,248	98,587	81	328	39
Northwestern Imp. Co.	No. 2, 6 and Dip.	Roslyn	114,608	3,902	8,015	126,525	74	429	92
Northwestern Imp. Co.	No. 3	Roslyn	76,254	234	1,331	77,819	76	285	13
Northwestern Imp. Co.	No. 5	Roslyn	71,997	151	1,495	73,643	78	211	20
Northwestern Imp. Co.	No. 7	Cle Elum	79,554	287	1,813	81,654	78	293	15
Roslyn Cascade Coal Co.	Patrick McKay	Ronald	28,318	138	188	28,644	73	55	31
Roslyn Fuel Coal Co.	Buckman Slope 1	Roslyn	119,015	520	3,067	122,602	144	181	45
Roslyn Fuel Coal Co.	Beekman 2	Beekman	645	97	....	742	...	2	13
LEWIS COUNTY									
East Creek Coal Co.	No. 3	Ladd	30,745	69	904	31,718	129	64	15
Mendota Coal and Coke Co.	No. 1	Mendota	22,988	79	714	23,781	67	53	11
Superior Coal Co.	No. 2	Cheholis	1,181	2,228	336	3,745	138	7	6
Wilson Coal Co.	Wilson	Kopiah	19,603	104	1,455	21,162	114	70	27
Carbon Hill Coal Co.	Carbon	Carbonado	161,373	756	10,612	172,741	149	368	216
Coast Coal Co.	7-10-11-12	Spiketon	26,316	161	635	27,112	153	143	84
Northwestern Imp. Co.	Melmont	Melmont	36,172	379	1,448	37,999	142	76	21
Pacific Coast Coal Co.	Burnett	Burnett	63,145	615	2,800	66,560	121	204	55
Tacoma Smelting Co.	Fairfax	Fairfax	1,449	156	419	16,178	149	39	33
Wilkesan Coal and Coke Co.		Wilkesan	27,145	162	1,810	46,979	91	130	105
West Tacoma Coal Mine Co.	Gale Creek	Wilkesan	12,797	218	2,072	15,087	131	44	13
THURSTON COUNTY									
Washington Union Coal Co.	Hannaford	Tono	19,761	110	463	20,334	79	38	18
WHATCOM COUNTY									
Whatcom Co. Coal Co.	Blue Canyon	Blue Canyon	3,345	......	48	3,393	141	15	4
			2,549,174	20,781	137,666	1,739,927	4,772	4,418	1,366

NOTE—21,688 tons of coke were produced in Pierce county.

West Virginia during 1911

Special Correspondence

The production of the West Virginia mines for 1911 will probably exceed 60 million short tons, the largest output the state has known. Conditions generally have been satisfactory.

West Virginia has at least made progress in three directions during the past calendar year—in production, in price of coal and in the methods of mining with a view to the greater safety of men and property and a reduction of costs. In other words, the practical side of mining has been sought and practiced, where for years the mining department of the state has struggled in vain to change policies.

Production and New Developments

The new development during the year was, briefly, the establishment of 18 new coal plants, the construction of 55 new power plants, the erection of 25 mine fans, 15 tipples and about 25 additional openings to old mines. This, however, does not mean that the above number of mines have been added to the number that existed on Jan. 1, 1911. On the other hand, a number of mine openings have been closed. In fact, a much greater number were closed than were opened, so that the number of mines, or openings, is much less at the end of the calendar year of 1911 than at the beginning.

The official statistics in the office of the Department of Mines show the total net ton output for the calendar year of 1910 was 60,099,239. While it is not possible, at this time, to get the exact tonnage for the calendar year 1911, the department of mines has sufficient information to form the belief that it will be at least 60,500,000 net tons, or an increase over 1910 of something like a half million tons. The fiscal year in the mine department in this state ends on June 30, and therefore to secure the calendar-year statistics it is necessary to go into the statistics of two years, and to the fact that the mine year does not end with the calendar year is doubtless due the many conflicting statements relative to the statistics in this state.

Early Statistics

The first statistics on mining in West Virginia began with the year 1863, when the output was 444,648 net tons. Since that time there has been an increase in output every year, with the exception of the years 1876, 1881, 1895, while the output in two years is given as the same—it not being possible to secure the exact tonnage. The biggest advance, however, came in 1910, when the output increased from something below 50 million to a little over 60 million net tons.

The output for the first six months in 1911 was not encouraging, when compared with the last six months in 1910, as a decrease of a little over three million tons was found to exist, but the output the last six months has been so great that the decrease was wiped out and an increase shown.

Price Improvement

One of the greatest improvements in conditions is the increase in price. Although small, and most of it due to the increase during the last month or two, it indicates a better outlook for 1912. The authority for this statement is the present head of the mining department, John Laing. Speaking about output and price, he said:

I think the output for 1911 will reach 54 million gross tons, provided the Christmas holidays do not make a greater deduction than usual. The price of coal, f.o.b. cars at the mines, from such information as we are able to gather will be 96c. a short ton, on the mine-run basis, which is about one cent better than for 1910.

While the production of coal in this state is rapidly increasing the prices at the mine stand about the same, which shows conclusively that the quality of West Virginia coal is superior to that of our competing states which are more favored in the question of freight rates. The difference in freight rates for West Virginia coal, you might say, is added to the cost of coal to the consumer, or, in other words, our competing states receive practically the same price that West Virginia receives. I believe the price of coal to West Virginia operators has gone as low as it will ever go and I can see no reason why it should not gradually increase until it reaches what we might call a fair return for our product. The operators of West Virginia are not receiving the same interest on their investment as the operators of other industries on theirs and at the same time the coal business is responsible for other industries in West Virginia.

The production of coke has decreased about 50 per cent. during 1911, and will not greatly exceed two million tons. The operators find it almost impossible to manufacture coke at the present market price, especially while the price of West Virginia coal is near normal. The ovens are gradually being closed all over the state. The price of coke this year has been about $1.80, net, at the mines, against $1.83 in 1910. It is the belief of Mr. Laing that if all the ovens in the state were closed, the production of coal would not show any considerable falling off.

The state has been free of labor troubles during the past year. Several of the mines had trouble with their men, but the difficulties lasted but a few days. In fact, these occurred at only four or five mines. The statistics show that about 72,000 men were employed in and around the mines, exclusive of superintendents, mine foremen, managers, store and office forces.

Accidents

Unless there should be additions for the closing days of December, of which the mine department has received no information, the total fatal accidents for the year will be 325—a slight decrease over 1910. The nonfatal accidents totalled 770—also a slight decrease over 1910. The state had two explosions during the year. At the Ott mine, of the Davis Coal & Coke Co., at Thomas, 20 lives were lost, due to a gas and dust explosion. At the Bottom Coal & Coke Co.'s mine, at Vivian, 18 lives were lost, caused by men entering an abandoned section with open lights. In 1910 there was but one, causing the death of three men. Speaking of the accidents in mines, Chief Inspector Laing said:

I regret that reports received by this department show that 80 per cent. of the fatal accidents were caused by carelessness on the part of workmen themselves by going in dangerous places after being warned not to do so.

One thing that entered into, and probably made possible the increase in output in 1911, was the supply of cars. There was, in fact, no serious shortage of cars at any time during the year—a condition that has never before prevailed in West Virginia, in the opinion of some of the oldest miners. The railroads have made great improvements in equipment and facilities for handling coal, and their interest in trying to handle the output has received coöperation from the operators, and instead of being at "outs," the operators and railroads have been working in harmony and friction was little known.

One of the greatest changes in the industry has been in requiring every mine foreman and fireboss to hold a certificate obtained at an examination held under the supervision of the chief of the Department of Mines. These examinations have been held during the year, and beginning with Jan. 1 no mine was permitted to be operated that did not employ a mine foreman and fireboss (if one was necessary) that did not hold a certificate. The department has also laid down other important rules in mining, all leading to the one thing—efficiency of the persons holding responsible positions—and the operators have agreed to coöperate with the department in carrying out the instructions.

Coal and Coke Exports in 1911

Editorial Correspondence

The export tonnage of the United States is increasing rapidly as compared with that of other countries. During the past 12 years this trade has trebled in value and for 1911 will amount to more than 80 million dollars. Exports are largely to Canada. Alaska is buying more coal each year.

According to the Bureau of Statistics of the Department of Commerce and Labor, the coal exports from the United States have trebled in value in the last dozen years. The total value of the coal exported in the year of 1911 is in round numbers, 80 million dollars, as compared with 65 million for 1910.

The United States now ranks third among the coal exporting countries of the world, being exceeded by the United Kingdom and Germany, who exported in 1910, 179 million and 104 million dollars worth of coal respectively, while the United States exported only 45 million, exclusive of bunker coal. However, the growth of the United States export trade is increasing much more rapidly than that of any other country, as may be shown by comparing the export figures of 1900 and 1910. During this period the export coal trade of the United States has increased practically 100 per cent., Germany 60 per cent., while that of the United Kingdom has suffered a slight decrease.

The principal destination of our export coal is to Canada, as shown by the figures for the first ten months of 1911, during which period our total exports of bituminous were valued at $28,732,888, of which $21,510,604 was shipped to Canada. Because of the strike of about eight months duration in the British Columbia fields our exports to this trade have been abnormal during this period. The next four important export markets are Cuba, Mexico and Panama, each taking between one and two million dollars worth annually.

As compared with our other exports, coal now ranks seventh in importance, being exceeded by cotton, iron and steel, meat and dairy products, copper, wood manufactures, wheat and flour.

Quantities of Exports

The total exports of anthracite for the first ten months of 1911 were 3,016,127 tons, as compared with 2,483,413 tons for the same period last year, showing an increase of approximately one-fifth. This trade is almost entirely with Canada, only a very small portion going to other countries. An approximate estimate of the total anthracite exports for the year of 1911 places this tonnage at about 3,620,000 long tons, as compared with 3,021,627 tons for the year of 1910, showing an increase of nearly one-third in the export anthracite trade.

The total exports of bituminous coal for the first ten months of the year just closed were 11,643,931 tons, as compared with 9,105,787 tons for the same period in 1910. These figures do not include bunker or fuel coal laden on vessels in the foreign trade which aggregate 5,578,497 long tons for this period in 1911.

Of the total bituminous exports, 8,933,044 tons were shipped to Canada, and, for the same period last year, this amounted to 6,432,632 tons, showing an increase of approximately one-third in this trade alone.

The total export bituminous trade for the year of 1911 is estimated at about 14 million long tons, as compared with 10,784,239 long tons for 1910. The total bunker or fuel coal laden on vessels in the foreign trade will be approximately, 6,700,000 long tons, as compared with 6,445,593 long tons in 1910.

Gross Estimates for 1911

The total shipments of both bituminous and anthracite coal, including that laden on vessels in the foreign trade will, for the year 1911, be approximately, 24,320,000 long tons, as compared with 20,251,459 tons for 1910.

The total exports of coke for the first ten months of 1911 were 777,861 tons, as compared with 715,196 tons for the same period in 1910, showing a material increase in this department. The total exports of coke for the entire year are estimated at 933,400 tons, as compared with 879,073 tons for the year of 1910, showing a material increase in the coke trade for the year just closed.

While the figures in our export trade for the year now closed show heavy increases all along the line it should be remembered that conditions have not been normal during this period. The British Columbia mines during about two-thirds of 1911 were practically closed down and since Canada is the destination of fully three-fourths of our export coal this has necessarily caused a heavy increase in shipments to that market.

Exports to Panama

As a natural result of the activity at the Panama Canal, exports of fuel to that trade has shown a steady and heavy increase during the last few years.

In 1908 the total exports to Panama amounted to 345,464 tons valued at $909,512. In 1909 this trade increased materially, the total tonnage for that year being 427,462 tons valued at $1,168,774. An increase was still evident in 1910, but not of such proportions as that for 1909. The total tonnage for 1910 was 497,316 tons, valued at $1,321,378. The total tonnage shipped to this trade for the first ten months of 1911 was 417,476 tons, valued at $1,071,494 and it is estimated that for the year of 1911 these exports will amount to slightly over a half a million tons.

Philippine Islands

For the first time in a number of years no coal has been exported to the Philippine Islands. In 1909 there were exported to this point, 155,655 long tons and in 1910 the exports amounted to 118,389 tons, while for the present year the Islands are apparently drawing on their own supply.

Exports to Porto Rico

Our Porto Ricoan export trade is not well established yet and a review of this market over the past three years shows considerable fluctuation in tonnages. In the main, however, this trade appears to be on the increase. In 1908, the total shipments of both bituminous and anthracite to Porto Rico amounted to 88,624 tons. In 1909 this trade fell off to 75,927 tons, valued at $232,679. In 1910 another heavy increase was experienced, the total exports for that year being 108,105 tons, valued at $333,547. The total exports for the first ten months of 1911 were 86,745 tons, and the total tonnage for the year is estimated at 104,000 tons, or about 4000 tons less than for 1910.

Alaska

Exports to Alaska, while comparatively light, continue to show an almost uninterrupted increase.

For 1908 the total of both coal and coke amounted to 21,509 tons valued at $137,567 and for the year following the tonnage was 29,684 tons valued at $191,420. During 1910 the tonnage fell off slightly amounting to only 28,833 tons valued at $177,127.

The total shipments for the first ten months of 1911 were 28,277 tons valued at $158,224. For the entire year it is estimated the shipments will total more than 30,000 tons the largest tonnage yet recorded.

Coastwise Trade Conditions in 1911

By J. J. Wolkins*

Coastwise tonnages for the year have been unusually heavy, particularly in anthracite. Some new high rates on water freights were recorded.

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In New England, 1911 was a year of large tonnages. Receipts at the port of Boston were well in excess of 1910, both in anthracite and bituminous, and had soft coal yielded better prices, the dealers generally would have called it a fairly good year. The early months were favorable to coal consumption, and were followed by a prolonged dry season cutting down the supply of water power for the mills. Then in August began the most unusual succession of fogs and gales that prevailed through the fall months and sent freights up to more than double the summer figures.

The Bituminous Trade

The bituminous trade has been the despair of the larger agencies. A weak situation early in the year gave little hope for fair prices, but for a time it seemed the West Virginia operators might settle their differences. All efforts, however, proved futile, for no sooner had the season opened strong with a contract price of $2.70 f.o.b. Hampton Roads, Va., or $3.63 gross tons weighed on cars at Boston for inland delivery, than an open cut was made March 31, to $3.30 on cars for the year, a price based on the water freights then current and netting less than $1 at the mines for the best brands of Pocahontas and New River.

Market Settled Into Dullness

For awhile the low values of 1909 looked certain to be duplicated, but at length, after all sorts of efforts to save the season, the market settled into a summer dullness at a range of $2.40 to $2.50 f.o.b., less selling commission, and $3.10 to $3.20 on cars at Mystic Wharf. Buyers were encouraged to hold off until minimum prices were to be had, and all the shippers were not only long on coal, but most of them were forcing supplies on the market rather faster than they could be absorbed. This condition held until late in August or September when large consumers began to worry over the slow movement of water transportation and pressed for deliveries on their low-priced contracts.

Bottoms were making but three trips when normally they would have made five and six, and with several heavy losses besides, by wreck and partial damage, a serious shortage became apparent late in September. Water freights advanced on big vessels, Virginia ports to Boston, from 60c. to $1.25 within a few weeks, and at the end of the year there was only a slight recession to $1.10 and $1.15. Coal at the loading ports is now reported to be in short supply, and for spot shipment would command a higher price than was secured on any contract business the year through. Current prices on cars Boston are around $4.00, and most of the shippers have been obliged to buy outside at present prices in order to tide over customers until they could make deliveries of their own.

A Lesson to West Virginia Operators

The year's experience should be valuable to the West Virginia operators for it must have shown how easily a big tonnage can be thrown away, with no adequate return. In a word, the trouble has been an over anxiety on the part of too many sales agencies to place tonnages in this market, without apparent regard to the returns that would have to be made later. If there was one feature worse than another, from April to July, it was the practice of sending cargoes here unsold, and them hammering prices to attract small buyers. So long as "protection" is guaranteed the buyer, the slow season can never be improved until the "auction hazard" is eliminated.

The principal Georges Creek shippers have apparently enjoyed a satisfactory year. They have an advantage of 15c. in rate to tide over West Virginia mines, and with an ample fleet of steamers, tugs, and barges have been able to live up to contract obligations and have coal for sale besides at lucrative figures.

Bituminous all-rail has been heavy all the year. The low prices at tide diverted a large tonnage that would ordinarily be railed from the Pennsylvania districts, and it was to be expected that the mines with less well established selling connections would suffer most. The better known shippers have had to make low prices to keep up anything like a normal output, and prices have ranged down to 85c. on coals higher in ash and volatile. The better grades from Somerset and Cambria counties have lately advanced from $1.20 to $1.35, in response to a slightly better demand.

At tide-water most of the Pennsylvania shippers have been in straits all the season. When Southern prices moved up in October there seemed an opening for a large tonnage from Philadelphia, but rates were soon advanced for shipment in anthracite transportation in sympathy with those from Hampton Roads, and a promising outlook faded away. The retail price of bituminous in Boston was advanced from $4.25 to $4.50, net tons, Dec. 1.

Generally, the 1912 prospect is good for bituminous. The mills and corporations all over New England are enjoying fair business, and each year seems to mark requirements up to a new high figure.

Anthracite

The year of 1911 was a record one for anthracite. The cold easterly weather from January on made stocks unusually light when the shipping season started and the months from March to June a very heavy tonnage was taken on. The usual April demand, both at tide and all-rail, lasted well into the summer, and there was a notable shortage of free stove and hard egg. Indeed the companies are still behind on orders for stove, and there was no apparent slackening in the demand at the end of the year. Early in September a cool wave brought in an extra business and it was not long before the anthracite companies had requests for prompt shipments on all sizes. The slow movement of barges had the effect of shortening up supplies and during October, November, and December the shippers were swamped with orders and there has been anywhere from three to six weeks' delay.

The Situation Grew Acute

In December the situation grew really acute; for the first time in years certain of the producing companies allowed their Eastern storage depots to go practically bare of stock, and with no early replenishing in sight. Warm weather before Christmas relieved the situation somewhat but the last days of 1911 saw the big cities in the market again and eastern shipments as slow as before. Chestnut size has continued in strong demand all the year, and the 25c. advance over the usual circular Apr. 1, has been easily maintained.

The end of 1911 saw another announcement, this time a similar advance in the contract price of broken coal, to $5.00 alongside. These advances, together with those in pea and the steam sizes within a year or two leave stove and egg the only sizes that have not been advanced since 1903. The anxiety over strike possibilities in the spring no doubt accounts in part for the increased ton-

nage in this section, but that does not deprive 1911 of its position at the top of recent years in anthracite.

A Large Contract

The latest "big news" in 1911 was the purchase by the New York, New Haven & Hartford R.R., through its Boston offices, of about 3,400,000 tons of steam coal for delivery during five years for the New England lines of the so-called "Mellen System," including the New Haven Road proper and subsidiary companies like the Boston & Maine and the Maine Central. The contract was made with the Virginia Iron, Coal & Coke Co. of Bristol, Va.-Tenn., operating mines on the Clinch Valley Division of the Norfolk & Western Ry., as producer, and the Coastwise Transportation Co. as carrier.

The biggest steam collier in the trade, the "Suffolk," has been chartered to bring part of this coal to Boston and to Portland, and it is understood that the Coastwise Transportation Co. will at once build a sister ship to the "Suffolk" to assist in carrying the coal. It is believed that the construction of such ships as the "Suffolk" and the "Newton," launched in September, carrying upwards of 7200 tons, and making quick and regular trips, means the passing eventually of the large sailing vessels that have hitherto had most of the coastwise carrying trade. There are now seven of this largest type of steam collier, and some of them have made four round trips from Hampton Roads to Boston within a calendar month.

Review of Year's Coal Trade

By John H. Jones*

Coal production in 1911 while reduced by industrial depression is upheld by increasing domestic uses. Advanced legislation is favored in order to clean the slate and give capital, assurance of stable conditions. Present liability law in case of a severe explosion with proved liability, would fail because of bankruptcy of the corporation involved.

The coal tonnage in the United States for 1911 will nearly equal that of 1910, which was slightly more than 500,000,000 tons, or about 10,000,000 tons in excess of the entire production in this country from the time the first ton of coal was taken from the earth up to and including the year 1871. Not more than 60 years ago, the yearly production of the country did not exceed 7,000,000 tons; comparing this with the more than 500,000,000 tons of 1911, will give some idea of the wonderful strides which the coal industry has made and is making. That the production in 1911 has not shown a decrease over 1910 is accounted for mainly by the fact that while many of our largest manufacturing plants have not operated as fully as in years past, there is a steady increase in the use of coal for gas making, the production of electricity, railroad fuel and domestic consumption.

Production of Coming Year to Be Large

While the production in 1911 has been rather unsatisfactory, 1912 will show (from present indications) the largest production in the history of the coal business, with an increase of from 10 to 20 per cent., or a total of from 550,000,000 to 600,000,000 tons. This, of course, will come from a simultaneous increase in other lines of industry. That increase will be brought about by the willingness of the largest corporations to comply with the law, and their desire to coöperate with the government to bring about better business conditions by legislation which will eliminate as far as possible the discontent on the part of capital caused by the attacks which have been made from time to time.

I think we should urge upon the government the appointment of commissions to settle such questions as monetary and tariff conditions, and, moreover, urge the establishment of a federal corporation law, which would be regulated in such a manner that capital would have a fair return upon its investments and at the same time the consumer be assured of the lowest possible prices for his purchases.

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The lake tonnage from all districts, for the 10 years ending 1911, is as in the following table:

LAKE TONNAGE FROM ALL DISTRICTS

	Pittsburg District	Ohio District	W. Va. District	Total
1902	4,704,093	2,689,974	965,769	8,359,036
1903	6,092,047	2,458,265	1,539,435	10,089,747
1904	6,058,383	2,138,247	1,279,876	9,476,506
1905	7,443,883	2,062,692	2,109,262	11,615,637
1906	9,287,272	2,560,906	2,743,732	14,591,910
1907	10,549,993	4,074,296	3,420,941	18,037,232
1908	8,700,000	3,600,000	3,450,000	15,750,000
1909	8,687,305	3,002,815	3,874,570	15,364,690
1910	11,911,900	4,297,300	6,629,500	22,838,700
1911	10,611,941	4,019,544	7,151,200	21,782,685

Employers of labor and their employees should endeavor to get closer together. Union labor should not be criticized for the acts of certain of its officials. The labor unions should discourage, collectively and individually, violence by their members. They should select from their ranks the most conservative and efficient leaders. Capital and labor must recognize that their interests are mutual. Where treating with union labor, capital should insist that the union officials be honorable and intelligent men, in order to deal honorably and intelligently with them. Where labor is not organized, capital should get closer to the men and treat them, as is already done by a large number of companies, in the way it would like to be treated. Capital should do everything possible to disarm labor, whether union or nonunion, of the belief that it is its desire to make every dollar possible from its toil, regardless of its welfare. This is certainly not true of capital in most cases.

The Equity of a Compensation Law

A compensation law, which will provide for a man and educate his family in case of accident or death, will be a step in the right direction. Let us hope that Congress will recommend to the several states that such a law be passed. Let us also hope that no state will hesitate to pass a law which will bring about conditions which mean so much to the workingman and his family. A compensation law which means individual liability for the different companies, to be recovered through the courts of our country, is simply an encouragement to "ambulance chasers," and only pays compensation to the workingman where it can be proved beyond doubt that it was not through his own negligence that the accident happened. Why not pass a law which will pay a fixed amount to those families as long as they are dependent upon the income of the injured or deceased employee? For instance, in coal mining there are not 20 per cent. of the companies engaged in business today who would be able to pay the required indemnity under the liability law in case of a serious accident, requiring them to pay from $100,000 to $1,000,000. In connection with this liability law, the strictest kind of laws should be passed by the states to minimize the number of industrial accidents as much as possible and protect the lives of the workers.

More tonnage will be moved in the early part of 1912 than has ever before been moved in the history of the country. Consumers have been postponing the buying of necessities as long as possible, and supply houses have been postponing the stocking of their warehouses. They are now ordering ahead, and the mills and manufactories have orders to keep them going for the first six months of the year. The possibilities of the last six months will depend to a large extent upon the political situation.

Baltimore and Vicinity in 1911

By Leslie Rawles*

The year 1911 has been one of reduced sales and small profits for Baltimore operators. Yet when an impartial view is taken of conditions as a whole, and the depression which has existed in so many industrial lines throughout the entire twelve months is considered, the Baltimore dealers feel they have no cause for complaint.

Market Conditions

It is true that when the present year made its advent, the hopes of the coal trade in Baltimore ran high. There was every evidence that there would be a general revival of business the country over. Operators had visions of prolonged activity in the steel industry, which would necessarily bring about a constantly increasing demand for their product; they saw an unprecedented traffic for the railroads, and these same railroads purchasing freely, thus stimulating the trade of the car manufacturing and supply companies, and adding zest to the coal market.

These hopes have not been realized to the extent that Baltimore operators had expected. Among the overly enthusiastic ones, the disappointment over the failure of the coal market to exhibit the life that was expected of it, is keen. But the conservative view taken by the trade here as a whole is that the year has been as good as one could expect in the face of the adverse business conditions which prevailed.

The steel industry did not have the boom expected and as these industries are looked upon as large consumers, the coal trade has felt keenly, the lack of orders which usually come from this source. The railroads in the East, and especially those which are closely associated with the business at this port, have had a fairly good year, but their policy of purchasing equipment and steel rails has been what might be termed a hand-to-mouth one and consequently the equipment and car specialty manufacturing concerns have been idle a greater portion of the time.

As a result of such conditions in the business world, the coal trade has been depressed. It is true that during some of the months of the year, coal has moved freely, representing shipments made under contract by Baltimore operators. And it might be said that nearly all the coal shipped in the past few months was called for under contract, but under slightly reduced prices when compared with last year. In this section, renewals of contracts take place around Apr. 1. When this time arrived, some of the consumers came in under prices quoted by operators. Others did not, preferring to hold out and take their chances of getting the product cheaper by spot purchases. Later they did agree to take coal under contract, but, according to authentic reports succeeded in getting a slightly lower price quoted.

The Spot Market

The spot business, which plays so prominent a part in the Baltimore market, has been extremely disappointing. In January this was somewhat brisk, and again in February, operators reaped satisfactory profits from this business. There was an easing off in the demand for coal in March, and during the complete slump which followed, the spot business disappeared. Contract shipments also eased up.

The early spring and summer months brought no improvement in the demand for coal. Inquiry at many of the offices elicited the information that consumers were entirely out of the market, and in many instances, operators disposed of coal at a price below the cost of mining it. Such stagnant conditions prevailed until the advent of October, when there was a slight improvement, as evidenced by the freer movement on the railroads over which Baltimore operators ship their product. The latter part of October found the demand not quite so brisk, and, while considerable coal moved in November, it was mostly under contract. The spot business was lacking, and the market bordering on stagnation.

Operators predict that the tonnage from Maryland and West Virginia mines operated by local companies will probably reach 19 or 20 million tons for next year, providing trade conditions get no worse. The opinion is that business is going to be better, and that the coal trade will share in the general improvement.

New Developments

The improvements which are to make possible this increased output of coal, were, for the most part, started during 1911. Probably the biggest development inaugurated by any company throughout the United States, was that of the Consolidation Coal Co. in the Elkhorn Valley of Kentucky. This company owns a tract of 100,000 acres of high-grade coal, and is spending millions of dollars in developing their property. It began the opening up of between sixteen and twenty mines at various locations on the tract, and expects to begin mining coal within the next two or three months. In addition, the Consolidation has practically completed the construction of the Sandy Valley & Elkhorn Ry., from the Chesapeake & Ohio Ry. at the mouth of Shelby Creek to Jenkins, Ky., the new town built by the company. It is expected that the Consolidation will be shipping 1500 tons of coal daily from this property by April first.

The Consolidation also started construction work on its big electric power station at Hutchinson, W. Va., which is to supply electric power to all the company's mines in West Virginia. It is to be one of the most modern plants in the world, and will have three, 1500 h.p. engines driving three 1000 kw. generators. It will be constructed so an addition equal to one-third of the original plant may be added.

The Davis Coal & Coke Co. did considerable work in the way of opening up additional mines in the Davis vein territory at Thomas, W. Va., four in all being opened. These new mines will be operated under the contract which the company has with the Bethlehem Steel Co., and which runs for 20 years. Delivery of coal under this contract will begin May 1, 1912. An additional mine was also opened up by this company at Dartmoor, W. Va., in the Beaver Creek district.

Three mines were opened up by the Georges Creek Coal Co., Inc., in the Tyson vein in Allegheny County, Md. This company was formerly controlled by the Georges Creek Coal & Iron Co., of Baltimore. The headquarters of the concern are now at Lonaconing, Md.

Of particular interest to Baltimore is the construction of the Buckhannon & Northern R.R., which was begun this year, from Rivesville, W. Va., to the Pennsylvania state line. This road is owned by the Baltimore & Ohio, the Pennsylvania and the Pittsburg & Lake Erie R.R., a subsidiary of the New York Central system. When completed, the new line will tap about 60,000 acres of coal land which heretofore had no railroad facilities. The Little Kanawha Syndicate, which is controlled by these three roads, owns 60,000 acres of coal land to be traversed by the new line, and will open it up for development. It is expected that a large portion of the coal mined on this property will be exported through Baltimore.

*Baltimore, Md.

River Shipments at Pittsburg

Special Correspondence

Figures compiled by the United States Engineers for the first 11 months of 1911 of the amount of coal arriving in the Pittsburg harbor and also that shipped to down-river points, indicate a banner year in the river-coal business of the Pittsburg district. The estimate for December has not yet been completed but already a record breaking shipment has been sent on its way to Southern ports.

Were it not for the fact that during the summer the down-river boats were forced to tie up on account of low water, the coal shipments through Davis Island Dam this year would have greatly exceeded those actually made. During the summer of 1910 good stages of barge water prevailed at frequent intervals and the effect of this on the river shipments can be seen by glancing at the tables given below. But in spite of all this, taking the shipments for the first 11 months of 1910 and comparing them with the same period for 1911, it is found the shipments for 1911 are greater by 485,638 tons. When the December shipments have been tabulated this figure will be yet larger.

The table in next column shows shipments for the first 11 months of 1910 and 1911 in short tons. This table indicates a total tonnage of coal handled through the Pittsburg Harbor for the first 11 months of 1910 of 10,374,055, and for the same period of 1911 of 10,859,693.

The aggregate of the coal tonnage on the Monongahela River is arrived at by taking the coal shipped up through Lock No. 1, plus the amount shipped down through Lock No. 3 and to this sum is added the amount mined and shipped in Pools 1 and 2 on the Monongahela River. The river tonnage on the Ohio River is obtained by adding the amounts shipped, both up and down that river, passing through Davis Island Dam.

OHIO RIVER SHIPMENTS, 1910–1911

	1910		1911	
	Monongahela	Ohio	Monongahela	Ohio
January	796,046	451,350	973,861	574,170
February	902,832	138,680	1,005,741	448,160
March	1,083,251	245,150	1,010,871	271,210
April	234,884	61,950	814,724	430,090
May	936,308	102,275	826,093	102,320
June	989,343	378,280	481,412	55,040
July	867,504	80,520	486,752	27,865
August	763,262	47,940	556,413	160,930
September	754,130	36,770	610,985	157,955
October	701,713	37,380	727,113	159,530
November	684,287	80,200	811,588	166,870
December	759,275	114,265	....	....
	9,472,835	1,774,760	8,305,553	2,554,140
December	759,275	114,265	....	....
11 months	8,713,560	1,660,495	8,305,553	2,554,140

to local points. An example of such a company is the Jones & Laughlin Steel Co., operating mines near California, Penn., in the Fourth Pool of the Monongahela River. Most of the coal mined and shipped by this concern is used at its mills in the Pittsburg Harbor, although of recent years much has been sent through Davis Island Dam to its new plant at Aliquippa, Penn., on the Ohio River.

Less than 10 per cent. of the coal shipped and mined on the Monongahela River is sent South, the larger portion of it being used in the local steel and other mills. According to the Monongahela River Consolidated Coal & Coke Co., one-third of all the coal they mine is shipped to the Southern trade, one-third to the Pittsburg Harbor for local consumption and one-third by rail to the Lakes and the Northwest. However, this company is the largest coal shipper to the South, most of the others confining their trade

Despite the fact that the Monongahela River is slack-watered almost to its headwaters, the frequent stages of low water on the Ohio River, preventing continuous navigation, reacts on the former stream. This is caused by the inability of the operators to bring back the empty barges and coal boats to the local harbor, eventually resulting in a shut down at the mines.

The Mississippi Valley in 1911

By E. J. Wallace*

With the close of 1911 the operators of Illinois have put the year down as one of the most unsuccessful in their history. At no time during the past year has the price of Illinois coal gone beyond normal, and for the greater portion of the year the actual selling price of coal was around and below the cost of production.

The principal reason for this is the fact that the strike of 1910 caused much business that heretofore came to the Illinois field to be diverted to other fields, principally Indiana and West Virginia, and the Illinois operators have been unable to recover this lost ground. Again, the production of Illinois coal is growing twice as fast as a logical market for it is being developed, and the result is that today Illinois can produce twice as much coal as there is any natural demand for in its territory. The development of new mines has not been as extensive in the northern field as it has in the southern, where several new mines have been started or completed in the counties of Williamson and Franklin, and also in that great coal field adjacent to East St. Louis, including the counties of Madison, Macoupin, Montgomery, Bond and St. Clair.

In contrast to this a few mines have been abandoned, but they were of small tonnage, and the closing up of these did not affect the market in the least. The operators in the Illinois field have been hampered considerably by the taking up in a serious way by the miners of petty grievances, and perhaps one important change that would help better conditions was the effort made to use a new explosive in the mines of Franklin County in place of the ordinary black powder. In some mines the operators were successful, and in other instances strikes were local and long.

Costs and Production in Illinois

The cost of coal in the Franklin County field has been increased considerably on account of the operators taking the precaution to guard against coal dust explosions by installing sprinkler systems, and by putting on additional fire runners to guard against fires after the shot firers are through. The "wild-cat" sinking of

*The Dealers' Fuel Co., St. Louis, Mo.

mines has been put a stop to by the law that went into effect over a year ago, which requires all shafts and air shafts to be constructed of concrete, and this has had a tendency to stop almost entirely the promotion of speculative mines. In the coal field adjacent to St. Louis there has been no change of note during the past year, unless it be that the operators are poorer as a result of trying to do business in a shrinking market.

In the central- and northern-Illinois districts there has been no great development to any extent, and the tonnage here as in the southern field has always exceeded the demand. The low coal in this section offers many serious problems that are usually met with locally.

The production of Illinois coal for 1911 will not exceed, it is believed, the production of other years, under normal conditions. It is true that at the present time the state of Illinois, without opening another mine, can produce fully 100 million tons, while the market for Illinois coal cannot absorb more than 50 million tons. It is figured that Illinois coal, during the year 1911, brought between 3 and 5c. per ton less than in the previous year. There are no complete figures at this time to show what the tonnage for the year 1911 has been, but it is estimated at between 50 and 65 million tons. There is practically no coke produced in the state of Illinois, excepting at two or three points, and this production is insignificant when compared to the productions of other states.

Missouri

The year 1911 marked the beginning of the downward trend of coal operations in Missouri. There have been practically no new mines sunk in the state and several of the small older mines have been abandoned. As a whole, there were few mines in the state that made expenses, as the demand for Missouri coal is limited, as well as its market. This, chiefly on account of the higher grade coals produced in the other states surrounding. The Missouri coal market has been lost chiefly to coal from the Carterville and Springfield districts in Illinois, and there seems to be no hope of recovering this lost ground.

There is a feeling against the development of any more coal lands in Missouri on account of the low vein, and the high mining scale, and it is expected that from now on every year will show a lower figure in the coal production for this state. No coal produced in the state of Missouri reaches the St. Louis market, although a fair tonnage from the central western portion gets in to Kansas City and St. Joseph, and the market in the former city is limited on account of the use of natural gas.

Arkansas

The situation in Arkansas is a peculiar one, and it has developed so during 1911. In the semi-anthracite field of Arkansas there has been a good demand for the coal, and the market has been widening to some extent. This coal is gradually growing in favor on account of its superior quality, although it is produced under difficulties that are experienced in but few other mining sections. However, the cost of production is so great that only by the aid of favorable railroad rates can this coal compete with the higher-grade coals of other fields, but where these rates are practically the same, Arkansas coal is almost eliminated.

In the bituminous mines there has been no notable increase in the production as this coal is not of that superior quality where it can win its way into foreign markets. However, as the state of Arkansas is developing fast it will continue to create a growing market, which will no doubt take care of the present tonnage for the next few years, but if further development of the coal is contemplated, the condition in Arkansas will be much the same as it is in Illinois. During the past year three of the largest cities in the state have practically abandoned the use of coal, for natural gas and oil. Every city and town on the main line between Little Rock and Texarkana are now using natural gas from the Louisiana fields, and the same condition exists at Pine Bluff. In sections isolated from the gas mains the steam plants are looking with favor upon fuel oil, and there is nothing promising for future steam-coal production in this state. The encroachment of oil and gas, while affecting Arkansas production, is also hurting the operators of Illinois and to a greater extent in the southeastern portion of Missouri, and northern Louisiana.

Great Britain's Coal Industry, 1911

Special Correspondence

The British coal industry was considerably affected during the past year by labor troubles, especially in South Wales, and by the recent railway strike. Yet in spite of these difficulties, the pessimistic utterances of the president of the British Association, and the lamentations of the statisticians, to the effect that coal mining is not profitable below a certain depth, the industry, as a whole, is cheerful at the beginning of the year 1912.

Yorkshire

The various coal fields are producing up to their maximum output except in Yorkshire, Nottingham, and a mine or two in South Wales. It has been reported during the year that Yorkshire is underlaid by a vast coal field which was previously unknown and that in the course of several years 40,000 miners would be given employment in this region. But such is not the case. On the contrary, signs are not lacking to indicate that the remarkable development begun in South Yorkshire in 1900 has already reached its climax. This fact is due to the geological conditions that make shaft-sinking extremely expensive; the coal measures being overlaid by Permian and Triasic formations which contain quicksands and large volumes of water.

At Thome colliery as much as $1,250,000 has been spent the past year in sinking two shafts to a depth of 600 ft. each, owing to the fact that it was necessary to pump out 9000 gal. of water per min. The ultimate depth of these shafts is to be 2760 ft. At the Halfield main colliery, near Doncaster, the "Francois" system of injecting cement into the strata as a preliminary to shaft-sinking was tried for the first time in Great Britain.

The Midlands

During 1911, six new colliery companies started shaft-sinking in the Midland coal field, each mine being designed for an output of at least 1,000,000 tons per year, and altogether there are now 12 shafts being sunk in this locality. The increase of production in the Midlands has overtaken and exceeded the export trade with the result that a number of the older mines closed down when the newer and better equipped operations dumped their surplus output on the market. The erection of large central power plants and the consolidation of various groups of collieries in this region have both been in evidence during 1911.

In the Lancashire coal field, at Astley Green, the deepest colliery shaft in Great Britain is expected to be completed early in the coming year. This shaft will have a depth of 3360 feet.

During November, this year, much interest was aroused by the discovery of coal at Calvert, in Buckinghamshire, about 50 miles north of London. The geological conditions are here similar to those in Kent, yet owing to the thinning out of some formations, the coal

measures were found about 540 ft. from the surface, and three small seams have been encountered.

Coal Mine Bill

The coal mines bill for 1911, although a non-party measure, has been discussed even more than the Eight Hour act of 1908, which latter is now giving satisfaction. The chief discussion has centered around the use of electricity in gaseous mines, the abolition of naked lights, employment of female laborers on the surface, the provision of baths and wash houses and in connection with the rescue and ambulance equipment. The bill was not opposed in regard to its provisions for insuring the safety of mines and miners, but because of the increased cost which will devolve on some of the older collieries as a result of its being passed.

The Great Central Railway has just completed at Humber, a coal dock which is said to be the largest in the world. This dock has a capacity of 12,000,000 tons of coal per year on the basis of working 12 hours a day. Its eight hydraulic hoists can each handle 320 loaded cars a day. The cost of handling is much less than was heretofore possible.

Coal Output

The output of coal in 1910 was 264,337,786 tons, and for 1911 will probably exceed 270,000,000 tons. The number of workers employed in the mines has passed all previous records, and shows an increase over 1910. In 1851 nineteen persons were killed for every 1,000,000 tons of coal mined in Great Britain; in 1910 the death rate was 6.37 per million tons, whereas for 1911 the rate has been reduced below 6, there having been no serious explosions.

Chronology of Coal Mining for 1911

A record of important happenings arranged for ready reference. Also incidents and events of more than passing interest.

January

Jan. 3—Explosion and fire at the Sydney No. 3 mine of the Nova Scotia Steel & Coal Co. killed 8 men.

Jan. 4—Strike of 12,000 coal miners in Belgium was declared.

Jan. 10—A cave-in occurred at the Natia mine, Castro Urdiales, Spain; 190 men were entombed and 40 killed.

Jan. 20—An explosion and fire in the Casimir mine at Sosnowice, Russian Poland, killed 40 miners.—The Executive Council of the American Federation of Labor granted a charter to the Western Federation of Miners on the same basis as to the United Mine Workers of America.

Jan. 25—Explosion at the Hughestown No. 10 colliery of the Pennsylvania Coal Co. at Pittston, Penn., killed 6 and injured 5 men.

February

Feb. 6—Three men were killed at mine of Independent Coal & Coke Co., Kenilworth, Utah, by Greek miners on strike.

Feb. 9—Explosion at Cokedale Mine of American Smelting & Refining Co., near Trinidad, Colo., killed 15 men.

Feb. 17—Ninth annual meeting of western branch of Canadian Mining Institute.

Feb. 26—Fire was discovered in the Hazel mine of the Pittsburg-Buffalo Coal Co., near Canonsburg, Penn.

March

March 9—Lehigh Coal & Navigation Co., announced plan to build large electric plant at mines in Pennsylvania for high tension distribution of power over extensive area.

March 18—Explosion in Mine No. 16 of Missouri, Kansas & Texas Ry. Co., at West Mineral, Kansas, killed 6 men.

March 22—Fall of roof in Hazel Mine of Pittsburg-Buffalo Coal Co., East Canonsburg, Penn., killed 9 men.

April

April 1—Coal miners of Crows Nest Pass region of British Columbia and Alberta inaugurated strike.

April 3—U. S. Supreme Court upheld commodity clause of Interstate Commerce Law which prevents a railroad from owning stock in a coal corporation shipping over its lines.

April 7—Fire in the Throop mine of the Price-Pancoast Coal Co., Lackawanna County, Penn., killed 73 men.—Miners in British Columbia and Alberta agreed to submit wage dispute to arbitration.

April 8—Explosion at Banner mines of Pratt Consolidated Coal Co., Jefferson County, Ala., killed 128 men, mostly convicts.

April 11—U. S. Steel Corporation opened $5,000,000 coke-oven plant at Gary, Ind.

April 24—Explosion in Ott mine, No. 20 of Davis Coal & Coke Co., near Elk Garden, W. Va., killed 10 men.

April 28—Gypsy Grove breaker of the Pennsylvania Coal Co., at Dunmore, Penn., burned down, killing 2 men and seriously injuring four. The total loss was $50,000.

May

May 11—Fire at the Boston colliery of the Delaware & Hudson Co., Larksville, Penn., suffocated 5 men.

May 12—Mine tipple and buildings of the Pierson colliery near Jasonville, Ind., were destroyed by fire.

June

June 6—The 100th meeting of the American Institute of Mining Engineers opened at Wilkes-Barre, Penn.

June 19—Summer meeting of the West Virginia Coal Mining Institute opened at White Sulphur Springs, W. Va.

June 21—Dissolution of the E. T. du Pont de Memours Powder Co. was ordered on account of violation of the Sherman anti-trust act.

June 28—Summer meeting of Coal Mining Institute of America opened at Indianna, Penn.

July

July 6—Suit was filed by the U. S. Government against the Lehigh Valley R. R. Co. under the commodities clause of the interstate commerce act.

July 15—Explosion in the mine of the Cascade Coal & Coke Co., at Sykesville, near Du Bois, Penn., killed 21 men.

July 17—U. S. Government filed suit to compel separation of the Reading R.R. from the Reading Coal Company.

August

Aug. 1—Explosion in the mine of the Standard Pocohontas Coal Co., at Shannon, W. Va., killed 3 men.

Aug. 4—Suit was filed by the Government at Columbus, Ohio, against 6 railroads and three coal companies charging combination in restraint of trade.

Aug. 10—A four-deck cage dropped in the Krupp-Hannibal mine near Bocum, Germany, killing 25 men.

September

Sept. 8—Death of F. B. Robbins, for sometime president of the Pittsburgh Coal Co., and of the Monongahela River Coal Company.

Sept. 9—Merger effected at Cleveland of several independent steel companies into the Great Republic Steel Co.; Capitalized at $36,000,000.

Sept. 16—First-aid meets were held at Shamokin, Penn., Inkerman, Penn., and Trinidad, Colo.

Sept. 21—Death of John Bond Atkinson, president of Kentucky Mining Institute.

Sept. 30—H. C. Frick Coke Co. secured title to about 16,000 acres of coking coal from Pittsburg Coal Company, and Monongahela Consolidated Coal Company, the transaction involving about $18,000,000.

OCTOBER

Oct. 3—Fire destroyed the East Boston breaker of the Payne Coal Co., near Wilkes-Barre, Penn. Loss $100,000.

Oct. 5—Fire destroyed the Cuckoo mining plant of the South Chandler Coal Co. near Canon City, Colo. Loss $25,-000.

Oct. 6—Cage fell 80 ft. at the Peabody mine, Nokomis, Ill., injuring 8 men.

Oct. 10—Control of the Monongahela River Consolidated Coal & Coke Co. was absorbed by the Pittsburg Coal Co.—The 101st meeting of the American Institute of Mining Engineers opened in San Francisco.

Oct. 14—Reorganization of Peoples Coal Co., of Scranton, Penn. was effected.—Small fire occurred in the No. 9 mine of the Lehigh & Wilkes-Barre Coal Co. at Sugar Notch, Penn.

Oct. 18—Explosion in coal mine, Bardot, France, killed 26 men.

Oct. 20—Fire in the No. 8 mine of Brazil Block Coal Co. threatened the lives of more than 100 men.

Oct. 23—Explosion in O'Gara mine, No. 9 at Harrisburg, Ill., killed 8 and injured 10 men.

Oct. 24—The 14th annual convention of the American Mining Congress opened at Chicago.

Oct. 30—The National Mine Safety Demonstration opened at Pittsburg, Penn.

Oct. 31—The tri-district convention of the United Mine Workers of America, opened at Pottsville, Penn.

NOVEMBER

Nov. 9—Explosion in the Adrian mine of the Buffalo, Rochester & Pittsburgh Coal & Iron Co. near Punxsutawney, Penn., killed 8 men.

Nov. 10—Reorganization of the Pennsylvania Coal & Coke Co. was effected with a capitalization of $7,500,000.

Nov. 15—Freight reductions went into effect between Salt Lake City and Missouri River points.

Nov. 17—Canadian coal strike was settled by agreement signed at Hosmer, B. C., under which miners returned to work, Nov. 20.

Nov. 18—Explosion in mine of Bottom Creek Coal & Coke Co., at Vivian, W. Va., killed 18 men.

Nov. 20—Serious cave-in occurred at Scranton, Penn.—Coal Miners of British Columbia and Alberta resumed work.

Nov. 21—Hearing of Pittsburg-Lake coal rate case was started by Interstate Commerce Commission.

Nov. 28—Non-union Miner was shot at Louisville, Colo., in conflict with strikers.

DECEMBER

Dec. 4—Winter meeting of West Virginia Coal Mining Institute opened at Fairmont, W. Va.

Dec. 9—Explosion in Cross Mountain Mine No. 1, of Knoxville Iron Co., at Briceville, Tenn., killed 84 men, 5 entombed miners being rescued alive.

Dec. 11—Mid-winter Meeting of Kentucky Mining Institute opened at Lexington, Ky.

Dec. 12—Fire destroyed the top works of the Northern Central Coal Co.'s mine at Higbee, Colo.—The United Mine Workers of America balloted for their national officers.

Dec. 13—Eastern Ohio Coal Operators Association entered complaint before the Interstate Commerce Commission against three railroads, regarding freight rates to Lake Erie ports.

Dec. 18—American Federation of Bituminous Coal operators was organized at Chicago.

Dec. 19—Mid-winter Meeting of Coal Mining Institute of America opened at Pittsburg.

Dec. 23—Pit of Cross Tetley Coal Mine at Wigan, England, was flooded and the lives of 200 miners endangered.

Dec. 23—Six miners were killed by firedamp explosion at Teutoburgia colliery, Dortmund, Germany.

Dec. 24—Ohio and Pennsylvania operators declined to enter into interstate agreement with Illinois and Indiana operators.

Lake Tonnage for 1910 and 1911

According to the reports of the Hocking Valley docks at Toledo for the lake season of 1911 there was an increase of 175,455 tons over the amount handled by the docks in 1910. During the season of 1911 the docks handled 2,253,069 tons as compared with 2,077,614 tons in 1910.

The tonnage secured for the lake trade from the various mining districts in Ohio and West Virginia was as follows: Hocking district, 662,388 tons as compared with 666,218 tons in 1910; Kanawha & Michigan district, 886,405 tons as compared with 885,562 tons in 1910; Chesapeake & Ohio district, 651,-205 tons as compared with 492,101 tons in 1910; Kanawha & West Virginia district, no tonnage as compared with 12,239 tons in 1910; Coal & Coke district, 816 tons as compared with 13,449 tons in 1910; Norfolk & Western district, 50,781 tons as compared with 6367 tons in 1910; Wellston district, 1443 tons as compared with 1678 tons in 1910.

Coal and Coke Production in the United States

The following table has been compiled largely from data communicated by the several state mine inspectors, estimates having been made only where no such statistics were available, but in all cases upon the basis of good information:

PRODUCTION OF COKE IN THE UNITED STATES

States	1910, Short Tons	1911, Short Tons
Alabama	3,249,027	2,784,880
Colorado	1,190,901	946,284
Georgia	40,000	25,000
Illinois	390,000	375,000
Kansas	10,000	10,000
Kentucky	58,700	60,000
Missouri	5,000	5,000
Montana	58,200	52,300
New Mexico	510,000	450,000
Ohio	260,000	240,000
Oklahoma	30,000	30,000
Pennsylvania	22,875,000	19,403,750
Tennessee	240,000	210,000
Utah	141,050	140,000
Virginia	1,264,300	901,000
Washington	40,000	35,000
West Virginia	3,803,881	2,200,000
Other states	1,890,000	1,470,000
Total	36,056,059	29,338,214

PRODUCTION OF COAL IN THE UNITED STATES

States	1910, Short Tons	1911, Short Tons
Bituminous:		
Alabama	16,139,228	14,500,000
Arkansas	1,870,000	(*a*) 1,700,000
California	10,000	5,000
Colorado	12,104,887	10,075,861
Georgia	180,000	168,000
Illinois	47,064,500	(*a*) 48,411,000
Indiana	18,125,244	14,070,000
Iowa	7,260,000	(*b*) 7,574,919
Kansas	5,100,450	6,000,000
Kentucky	14,750,092	(*a*) 15,000,000
Maryland	5,009,600	4,500,000
Michigan	1,620,000	1,500,000
Missouri	2,980,700	(*a*) 3,000,000
Montana	3,050,000	(*d*) 2,913,397
New Mexico	3,616,665	3,440,022
North Dakota	385,882	395,000
Ohio	33,876,400	30,500,000
Oklahoma	2,840,000	2,800,000
Oregon	55,000	50,000
Pennsylvania	148,471,826	143,978,671
Tennessee	6,750,000	5,950,000
Texas	1,940,000	1,875,000
Utah	2,526,094	2,501,472
Virginia	5,750,041	5,490,000
Washington	(*b*) 2,490,047	(*b*) 2,371,481
West Virginia	59,690,300	60,500,000
Wyoming	7,469,452	7,027,000
Total bituminous	411,126.408	396,296,823
Anthracite:		
Colorado	70,586	64,379
New Mexico	8,000	(*a*) 8,000
Pennsylvania	82,591,649	86,823,686
Total anthracite	82 670,235	86,896,065
Grand total	493,796,643	483,192,888

(*a*) Estimated. (*b*) Fiscal year ending June 30. (*c*) Includes output of byproduct coke for Massachusetts, Maryland, Minnesota, New York, Michigan, Wisconsin. (*d*) Year ending Oct. 31.

The State of Indiana produced 18,125,-244 tons of coal in the year 1910, an increase of 4,433,155 tons, or 32 per cent. Of this total 17,249,785 tons was bituminous and 875,459 tons was block coal. The proportion of machine-mined coal was 10,888,367 tons, while 7,236,877 tons was mined by hand.

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This journal is interested solely in matters relating to the fuel industries, and is designed to be a medium for the free interchange of ideas, the detailed description of coal-mining practice, and the expression of independent thought calculated to benefit both operator and miner.

Contents

COAL AGE

The Year 1912

The year just commenced is likely to prove an eventful one to coal men. Notwithstanding the much talked of hesitation and caution that is supposed to accompany each presidential year, there are good indications that the wheels of industry are beginning to turn a little faster, and it is posible the coming twelve months will be a period of marked prosperity.

Much heralded events seldom fulfil expectations. We have been told so often that 1912 (presidential year) is to be a time of lethargy in business due to the activities of politicians who desire to manufacture campaign material, that companies and individuals have prepared to withstand a siege, and repulse any attack that may be precipitated.

The past two years of curtailment in business expansion has healed many sore spots. Weak links have been eliminated and the commercial chain is stronger than ever before. Best of all we have entered a period of growth based on no less solid foundation than the provision of necessities for a rapidly increasing population. We have been taught that prosperity does not necessarily mean inflation, and that the utterances of a few rich men, who temper their words according to the state of their indigestion, cannot block the advance of the great body of industrial workers in America.

As a nation, we have unlimited natural resources, great visible wealth, and the willing hands and restless brains necessary to the development and increase of these valuable assets. Too many people mistake the meaning of an occasional drawing-back; they think it is a retreat, when it is but a preparation for another and greater leap ahead.

There has been no unusual advance in coal mining this last year, but the growth has been healthy. Innovations have been rare, however, more attention than usual has been given to perfecting present methods and to safeguarding the men underground. Prices have been rather unsatisfactory, but most operators have made both ends meet, and have brought their mines to a point of efficiency that will enable them to take advantage of the coming upward swing in business.

Legislation, especially with reference to employer's liability, will occupy the principal attention of coal-mine owners in 1912. It is also to be hoped that the year will witness a closer understanding between operators, not only in each district, but in each State. Competition is to be desired, but not a business war that will destroy all and fail to benefit even the consumer.

That consolidations are to be desired is proved by the distory of recent events. In 1904 and 1905, mines in several states were organized into a number of large companies and the beneficial result was clearly shown in an immediate bettering of conditions for the men; an improvement in mining methods, and the installation of modern machinery. The large companies were able to do things the small fellows could not attempt. Coal does not grow like fruit or grain and a pound wasted is a pound lost forever.

The talk of an extended strike in April should not be taken too seriously. The men will, of course, demand an increase in wages, shorter hours, etc.; however, there is little likelihood but that a fair settlement of differences will be reached. A strike will probably occur, but we hope and expect it will be of short duration, and be more in the shape of a temporary suspension that will injure no one.

By April 1, anthracite operators will be well stocked with coal. Mines in West Virginia, Alabama and other unorganized states will be able to supply fuel to meet any deficiency. Last and most important, coal miners are already receiving wages higher than ever before in the history of mining, and the slack between the "increase in the cost of living" and "an equal advance in wages" has been taken up. The chief labor leaders do not desire a serious conflict, knowing from late history that the time is inopportune, and the few minor officials who have assumed a belligerent attitude will probably be overruled.

Blackdamp

Many nontechnical words have an indefiniteness which serves a useful purpose for a while. And this commendable breadth of purview is often their complete undoing because they are liable later to be submitted to a narrow definition covering only a part of the ground they formerly covered, and thus their meanings become uncertain and obscure.

Those scientists who cater to the unscientific will try in vain to save the life of the word "blackdamp" as a specific scientific entity, though it might be left to live a long and useful life as a roughly generic word. It would be well constantly to revert to the fundamental meaning of the word. When a light is brought into an atmosphere in which it tends to expire or when a light in an unventilated atmosphere dulls in the air it has befouled, then blackdamp is present. The light deadens or actually dies out and the black darkness resulting causes the agent of that darkness to be termed appropriately "blackdamp."

This definition seems satisfactory. It is not technical and we need a nontechnical word which will cover the condition in a noncommittal manner, leaving it open to later investigations perhaps to determine what the nature of that particular blackdamp may be.

But blackdamp has not been permitted to remain the name of a flame-extinguishing gas *per se*. It is said that afterdamp, though it may dull or quench flame, is not blackdamp because carbon monoxide is present. So, according to some definers, we cannot distinguish blackdamp unless we know either the cause of its existence or its analysis and the term becomes needlessly exact and by that token less useful.

Some years ago blackdamp was declared a nontechnical term for carbon dioxide. A new use of the colloquial word was advocated as that word was less technical in appearance than that which indicated the definite chemical combination. But this twist in the recognized meaning of a familiar word nearly destroyed its value, because it was soon discovered that an extinctive natural atmosphere, which is a true "blackdamp," was always depleted of free oxygen whether rendered extinctive by the burning of lamps, the respiration of animals, or by the action of the mine walls.

So blackdamp has been twisted a second time to mean the mixture of carbon dioxide with an excess of nitrogen and its allied gases above their standard presence in common air. But this is clearly a technical definition; it does not represent an actual, existing gas nor even the full sum of the impurities of any actually existing gas, nor yet the change due to a certain single chemical or physical action.

It is a fact that "air" is still "air" and will be styled "air" though we now know it contains argon, krypton, xenon, helium and neon, as well as carbon dioxide and a little hydrogen. Nevertheless, the meaning of the word "air" is still definite because it includes all normal elements and gas compounds in an existing mixture—the atmosphere. But blackdamp only includes, we are now told, part of a mixture, to wit—carbon dioxide and nitrogen. Some would say moisture, if present, might be accounted a part of the blackdamp.

But some would declare that if methane is present, it cannot be considered a part nor can carbon monoxide or hydric sulphide. Yet others might even permit methane to be rated as blackdamp if the oxygen were low in percentage because a large percentage of methane extinguishes flame. All air vitiated by seclusion in the mines contains methane. And secluded air is the most common form of blackdamp, of which methane might under a new definition be said to be a part. If the word discussed is to be limited by all the artificial restrictions by which technicists would hedge it, it has become a narrow term, which only a technical man can use aright and which we may confidently assert many technical men of long training are grievously misusing. Hence the need to retain the word in its pristine value, neither adding nor subtracting from the original definition.

The word "blackdamp" as recently constrained, redefined and newly conceived by Dr. Haldane, is the excess of inert gas above that in normal terrestrial air. The suggestion occurs that we abandon the "blackdamp percentage" of Dr. Haldane and describe the natural air as containing 79.1 per cent. of inert gas; then graduate his tube for "testing blackdamp" so as to give not "blackdamp percentage," so called; but the "gross inert-gas percentage" in the air of the mine.

And this is advocated because it is a chemical device almost unheard of heretofore to group part of a constituent of a mixture under a different heading to that under which another part of the same constituent in like condition and of like qualities in the same mixture is grouped. And as it is true that the action of moisture and carbon dioxide by volume is not exactly equivalent to the action of nitrogen by volume, would it not be well to replace the words "gross inert percentage" by a more indefinite expression which would not indicate that the percentage was definitely indicated. We would suggest that this form of words should run "chemical index of inertia" or conversely "oxygen index," leaving the word "blackdamp" to express an atmosphere depressive of flame.

In conclusion it may be truthfully asserted that chemists of light and leading, do not know how to define blackdamp and will ascribe it to entirely different concepts in the course of a single article. Sometimes it will be an inert diluent of air. Sometimes it will be the diluted air itself. Even the context will be no guide. Nothing but the good judgment of the reader can follow the vagaries of the text.

Reversing Ventilation

Though the advisability of reversing the air current after an explosion or mine fire is a hotly debated question in this country, the English mining men seem definitely to favor that reversal. The Royal Commission of Mines as far back as 1906 considered the matter of such importance that it strongly recommended the provision at every mine, of means whereby the reversal of the air could be effected. The commission quoted several instances both of explosions and underground fires, wherein many lives might have been saved had it been possible to reverse the air without delay.

In this connection were instanced the fires at Hamstead, Whitwick, and the explosions at the Thornhill and Great Western collieries. Since then the explosions at the West Stanley and Whitehaven mines have strengthened the former conclusions. As a result, the new coal mines bill, which has just received the approval of both Houses of Parliament, requires that all fans shall be reversible.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Some Pennsylvania Questions

Blasting in Gassy Mine

Ques.—In what way is blasting dangerous in a mine giving off marsh gas? Explain fully.

Ans.—The flame of the blast may ignite a body of gas that has accumulated in some pocket in the roof or in a void place in the gob and escaped the notice of the fireboss. The explosion of this gas may stir up and ignite the dust and cause a disastrous mine explosion. A windy or a blown-out shot is always more dangerous in a gassy mine, because even a small percentage of gas greatly assists the ignition of the dust that is thrown into the air by the force of the blast, and the result is more apt to be a mine explosion. The firing of a shot in a gassy mine is unsafe unless the place is first carefully examined for gas, and reported safe.

Coal-mine Gases

Ques.—(a) What are the gases produced in coal mines? (b) Where are they to be found? (c) What are their relative weights?

Ans.—(a) The common coal-mine gases are marsh gas (CH_4), carbon monoxide (CO), carbon dioxide (CO_2), hydrogen sulphide (H_2S), and olefiant gas (C_2H_4). Hydrogen, oxygen and nitrogen, though occurring, at times, in mines, are not classed as mine gases; the two last named occur chiefly as air.

(b) In a well ventilated mine, outside of the return air current, these gases when present will be found at or near the place where they are generated. Marsh gas, being lighter than air, tends to accumulate at the roof or in rise workings at the face of steep pitches, where the air current is not sufficiently strong to sweep away the gas. Carbon monoxide is but a trifle lighter than air. It is principally found in close or poorly ventilated places, where shots have been recently fired or where combustion (oxidation) in some form has been taking place. Carbon dioxide, being half again as heavy as air, tends to accumulate at the floor or in dip workings, in swamps or other low places in the mine. Hydrogen sulphide is somewhat heavier than air, but does not occur in large quantities in coal mines. It would be found mostly in seams where pyrites occurs in the coal or the underclay, in low wet places or swamps where the air is dead. Olefiant gas never occurs in large quantity as a separate gas, but is often associated with marsh gas and found under similar conditions.

(c) The relative weights of these gases are shown by their several specific gravities. They are as follows: Marsh gas, 0.559; carbon monoxide, 0.967; carbon dioxide, 1.529; hydrogen sulphide, 1.1912; olefiant gas, 0.978.

Safety Lamps

Ques.—(a) What is a safety lamp? (b) Where and by whom should they be used?

Ans.—(a) A safety lamp is any lamp in which the flame is surrounded by a gauze or glass-and-gauze chimney in such a manner that it is completely isolated from the outside atmosphere surrounding the lamp.

(b) Safety lamps should be used at the working face and in all parts of a mine generating marsh gas in dangerous quantity. The condition of the mine with regard to dust, and the inflammability of the coal will determine the relative danger and the percentage of gas that may be considered as safe for open lights. In many bituminous mines 1 per cent. of gas, in the mine air at the face, would demand the use of safeties; while in hard-coal mines open lights are used with safety in 2 per cent. of gas; and 2½ and even 3 per cent. cause no particular alarm, in many cases.

Safety lamps should only be intrusted to those fully acquainted with their use and who know how to handle them. A safety lamp is very unsafe when handled in gas by an inexperienced person.

Improper Use of Safety Lamps

Ques.—What are the dangers arising from the improper handling and care of safety lamps by workmen?

Ans.—When a safety lamp is tipped or canted to one side so that the flame is directed toward the glass or gauze chimney, the glass may be cracked by the heat or the gauze become hot and the lamp pass flame. When the lamp is allowed to smoke continually or the gauze not thoroughly cleaned after each shift, or exposed to dust and dirt falling from roof and timbers, the mesh may become clogged so that the lamp is unsafe in gas. When a lamp is swung or allowed to fall or exposed to a strong current of air or the force of a heavy blast or carried rapidly against the air, the flame is liable to be blown through the gauze and ignite any gas that may be present. When a lamp is improperly put together, or any of its parts omitted or the lamp not properly examined, cleaned and trimmed in the lamp room, there is danger in its use in gas. When a lamp is exposed too long to gas or is allowed to flame badly, especially if moved quickly at the time, the flame may pass through the gauze.

Qualifications of a Fireboss

Ques.—What qualities, moral, mental and physical, are or should be considered essential in a fireboss?

Ans.—The moral character of a good fireboss must be unquestionable; he must be sober, honest, conscientious and fully trustworthy. Mentally, he must be observant and possess good judgment, alert to what is going on about him and quick to decide and act. He must be physically strong and possess in a marked degree the senses of hearing, seeing and smelling.

Safety-lamp Shields

Ques.—What are the advantages of having safety lamps shielded?

Ans.—The shield of a safety lamp is a small piece of sheet metal attached to one side of the lamp to protect the lamp flame better against a strong air current. The shield is sometimes fixed, but more often is movable and arranged to slide up and down, according to need. It has the advantage of giving added protection to the lamp when required without obstructing all of the light. It is very useful when traveling an airway with an unbonneted Davy or other lamp. The bonnet of a safety lamp is sometimes improperly called a shield.

Danger Signals in Mines

Ques.—When, where and by whom shall danger signals be used?

Ans.—The revised bituminous-mine law requires the fireboss to place a danger signal across the entrance to every working place or other place where explosive gas is discovered or any danger found to exist. The law requires that the superintendent furnish the signals, at the request of the mine foreman, and that they shall be uniform and of a design approved by the Chief of the Department of Mines and kept in good condition and distributed by the mine foreman or his assistant to points in the mine convenient for the use of the fireboss. Danger signals must be placed immediately on the discovery of the danger.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Is Carbon Dioxide Blackdamp?

Will you kindly explain what carbon dioxide is, and whether it is the whole of blackdamp or only a part. Please explain fully, as this question is the result of a discussion of five first-grade mine foremen and three firebosses located at the Eclipse mine, Elco, Washington County, Penn. I have claimed that carbon dioxide is not blackdamp, but is a part of it. I am taking COAL AGE.

CHAS. C. CRAWFORD.

Newell, Penn.

In early mining, when little was known of the nature of mine gases, and much less of their properties and composition, miners called all mine gases by the general term "damps," derived from the German *dampf*, meaning vapor. Later, as the different natures of the gases became known, the terms "firedamp; whitedamp; blackdamp; chokedamp, or stonedamp; stinkdamp; afterdamp, etc.," came into general use by the miner.

Still later, as mining conditions have been carefully studied by chemists and other scientific men it has been found that what miners have been calling *firedamp* is any inflammable mixture of gas and air that gives a flame cap. Before the use of the Davy the cap was observed on the open candle flame.

What was called *whitedamp*, in the mines, was found to be carbon monoxide (CO). The term *blackdamp*, likewise, was found to refer to any unknown mixture of gases that dimmed or extinguished a light and caused headache, nausea or suffocation.

While this mixture generally consisted largely of carbon dioxide (CO_2), it was found, in many cases, to contain much nitrogen and naturally the oxygen content was below the normal percentage in air.

Mining textbooks, based largely on the early writings of Atkinson, Fairley and other pioneers in mining literature, have been prone to describe blackdamp as carbonic acid gas (carbon dioxide, CO_2). The error of calling blackdamp carbon dioxide is therefore pardonable; but in reality the term, as used in the mines, refers to variable mixtures of carbon dioxide, nitrogen and oxygen, the two last-named gases being a residual atmosphere resulting from the various forms of combustion (oxidation), both slow and rapid.

Use of Brattice Cloth in Mines

What is brattice cloth and how is it used in mines? Is it used as much in metal mines as in coal mines?

New York. K. C. C.

Brattice cloth is any heavy canvas used as a curtain or a temporary wall or partition, in a mine airway or passage, for the purpose of directing the air current or deflecting it from its natural course, so as to ventilate certain rooms, headings, or void places that would not otherwise be reached by the air. The plain canvas or duck is frequently treated with tar, creosote or other preservatives to lengthen its life or render it incombustible. The canvas is furnished in rolls by mine-supply houses, or in larger quantities by commercial dealers in all kinds of asbestos cloths and packings, canvas, etc.

Brattice cloth finds its most important use in development work in mining, and in recovery work for reaching lost coal, or in mine-rescue work after a cave-in or an explosion. It is much used in driving prospect entries or headings or pushing rooms or chambers, for a time, ahead of the air.

The demand for brattice cloth is not as great in metal mining as in coal, only because the question of ventilation in metal mines is of minor importance. There is little or no gas, in these mines, that would prove a hindrance or a menace to the work.

Percentage of Grade

(a) I have two slopes, one dipping at an angle of 44 deg., and the other at an angle of 48 deg.; what is the per cent. of the grade in each slope? (b) How is the per cent. of grade determined for any angle of dip? (c) What is the angle of dip or pitch corresponding to a grade of 100 per cent.?

H. B.

Burgettstown, Penn., Dec. 4, 1911.

(a) The per cent. of grade, referred to the horizontal, in each slope, is as follows:

1. $100 \times \tan 44 \text{ deg.} = 100 \times 0.9657 = 96.57 \text{ per cent.}$
2. $100 \times \tan 48 \text{ deg.} = 100 \times 1.1106 = 111.06 \text{ per cent.}$

(b) The per cent. of grade, referred to the horizontal, for any dip or pitch, is always 100 times the tangent of the angle of inclination. If, however, the grade is referred to the pitch distance instead of the horizontal, as is the custom of some engineers, in steep pitches, the sine of the angle of inclination must be used in place of the tangent.

(c) To find the angle of dip or pitch corresponding to a given percentage of grade, referred to the horizontal, divide the given percentage of grade by 100, and find the angle whose tangent is this amount. For example, the angle of inclination corresponding to a grade of 100 per cent., referred to the horizontal, is the angle whose tangent is $\frac{100}{100} = 1$, or an angle of 45 degrees.

Ventilation of Airway

In an entry 7 ft. 6 in. wide and 6 ft. 8 in. high, the air is traveling at the rate of 120 ft. in 12 seconds. (a) What is the quantity of air passing per minute? (b) If the water-gage reading is 2.5 inches, what is the horsepower on the air?

Pittsburg, Penn. R. F. A.

(a) The sectional area of the airway is $7.5 \times 6\frac{2}{3} = 50$ sq.ft. The velocity of the air current is

$$\frac{120 \times 60}{12} = 600 \textit{ ft. per min.}$$

The quantity of air passing is then $50 \times 600 = 30{,}000$ cu.ft. per minute.

(b) The ventilating pressure due to a 2.5-in. water gage is $2.5 \times 5.2 = 13$ lb. per sq.ft. The horsepower on the air is then

$$\frac{30{,}000 \times 13}{33{,}000} = 11.818 \textit{ hp.}$$

Weight of Motor Required to Haul Trip up Incline

What weight of traction motor will be required to haul a trip of 10 loaded cars, weighing 3 tons each, up a grade, the tangent of the grade angle being 0.02619, and assuming a coefficient of friction of 0.03, and a coefficient of traction of 0.18.

South Fork, Penn. B. H.

The weight of the loaded trip is $10 \times 3 \times 2000 = 60{,}000$ lb.; and the weight of the motor car required, under the assumed conditions, is calculated as follows:

$$W = \frac{0.03 + 0.02619}{0.18 - (0.03 + 0.02619)} \times 60{,}000 = 27{,}230 \textit{ lb.}$$

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

A Speedy Coal Dump

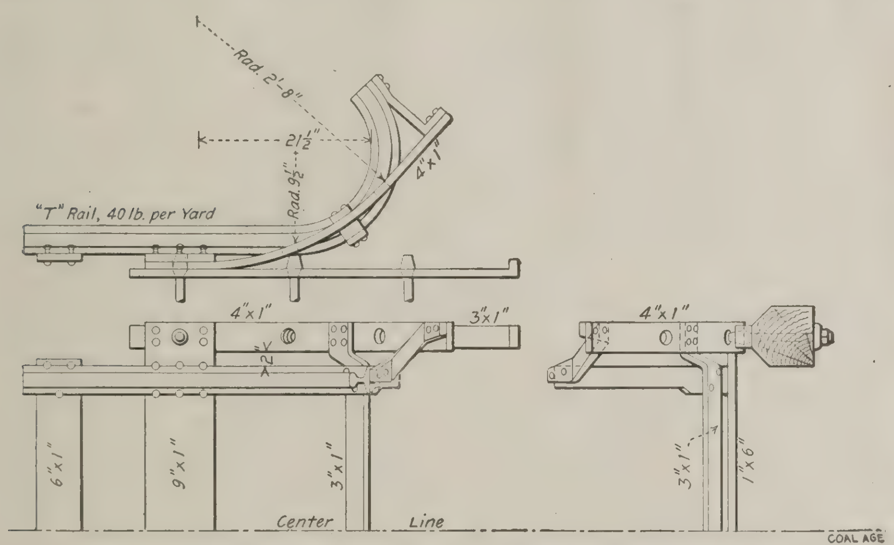
The readers of COAL AGE may be interested in the coal dumps much used in the Georges Creek field. The amount of coal dumped over them is remarkable. The dumping device, as shown in the illustration, consists of a movable platform which stops and supports the car as it tips over for dumping. There are two stationary guide plates on either side, outside the rails. These plates are of 3x1-in. iron, mounted on longitudinal timbers. Two lengths of 40-lb. T-rail are bent to form horns for engaging the car wheels on each side and just outside the rails, 1x4-in. roller bars are carried by the same plates, which act as spreaders for the rails.

In operation the carriage is held to its proper position by tapered studs which project from the guide plates and engage corresponding holes in the rollers. The force and the angle of the tip is so great that the car is pitched forward until the hind wheels leave the track, the car balancing on its front wheels. This complete tilt makes the car clean itself rapidly of all its coal.

The dumps are set close up to the switch of the track for empty cars, so that the car on being dumped immediately switches out of the way of the approaching loaded car. The distance of the heel of the rocker from the point of switch is 2 ft. 2 in. and the lead of the switch is 9 ft. 4 in. As much as 5403 long tons (6061 short tons) have been dumped in 10 hours over one tipple of this sort, and the dump has a capacity of at least 6000 long tons (6700 short tons) when the coal is kept ready on the sidetrack all day long. The following records have been made: Nine long tons per minute for 10 hours, 9¾ long tons per minute for two hours, 11 long tons per minute for one hour and 16.9 long tons per minute for short periods. The approaching grade is 3 per cent.

The mine cars, with normal topping, carry a net load of 2 tons 2 cwt. to 2 tons 6 cwt. (4704 to 5152 lb.) The dimensions of the cars are as follows: Length inside, 8 ft.; width inside at bottom, 25 in.; height inside, 2 ft. 10 in.; length over all, 9 ft. 6 in.; width outside at top, 36 in.; height over all, 4 ft. 4 in. Running to the dump at a good speed, they would jerk the tipple considerably were it high or long, but this is not the case at any of these tipples; they are all low and short. The tipple shown in the accompanying illustration (Elkhart mine) is in every way typical, though it happens to be one of the oldest in the district. I am indebted to R. A. Walter, chief engineer, Consolidation Coal Company, for this information and cut.

Chicago, Ill. R. O. BURT.



SPEEDY MINE-CAR DUMP USED IN THE GEORGES CREEK DISTRICT

TIPPLE IN GEORGES CREEK FIELD

Mine Workings Contiguous to Oil Wells

A gas or oil well may be considered one of the most dangerous features of its kind encountered in the operation of a coal mine. The ordinary dangers of the most gaseous mine do not compare with that which would result from workings tapping a producing gas well.

It is even possible that a serious accident could happen in working a mine some distance away from a well due to gas escaping through cracks, crevices or fissures in the coal seam. I have known oil to seep through pillars of solid coal when the nearest well was from 50 to 80 ft. away. It is also reasonable to assume that when drawing pillars, cavities or reservoirs of gas are formed which any disturbance of the overlying strata may force out with disastrous results.

In development work, when approaching a gas well, a pillar of solid coal equal to one-third of the thickness of the overlying strata should be felt for protection. In a mine, where pillars are being drawn, much more coal should be left and the same rule applies to a mine that is subject to a squeeze or creep. If the well is surrounded with old workings, I would suggest that a 12-in. hole be drilled into these workings at a distance not to exceed 15 ft. from the well; this will tend to relieve the rock pressure incident to the accumulation of any large reservoirs of gas. The pipes should be raised at least 10 ft. above the surface in order to allow any gas, which might be liberated from the workings, to readily escape.

No doubt we all can recall instances where havoc has been wrought in homes and business houses through a small leak in a gas line. So we can readily understand that it would not require the entire production of a gas well to cause a serious destruction of life in a mine. The gas pressure in houses varies from 2 or 4 oz. to 1 lb. per sq.in., while rock pressure, as recorded in wells in the McDonald and Oakdale oil and gas fields,

varies from 25 to 600 lb. per square inch.

The term rock pressure, as used in connection with oil or gas wells, signifies the force which the confined gas exerts in an effort to free itself. We have no guarantee that the casing itself will prevent the escape of gas, and even if it did, the life of the casing will not, in all probability, be equal to the life of the well.

To determine the size of pillars that may be depended upon, one must rely on his own personal observation and judgment. The following notes, however, should be carefully considered: (*A*) the thickness of the overlying strata; (*B*) the nature of this strata; (*C*) the character of the bottom; (*D*) the thickness and nature of the coal seam, whether hard and compact or soft and brittle, and (*E*) the inclination of the measures.

C. C. MAC. GREGOR.

408 Main St., Carnegie, Penn.

Narrow Work vs. Wide Entries—Relation to Operating Expense

I notice, in your issue of Dec. 23, page 354, a superintendent of mines, Marion, Ill., is interested in the opinion given relative to the driving of wide and narrow entries in mines; and the comparative expense of paying more yardage and getting less coal per yd. of narrow-work driven, or having to bear the lasting expense caused by roof falls and the timbering of wide entries, as long as the mine is a mine. Of course, much depends on the kind of roof you have to support. Some roofs will not allow you to drive anything but narrow entries.

I will state some facts that I have seen proven beyond a doubt, in regard to this matter. First, while top may be good at the start, it often gives way later, sometimes even years after the time of driving the entry. The cause may be due to a slight movement of the roof, owing to the removal of the coal in the rooms driven off the entry or the extraction of the coal in nearby workings. In some cases, there are peculiar roof conditions and the overlying slate or stone seems to give way suddenly from no apparent cause whatever.

Under such conditions as these, if the entries have been driven narrow, the expense of maintaining the entries is reduced to a minimum, as narrow-work always stands better than wide openings.

The Ohio-Valley coal seams are mostly all hard and the roof and coal, alike, are not badly affected by the action of air and moisture. Crossbars can be put overhead, in narrow entries, by hitching one end of the bar into the coal straight and making a sliding hitch for the other end. This method when it can be used saves much timber, as no legs, or only short ones at the most, are required for timber frames.

Narrow-work also does away with the heavy timbers that would be necessary on wide entries in order to avoid the setting of center posts in the entry, under the collars. Center posts not only increase the cost of timbering, but are dangerous to drivers and persons who must travel the entry. They are liable, also, to be knocked out and cause a heavy fall of roof in case a car jumps the track, which is by no means an uncommon occurrence in a mine.

My experience in overcoming a heaving bottom by driving narrow entries when opening a shaft mine, in a region new to me, at Cleaton, Ky., in 1905, was valuable. I found on investigation that quite a few of the mines in that region were troubled with heaving bottom, which necessitated the continual lifting of bottom on the roads and its removal from the mine. This work, in that region, was absolutely necessary.

It occurred to me that the difficulty could probably be overcome by driving only narrow entries with heavy entry pillars and making the room-necks about five times as deep as had been the custom there. The result of adopting this system was that I never had any heaving bottom. It saved the company many thousands of dollars. Another bad feature in regard to heaving bottom on entries is that it makes much mud in wet entries, and if the entry is dry it causes quantities of dust.

E. W. HOLT.

Central City, Ky.

Danger Periods in Mines

Regarding your recent editorial about "Danger Periods in Mines," will say that there are undoubtedly such periods both in a general and specific sense, but I cannot believe that seismic disturbances are responsible for the occurrence of mine explosions. It seems to me that the problem is perplexing enough without indulging in speculation as to whether the Courrières explosion caused the subsequent Formosa earthquake or whether the latter was responsible for the prior disaster in France.

I believe the reason why mine explosions, and especially dust explosions, are as yet so imperfectly understood is largely due to the fact that the laws governing them have not been established. A mine cannot be successfully ventilated unless the laws relating to mine ventilation are properly applied; neither can the danger from explosions be successfully averted unless the underlying principles regarding them are thoroughly known and understood. It may be said that dust explosions are erratic and subject to no law, but it can be readily proved that this is a mistake and that the occurrence and action of these explosions are controlled by well defined laws.

I do not know anything definite about conditions in the Briceville mine, but I am confident you will find when all the facts are known that the mine was not only well ventilated, but that draft facilities in it were exceptionally good, highly favoring what Mr. Hall terms "the advance (of air and dust) toward the center of the disturbance." According to the brief statement in the Dec. 16 issue of COAL AGE it appears that the air shaft was located in an ideal spot on the summit, nearly in the center of the mine; the main entries for at least 4000 ft. were exceptionally high (8 to 14 ft.); while at least one other opening to the surface besides the main entries and air shaft is mentioned and probably others exist leading either to the surface or into adjacent mines. Furthermore, I think it will be found that butt entries were more or less connected by rooms being driven through and that butt headings, not connected with others or with the surface or adjacent mines, will be found the least affected by the explosion.

The facts regarding conditions in the Briceville mine will also show that the conclusions presented in my article on "Iowa Mine Explosions," which you expect to publish in one of your January issues, are fairly sound.

JOHN VERNER.

Chariton, Iowa.

[If Mr. Verner will read carefully paragraphs 5 and 6 of the editorial he will see that we have merely drawn attention to the periodicity of both these phenomena, and their clearly evident synchronism in numerous instances.—EDITOR.]

Danger in Gassy Mines

For the benefit of some of the firebosses, I send you the following note showing the danger that may be caused by sudden fall of roof or open door in a gassy mine.

Suppose, for example, there is a current of 50,000 cu.ft. of air passing per minute, in a certain section of a mine, and the safety lamp shows ½ of one per cent. of gas on the return current, in this section. The quantity of gas given off is then $\frac{1}{2}$ $(0.01 \times 50{,}000) = 250$ cu.ft. per min. Suppose now a door is left open on the airway, so as to short-circuit the most of the air-current; or suppose a cave-in occurs on the main intake, so as to block the circulation and reduce the current to, say 3000 cu.ft. per min. This will render the return air-current highly explosive, and only the prompt and decisive action on the part of the fireboss will avert a serious catastrophe.

Red Ash, Va. A. T. WADE.

[The percentage of gas in the return air would be, in this case,

$$\frac{250}{3000} \times 100 = 8\tfrac{1}{3} \textit{ per cent.}$$

which is not far from the maximum explosive point.—EDITOR.]

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The new year has opened with the coal trade stronger than it has been at any time during the present season. More seasonable weather has appeared and brought with it heavier domestic consumption and a general improvement all along the line.

The market in the East has been rather quiet as a result of the holiday cessation of the industrial plants. While not active it has, however, been steady, with heavy movements on contract, and some demand for spot. The possibility of a shut down next April is being already anticipated in some instances by storing. Colder weather is reported from the South but as yet not of sufficient duration to effect conditions or prices.

The middle West has experienced it's first heavy blizzard of the season and there is a decided improvement in market conditions there. This trade has been on the verge of complete demoralization and the drop in temperature has appreciably strengthened the market, and checked any further shrinking in prices.

Trade in the Rocky Mountain states continues active and heavy tonnages are being moved. On the Pacific Coast the weather is mild and the market heavy.

New York

Business has not been as active this week as last. The market however, is steady as contract movement continues in excellent volume and although there is only a limited spot demand the tonnage moving on contract is sufficient to absorb the coal arriving at the piers without much delay. Railroad movement has been unusually prompt for this season of the year which has resulted in a good supply of coal at the piers so that shippers have been able to take care of their obligations with less difficulty than has often been experienced in the past, at this season of the year.

Strike talk is beginning to have considerable effect on consumers and shippers report that many of their customers are cognizant of the possibility of labor troubles in the spring and that those consumers who are in a position to stock up in anticipation of a suspension in the mining regions are making arrangements to store as much coal as is practicable. Marine transportation is still short and vessel freight rates are up.

Spot prices for steam coal f.o.b. New York are unchanged from those reported last week, West Virginias being quoted at about $2.40; ordinary Pennsylvanias $2.55@2.65; best grade Pennsylvanias $2.80@2.90. No accumulations at the piers of demurrage coal are reported.

Hampton Roads, Va.

The year closed at Hampton Roads unusually active in the coal business. Never in the history of the port has there been so great a tonnage put over the three coal piers. In round figures it may be reliably stated that ten million tons have been dumped at Hampton Roads during 1911. Official figures place it at 9,981,431 tons, divided among the three railroads as follows: Norfolk & Western, 4,393,353; Chesapeake & Ohio, 3,585,592; Virginian, 2,002,486. The optimism does not cease here, but it is predicted by those in close touch with large interests in the coal business that this figure will be boosted to 15,000,000 tons within the next three years. The exporting of coal from this port has risen from the experimental stage and is today a factor worthy of serious consideration. The prospects along this line for 1912 are unusually bright.

Owing to the customary let-up in mining in the New River Pocahontas fields between Christmas and New Years, the tonnage moving to tidewater is rather light. Nevertheless, the heavy shipments made in anticipation of the shut-down during the holidays is arriving and is being promptly dumped. There is practically no free coal at Hampton Roads this week, but that on hand is more evenly divided than it was last week. Prices are firm, possibly the best they have been throughout the year. Vessels appear to be more plentiful and rates are some easier.

Louisville, Ky.

This vicinity was visited by a belated cold snap within the past few days and, as a result, there is a better feeling among the dealers. Retail business improved, to an appreciable extent, although the increased trade was not sufficient to cause any change in the prices, which have prevailed locally for about three weeks. As it looks now, there will be little change before March, when a drop will come. In Louisville, and throughout Kentucky and southern Indiana the worst winter weather comes usually after Jan. 1. As a rule, however, most of the coal is ordered in advance of the new year, at the prices prevailing when the orders are given, and this accounts for the quotations fluctuating but little during January, February and early March.

One dealer is quoting Bannar lump at $3.25 per ton of 2000 lb. New River smokeless is quoted at $4.50 per ton and Pocahontas smokeless at $4.75. Reports from the mines are rather pessimistic, the producers insisting that the demand is not nearly what it should be at this time, and the prices hardly as good as last year.

Nashville, Tenn.

There is practically no change in the coal situation in this district. The usual dullness prevailed over the holidays, which together with the spring weather, made everything extremely quiet, although there is a good demand for screenings, which is always the case when orders are slack on domestic lump.

Prices are unchanged, as most of the shippers realize that cutting in order to get business, accomplishes little. It does not help moving the coal and has a tendency to place prices back to a low level.

The strike situation for the coming spring is being watched closely over the nonunion field, for it takes just such conditions as this every two years to keep a great many of our mine operators from going into bankruptcy.

Prices as quoted by the majority of the operators at present are as follows per short ton: 2½-in. lump, $1.50; nut, $1@1.10; pea and slack, 30@35c.; mine-run, 90c.@$1.

Chicago

An upward trend is noticeable in the Chicago market. A cold wave, accompanied by snow and a general cleaning up of surplus stock, have tended to strengthen the position of coal dealers and to check the recent fall in prices.

A closing down of the Illinois mines for several days also had its effect. Smokeless coal, which was at 80 to 90c. for mine-run, is now established on a basis of $1, and higher prices are looked for. Some observers predict that the same price for mine-run as is being obtained in the East—$1.20—will soon be secured. Lump and egg is firm at $1.75.

Prices direct from the mines in net tons to retail dealers and steam users on spot shipments are as follows:

Sullivan County	*Chicago*	*F.o.b. Mines*
Domestic lump....	$2.35@2.50	$1.50@1.65
Egg..............	2.30@2.40	1.45@1.55
Steam lump......	2.10	1.25
Screenings........	1.37@1.52	0.50@0.65
Springfield		
Domestic lump....	2.07@2.32	1.25@1.50
Steam lump......	1.92@1.97	1.10@1.15
Mine-run.........	1.82@1.87	1.00@1.05
Screenings........	1.32@1.42	0.50@0.60
Clinton		
Domestic lump....	2.12@2.27	1.35@1.50
Steam lump......	2.0[illegible]@2.20	1.25@1.45
Mine-run.........	1.82@2.02	1.05@1.25
Screenings........	1.42@1.52	0.65@0.75
Pocahontas and New River		
Mine-run.........	$2.95@3.05	$0.90@1.00
Lump and egg....	3.65@3.90	1.60@1.85

Coke—Coke is quoted at: Connellsville, $4.50@4.65; Wise County, $4.50@4.65; byproduct, egg and stove, $4.95; byproduct, nut, $4.55@4.65; gas house, $4.85.

Minneapolis—St. Paul

The coal business this past week has greatly improved over the previous weeks of this month. The weather turned cold, beginning on Christmas day, and has been hovering around the zero mark all week, ending with a good old-time blizzard. Abundant snow has fallen and has changed the Indian summer into real winter. Better sleighing could not be wished for. Wholesalers claim that the reason domestic trade from the country has been so slow this month is due to the fact that the dealer has been well stocked up, and, that the farmer has not been able to haul any coal home with him on his return from town, owing to the bad condition of the roads.

During the last week in December the average maintained was as much as any week during the record-breaking month of November. This indicates that the weather was largely responsible for the heavy movement into the country during that month. It is quite probable that the final figures will show that the tonnage for December, 1911, will be greater than for the same month in 1910, although the shipments will be less than for November. Dock men report that about 40,000 carloads of coal were removed from the head of the Lakes last month, and it is not probable that the December shipments will exceed 30,000 carloads. From now on till spring the market in this territory will be a weather proposition.

Prices on mostly all grades of coal have stiffened up and with continued favorable weather there is no reason why list prices should not prevail. Youghiogheny dock screenings are scarce, only two or three docks reporting any supply. Illinois prices are a great deal better than formerly. The dealer trade in the Twin Cities is reported as good and retailers are rushing out all orders while the sleighing is favorable, as teams are not any too plentiful.

The new briquetting plant of the Berwind Fuel Co., at the head of the Lakes, will soon be in operation and shipping briquets. They are also building an extension to their dock, which will give it a storage capacity equal to any of the other docks.

St. Louis, Mo.

With the first of the year came a change for the better in St. Louis prices. As a matter of fact, the demand has been considerably better than several anticipated, both for the city and country. A great many of the stocks that were run down are being replenished, and factory stocks that were slim, on account of the year-end inventory, are being laid in to the fullest capacity.

However, with this increased demand prices are not what they should be under present conditions. Two years ago this time, with the threatened strike, lump coal of Carterville grade sold for $2 per ton.

The chances are, however, that from this time on the coal market will continue to improve unless abnormal conditions set in. The winter thus far has been rather open and predictions are that from now on the weather will be more severe, and this, of course, will stimulate the demand. St. Louis prices are:

Franklin County	
Lump and egg................	$1.40@1.50
No. 1 nut....................	1.25@1.35
No. 2 nut....................	1.20@1.30
No. 3 nut....................	1.05@1.15
2-in. screenings..............	0.65@0.75
Carterville	
Lump and egg................	$1.25@1.35
No. 1 nut....................	1.15@1.20
No. 2 nut....................	1.05@1.10
No. 3 nut....................	0.90@0.95
Screenings..................	0.60@0.65
Mine-run....................	0.95@1.00
No. 1 washed................	1.60@1.75
No. 2 washed................	1.30@1.40
No. 3 washed................	1.20@1.30
No. 4 washed................	0.80@0.85
No. 5 washed................	0.40@0.45
Standard	
6-in. lump..................	$0.95@1.00
2-in. lump..................	0.90@0.95
3x6-in. egg..................	0.80@0.85
No. 1 nut....................	0.70@0.75
No. 2 nut....................	0.60@0.65
Screenings..................	0.40@0.45
Mt. Olive	
6-in. lump..................	$1.35
3-in. lump..................	1.25
3x6-in. egg..................	1.00
No. 1 nut....................	$0.85@0.90
No. 2 nut....................	0.75@0.80

There are no other coals coming into the market from the Illinois field, with the exception of Big Muddy, which is strong at $2.20 for 6-in. lump. High-grade coals from the inner district, such as Trenton, etc., are in good demand at about $2 per ton. Since the first of the year there has been a fair demand for anthracite of all sizes, principally chestnut, at the current circular.

There is also an increased demand for smokeless, which retails lump and egg at $6, f.o.b. bins, St. Louis. A fairly good volume of byproduct and gas-house coke is moving at $4.75 for the byproduct and $4.65 for gas house.

Spokane, Wash.

The prices for coal in Spokane and the surrounding territory have remained unchanged during the past week, and all indications are that there will not be any material changes until spring. The prices for the week ending Dec. 27 are as follows:

Kind	Wholesale	Retail
Rock Springs................	$7.20	$9.00
Owl Creek....................	7.20	9.00
Kirby........................	7.20	9.00
Carney.......................	6.70	8.50
Bearcreek....................	6.35	8.25
Roslyn steam................	5.25	6.25
Canadian steam..............	5.25	6.25

The cold snap, which has been prevalent for the last week, is drawing on the supply of coal in the local yards, but the supply is being continually replenished by shipments from the Canadian mines, and is equal to any demand that might come.

Portland, Ore.

Christmas trade was fine in all lines excepting fuel and the reason for the poor fuel trade was mild weather. Coal dealers look for no great volume of business until colder weather sets in. January, February and March are the coldest months in this territory. It is expected, however, that if cold waves sweep over the country for a couple of weeks during these months the rush for fuel will be so heavy that it will be difficult to fill orders promptly. The mild weather, while not making a heavy demand on the fuel stocks, has a tendency to make people forget that colder weather may follow and if it comes suddenly many will find their supplies short. A large number live here as in many of the larger cities, from a paper bag.

Foreign Markets

Great Britain

The labor outlook is regarded with much anxiety in view of the ballot of members of the Miners' Federation, of Great Britain, to be taken about Jan. 10. If further efforts to effect a settlement prove abortive and the result of the ballot is favorable to a strike, the men are to come out at the beginning of March, provided they observe their contracts and give one month's notice.

With the Xmas holidays at hand, the market is very quiet. Quotations are approximately as follows:

Best Welsh steam coal................	$4.20
Seconds............................	4.02
Thirds..............................	3.78
Best dry coals......................	4.02
Best Monmouthshire..................	3.78
Seconds............................	3.60
Best Cardiff small coal..............	2.16
Seconds............................	1.92

The above prices for Cardiff coal are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2¼ per cent. discount.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers, Affecting the Coal Industry

Washington, D. C.

An important joint meeting of the American Economic Association and the American Association for Labor Legislation was held here on Dec. 30, 1911, during sessions of the conventions of the two bodies. The U. S. Bureau of Mines had prepared an exhibit of mine rescue apparatus containing the familiar equipment usually on view at the Bureau of Mines itself and this was available for the inspection of the members and guests.

Secretary Fisher opened the meeting with a general discussion of the conditions under which the Bureau of Mines has been organized and the work it is attempting to do. He outlined the policy of the United States with respect to mining and the safety of miners in substantially the same way that he has on former occasions. Ex-President John Mitchell of the United Mine Workers who had been expected, was unfortunately detained away so that his address was not presented.

Diseases of the Mine

Dr. S. C. Hotchkiss discussed the general subject of occupational diseases, gave the results of work he has been doing for the Bureau of Mines on that topic, and reviewed such questions as diseases of the lungs due to damp and cold, and diseases like the hook-worm malady due to the presence in the soil of parasites which are probably propagated by faulty methods of disposing of excreta, etc. He then turned to the question of preventing such diseases and showed what had been done in Europe and what might be done here.

Dr. Holmes gave an interesting outline of the work of the Bureau of Mines and pointed out the particulars in which there should be an extension of activity. He said that the Bureau of Mines has been in existence one and one-half years. During that time its most important work has related to the causes and prevention of coal-mine disasters. This work concerns some 30,000 coal-mine officials, and more than 700,000 coal-mine workers, the majority of these latter being unfamiliar with the language, the laws, the institutions, or the policies of this country.

An Interstate Mining Commission

Dr. John H. Haynes, of Los Angeles, in his address, urged the establishment of an Interstate Mining Commission with power to enact and enforce regulations for the protection of the 700,000 coal miners now working in the privately owned coal mines of the United States, and to have direct charge of the coal lands owned by the nation, whether operated by the government or under private lease.

He showed that the national regulation in European coal mines had enormously reduced the percentages of fatalities in the last 18 years: in Prussia from 2.54 deaths annually per 1000 miners employed, to 1.94; in Great Britain from 1.49 to 1.29; in France, from 1.07 to 0.84; in Belgium, from 1.40 to 0.94; while under state regulation in the United States during the same period, the rate has steadily increased from 2.67 in 1895 to 4.86 in 1907.

The death rate in the several states, too, has varied all the way from 2.25, the average rate in Illinois for a term of years, to the frightful figures in the case of Colorado for the year 1907, when 21 out of every 1000 miners lost their lives in the single year, more than 20 times the rate of fatality for Belgium or France.

State vs. Federal Control

Continuing, Dr. Haynes said that the national government has saved the lives of thousands of railroad employees by enforcing the use of automatic couplers and other safety appliances; why should it not protect the lives of coal miners by enforcing in the case of mines producing coal for interstate markets such regulations as have been proven efficient in the saving of life? State regulation has failed wofully in the past; and it is altogether unlikely that it will improve in the future, for the following reasons: 1. Each state fears to impose regulations upon its own coal operators more burdensome than those to which their competitors in other states selling to common markets are subjected. 2. Each individual state cannot for itself make the scientific investigations, or maintain a body of experts, of the efficiency easily attainable by the national government. 3. State inspectors owing to political influences are notoriously less efficient than federal inspectors.

According to Dr. Haynes three European experts, invited by our national government to inspect our mines, agree that American mining, now so fatal, can be made as safe as any in the world, and at a small increase, if any, in the cost of production. Even if the last statement is called in question by coal producers, no broad minded and humane operator will object to efficient safety regulations, provided, of course, they shall apply equally to all of his competitors, including those of other states; so that the increased cost of production, if any, can be charged up to the general cost and added with other expenditures to the sales price.

Alabama

Birmingham.—The Pratt Consolidated Coal Co., with headquarters in Birmingham, will open an office in Mobile about Jan. 1. This company is one of the largest coal companies operating in the South, owning its mines and having a capacity of 10,000 to 12,000 tons a day. Offices have just been opened in Pensacola, Fla., also. The purpose of the establishment of these two branch offices is to develop the bunker and export coal business. The step is regarded as significant of the bearing that the opening of the Isthmian Canal is expected to have on the Alabama coal trade.

It is the general understanding that the underwriting of $2,600,000 of the proposed bond issue for the merged Alabama Coal & Iron Co. and Southern Iron & Steel Co., has been definitely arranged for, and that the way is now comparatively clear for the early announcement that the merger and reorganization plan is in effect. This will probably come when Cecil Greenfell returns from England.

Colorado

Denver.—A plan to unionize the 200,000 miners of Mexico was considered by the executive committee of the Western Federation of Miners which met here Jan. 4.

If the state land board incorporates a clause in its coal leases that was discussed recently and probably will be adopted, all danger of any combination of coal operators controlling the price of coal in the state will be forever done away with, for the clause will provide that the lessee shall sell all coal mined from state land at a certain price. With thousands of acres of coal still in possession of the land board, this clause will be sufficient to regulate the price of coal in every industrial center in Colorado.

Walsenburg.—The reports that a strike is imminent in the southern coal district are branded as being absolutely

false by B. P. Manley, of the Colorado Fuel & Iron Co. in a recent interview.

Central City—The coal dealers of Central City and Black Hawk are unable to get any coal from the Routt County fields, claiming that the Colorado & Southern R.R. will not bring up coal delivered to it by the Moffat road. Several cars have been turned over to the Colorado & Southern road, but that road has ordered them returned.

Illinois

Springfield.—Turning out 4,200 tons of coal a day, a force of 500 miners employed in mine No. 3 of the Superior Coal Co. at Bend, is straining every minute of the day to maintain that average and beat the record of a same amount for 13½ days held by miners of the Livingston mine at Livingston. The record established by the Livingston miners was made recently when for 13½ days the output of the mine averaged 4,200 tons a day. The Superior mine is one of the best equipped in the state and the miners are confident of being able to beat the record.

Returns from the recent state election of the Illinois' Mine Workers indicate that John Walker of Danville has been returned to the presidency of the organization by a large majority over Groce Lawrence of Herrin and Joseph Pope of Belville.

The new coal washer which the Chicago, Williamson & Vermilion Coal Co. has been building at Thayer is now completed and will soon be put in operation.

Peoria—The state mine inspector has strongly advocated a yearly service for the Fulton County mine inspector, because of the extent to which coal interests in this county have developed.

Belleville.—Work has been resumed by the Star Coal & Mining Co. and the St. Clair Coal & Mining Co., which operate mines south of Belleville. Both mines will employ a full force of men.

Edwardsville.—Parties whose identity has been concealed have been making large purchases of coal lands northeast of Edwardsville. Recently options on 2300 acres in Olive Township, Madison County, were closed. All the land lies at the junction of the Illinois Central and Chicago & Eastern Illinois tracks.

Indiana

Terre Haute.—Attorneys of the counties within the Indiana coal field have decided to appeal to the United States Supreme Court from a decision of the Indiana Supreme Court which held that the law imposing a tax on unmined coal is invalid.

The Indiana Coal & Land Co. recently filed options on about 500 acres of land in Otter Creek township. The price to be paid is $50 an acre if the options are followed by purchase of the coal rights.

Indianapolis.—In an effort to obtain a reduction in the price of anthracite coal, J. V. Zartman, secretary of the Indiana Manufacturers' and Shippers' Association, has authorized Alexander G. Cavins, attorney for the association, to file a petition with the interstate commerce commission attacking the freight rate on anthracite shipped from the Pennsylvania field to Indianapolis.

Brazil.—The American Coal Co. with headquarters in Brazil, has been buying land and taking options in the vicinity of Bicknell through its representative, Dr. Asbury of Clay City, until now it controls nearly everything between that city and the Baltimore & Ohio Southwestern R.R. at Wheatland. Most of this distance of about eight miles has been leased, but under some of the farms the coal has been purchased outright. As fast as the options expire they are renewed. The coal company will begin sinking a shaft on these lands early in the spring.

Kansas

Mineral.—It is rumored, from a reliable source, that the Mayer Coal Co. has purchased 120 surface acres and 200 acres of coal in what is known as the Wisewell tract a half mile northwest of town and near Mayer shaft No. 6. It is said the money consideration was $32,000.

Kentucky

Whitesburg.—It is given out in railroad circles that the Chesapeake & Ohio has completed arrangements for the early construction of a 25-mile branch line of road from Harold, on the main line of the C. & O., up Beaver Creek to the border of Letcher and Knott counties, to tap a rich coal and timber district owned by the Consolidation Coal Co., the Beaver Creek Coal Co. and the Northern Coal & Coke Co.

Sebree.—The sale of the mining property and coal rights of the Southern Coal & Transportation Co. at Robards was held by the Master Commissioner of Henderson County on Jan. 1. The coal and coal rights under 85.46 acres in Webster County and the surface coal and mineral rights under 64 acres in Henderson County and the coal and mining rights only under 7796 acres in Henderson County were sold.

The Kentucky River Consolidated Coal Co., composed of eastern capitalists, owning some 50,000 acres of choice coal and timber lands in southern Letcher and Perry Counties, along the line of the Lexington & Eastern R.R., makes the announcement that it will soon take steps looking to the development of the property. It will be necessary to build spurs out from the Lexington & Eastern R.R. to reach the property.

Barbourville.—The Harlan Town Coal Co., which is preparing to operate a mine on its property about a mile east of Harlan, in Harlan County, will soon have a town of its own in Kelly Bottoms. Many houses are already completed and others are going up or are contracted for.

Harriman.—The Harriman & Morgan R.R. Co., recently chartered, has elected officers as follows: C. E. Hendrick, president; J. N. Baker, vice-president; Robt. B. Cassel, secretary and treasurer.. Indications are that this road is to be built north from this city and will tap new and rich coal fields in the Lone Mountain and Brimstone Mountain sections of Morgan and Scott Counties. It is backed by the same interests that have constructed the Harriman, Knoxville & Eastern from here to Oliver Springs.

Missouri

St. Louis—The supreme court of Missouri has just handed down a decision which is of far more than local interest. When Gov. Hadley was attorney general of the state he instituted suit against the Missouri Pacific R.R. for violating that section of the state constitution which forbids a corporation from engaging in business other than that expressly authorized in its charter. Now Missouri's highest judicial tribunal decides that a railroad has a legal right to own coal mines or stock in coal mining companies, for the reason that "coal is necessary in the operation of trains." The court adds that "no one could contend for a moment that a railroad cannot buy a mine and dig its own fuel supply."

Moberly.—It is reported that Mine No. 11 of the Northern Central Coal Co. at Higbee, that some time ago sustained a great loss by fire will again be ready for operation in a month's time.

Ohio

Columbus.—Charges of discrimination in coal carrying rates were made Dec. 26 to the Ohio Public Service Commission by the Central Ohio Operators' Association against the Baltimore & Ohio and the Pennsylvania railroads. The association alleges that the tariffs of those roads for coal carrying from the Tuscarawas district are unjustly discriminatory and asks that the commission investigate at once and compel a readjustment.

Suit to foreclose a blanket mortgage for $834,500, given in July, 1901, was brought in the United States court Dec. 27 by the Bankers' Trust Company of

New York against the Pittsburg, Wheeling & Lake Erie Coal Co., the Wheeling and Lake Erie Coal Mining Co. and M. A. Hanna & Co., consisting of Dan R. Hanna, Robert L. Ireland and Matthew Andrews of Cleveland. The mortgage was given on 16,000 acres of Jefferson County coal lands and $200,000 was to have been paid by July, 1911. The Bankers' Trust Company asks that the Jefferson County property be disposed of to satisfy its claim.

Cincinnati.—The American Briquetting Co., which is a $1,250,000 Arizona corporation, was organized at Dayton, Ohio, recently, with C. L. McCrea, of that city, president and Thomas R. Morgan, of the Pocahontas Coal Co. here, as vice-president. The company will convert the lignite deposits of North Dakota into fuel briquettes at a plant to be built at New Salem, N. D. H. H. Hayes, the local representative, says that the company can produce the briquettes at $3.50 a ton at the mines, and will cut the retail price of coal in half in the Northwest.

Wellston.—An excellent grade of No. 2 coal, 3½ ft. thick, has been discovered on the Kessler farm, near Hawkes Bridge, east of here. A favorable report having been received from the chemist to whom the samples were sent for analysis a shaft will be sunk to the coal, with a view to placing it on the market.

Pennsylvania
(BITUMINOUS)

Bellefonte.—The coal mining operation of Atherton & Barnes, at One Mile Run, one of the most important in that section, has resumed work after a prolonged idleness. Upward of 150 men are again given employment.

Altoona.—Supreme Court Justice Bijur of New York has vacated an injunction obtained by the James Kerr Securities Co., holder of $500,000 bonds of the Pennsylvania Coal & Coke Co., to restrain the reorganization committee from executing a lease of the company's coal lands.

Indiana.—Development of the Brushvalley field which runs along the Blacklick near Josephine does not now seem as near at hand as it did a short time ago. Upward of $30,000 have been expended during the past year in drilling and prospecting and the tests have proved the coal to be some of the best in Indiana County. The sudden halting of proceedings is causing much comment, but several of the owners of the land, take the matter optimistically and fully expect final developments within a short time.

California.—Three men were burned to death in a poolroom and rooming house, at Daisytown, a mining hamlet, near here at midnight, Dec. 29. The men were employed by the Monongahela River Consolidated Coal and Coke Co., at Daisytown.

Latrobe.—Two miners are dead and four persons injured as the result of a dynamite explosion in a miners' boarding house near New Derry, Dec. 25. One miner, was blown to atoms. The explosion shook the town and was heard for several miles.

ANTHRACITE

Scranton.—Reduced freight rates on coal from the mines to points in New York state are scheduled to go into effect Jan. 20 on the Lehigh Valley, Philadelphia and Reading, and Delaware, Lackawanna & Western. Rates were reduced on the New York, Ontario and Western, Dec. 15, 1911.

Wilkesbarre.—For fear of damaging the county court house and the residences along the banks of the Susquehanna River, Mayor John V. Kosek has vetoed a bill introduced in Council to sell the coal underlying the river common.

Employees of the Hadleigh colliery of the Pittston Coal Co., at Sugar Notch, went on strike recently because they were paid by check instead of in money. Sugar Notch has no bank and the checks caused the men considerable inconvenience.

Pottsville.—The drainage tunnel which was begun nearly three years ago by the Lehigh Coal and Navigation Co., at a point a short distance above Nesquehoning Junction, and has been driven from there in a southwesterly direction, will soon reach No. 1 shaft above Nesquehoning, four miles from the beginning. Two sets of men are working toward each other, one from the entrance and the other from No. 1 shaft, and it is said that they are now only about 800 ft. apart.

Shamokin.—Preparations are now under way by the Philadelphia and Reading Coal Co. for driving a tunnel to cut the rich Buck Mountain vein, at the "Horseshoe" curve, near Glen Carbon. The Reading company has extensive coal operations all through that valley and the vein has been proven and followed for several miles east, along the Broad Mountain, showing a profitable thickness. The mammoth vein is to be worked from this locality as far as Frackville, a distance of eight miles.

Tennessee

Knoxville.—The regular monthly meeting of the Southern Appalachian Coal Operators Association was held Dec. 22. A feature of the meeting was a paper and discussion on workmen's compensation for accidents. The actions of certain law firms in connection with the recent Briceville disaster were vigorously denounced.

Texas

Strawn—After a suspension of work for nearly six months, the Mt. Marion Coal Mining Company has resumed work.

Utah

Salt Lake City—The Elk Coal Co., a Carbon County concern, which recently went into the hands of assignees, will probably be reorganized, according to an announcement made by the stockholders' committee, which has been investigating the company's affairs. The raising of $300,000 is contemplated to satisfy certain claims, and of this about $100,000 has been secured. The property is estimated to be worth several times the amount of the indebtedness. George Buckley, E. A. Lesser and L. Walker form the committee, which is looking after the interests of the stockholders.

Virginia

Bristol—The Virginia Iron, Coal & Coke Co., which has two large plants in Bristol, has made the largest coal contract ever made by a southern mining company. It has contracted to furnish the Boston & Maine R.R. with 66 cars of coal per day, for a period of five years. The amount involved is in excess of $9,000,000. Under the terms of the contract the coal is to be delivered to the tracks of the Boston & Maine R.R. in the city of Boston. The coal will be mined in what is known as the Toms Creek mines of southwest Virginia and will be shipped out over the Virginia & Southwestern and Norfolk & Western. This coal has heretofore been supplied from western Pennsylvania.

West Virginia

Morgantown.—The entire 200 ovens belonging to the Preston County Coke Company at Cascade are now in blast and the plant is working at full capacity. One hundred of the ovens have been fired during the past two months and between 300 and 500 men are now given employment.

There has been little change in the operations of the Elkins Coal & Coke Co. since No. 6 mine was opened.

Wheeling.—Ejectment proceedings involving more than 1000 acres of coal land in Webster and Randolph Counties recently came up before the United States circuit court of appeals. The Upper Elk Coal Co. and Christian Seybold both claim to own the property.

Weston.—Dr. D. P. Kessler is having a coal tipple built at his mines at Arcola and is making preparation to ship coal at an early date.

Canada

Montreal—The Dominion Coal Co. predicts a big increase in the output for 1912. Mr. Alexander Dick, the general sales agent says: "If everything turns out as we expect during the season of 1912, we will have a record-breaker, as the output will not be less than 4,000,000 tons, or a half million in excess of this year's figures." He also reports an improved situation at Springhill, where the output is between 30,000 to 35,000 tons a month, or around 400,000 tons a year.

Twenty-seven independent coal-mine operators of Alberta and eastern British Columbia voluntarily increased the wages of their workmen by 8 per cent., on Dec. 21, thus bringing the scale up to that of the mines employing union labor.

England

London.—The miners' federation has decided to take a vote on the question of national stoppage of the work in the mines, based on the question of a minimum wage. If a two-thirds majority of the members of the federation vote to stop work, the strike will be ordered for the end of February.

Another evidence of the labor unrest in the United Kingdom was manifested recently when 200 colliers, employed in the mines at Treorchy, Wales, went out on strike as a protest against the employment of non-union labor.

Personals

Frederick Gillmore, until recently with the Gulf Transit Co., has been given charge of the new branch office of the Pratt Consolidated Coal Co. at Pensacola, Fla.

C. M. Riker, formerly manager of the West Kentucky Coal Co. has been appointed assistant to W. B. Kennedy, president of the Nortonville Coal Co. at Nortonville, Ky.

Bart Murphy, for 20 years in the employ of the H. C. Frick Coke Co. and for a number of years foreman at the Standard shaft, has accepted the position of general inspector for all the mines of the Rainey Coal & Coke Co.

John Randolph Haynes of Los Angeles was recently appointed special commissioner, representing California, by Governor Johnson, for the purpose of investigating coal mines, and especially coal mine accidents throughout the United States. The commission issued by the Governor will furnish a sufficient entrée for Mr. Haynes in carrying on his investigations, and he will prepare a detailed report on the subject.

A committee of prominent mining and electrical engineers, which has been engaged in studying mining conditions in England, Germany and other countries, conferred recently with the officials of the Bureau of Mines, at Washington, D. C. Members of the committee are George S. Rice, chief mining engineer of the Bureau of Mines; Erskine Ramsay, of the Pratt Consolidated Coal Co., of Birmingham, Ala.; A. B. Jessup, of the Lehigh Valley Coal Co., of Wilkes-Barre, Penn.; H. M. Warren, of the Delaware, Lackawanna & Western R.R. Co., of Scranton, Penn.; G. B. Hadesty, of the Philadelphia & Reading Coal & Iron Co., of Pottsville, Penn., and John Bart, of the Berwind-White Coal Co., of Windber, Pennsylvania.

Obituary

George M. Davis, aged 67, one of the best known coal men in western Kentucky, died, recently, at his home, in Madisonville. Mr. Davis was manager of the St. Bernard mines, at Morton's Gap.

Capt. Levi Rinehart Doty, aged 64, for many years one of the best known men in Columbus, Ohio, died recently in Chicago, where he has been located for the past year. Capt. Doty was engaged in the coal business for nearly a third of a century. He served as president of the former New England Coal Co. and of the Northern Fuel Co., and also for a time as vice-president of the Pittsburg Coal Co. He was president of the National Tripoli Co. When he left the coal business, he became associated with the Ralston Steel Car Co. and for a year has been interested in the manufacture of cars at Chicago.

Industrial Notes

Announcement is made of the organization of the Bonnyman-Norman Coal & Iron Co., of Birmingham; James Bonnyman, president; James A. Norman, vice-president; A. H. Andrews, secretary. The new company will be the sales agent for the Brookside-Pratt Mining Co., and will handle coal and coke, and other industrial products in which the officers of the concern are interested.

The Ridgway Dynamo & Engine Co., Ridgway, Penn., announces the opening on Jan. 1, 1912, of a new district office in Room No. 1417, Oliver Building, Pittsburg. This move has been made in order that the company may better serve its many friends in the district and to facilitate the handling of its various well known lines of steam engines and electrical apparatus. J. F. Rodgers, who is a native of Pittsburg, and enjoys a wide acquaintance among the mine, mill and manufacturing interests of the city and vicinity, has been secured as local manager. Mr. Rodgers will be glad to welcome his friends and all friends of the Ridgway Dynamo & Engine Co. at its new office and to render any possible service on its behalf.

New Publications

FOURTEENTH ANNUAL REPORT OF LABOR STATISTICS FOR THE STATE OF VIRGINIA, 1911. 193 pp., 6x9¼ in. Public Printer, Richmond, Va.

Coal and coke production statistics are accorded three pages.

TECHNOLOGY AND INDUSTRIAL EFFICIENCY. Proceedings of the Congress of Technology, 1911. 486 pp., 6½x9½ in., illustrated. $3. McGraw-Hill Book Co., New York.

Some 70 pages are included in this volume and in all form a valuable and uptodate record of the present state of industrial science as well as a presentation of some of its problems and their probable solutions. The six sections into which the congress was divided are represented by papers on: "Scientific Investigation and Control of Industrial Processes," "Technological Education in its Relations to Industrial Development," "Administration and Management," "Recent Industrial Development," "Public Health and Sanitation," "Architecture."

ELECTRICAL ACCIDENTS IN MINES. THEIR CAUSES AND PREVENTION. Miners Circular 5. By H. H. Clark, W. D. Roberts, L. C. Ilsley and H. F. Randolph, 3 illustrations, 16 pp., octavo. Government Printing Office, Washington, 1911. Free on request.

It is a pleasure to commend this little booklet on the avoiding of electric shock and on the rescue work in connection therewith because we are sure that of all the people who have read and will read it, the authors will be the least appreciative. It is a book such as no technical men, immersed in advanced studies desire to write, but which they only undertake because they know that such books are needed by a public which cannot study and know the subject in a technical way. The authors are to be congratulated on the simplicity of their language, on their selection of essentials and on the fact that they have managed to write down a lot of practical information in a manner that will not fail to be of value to every miner or mine official who may read it. The booklet is for free distribution on request.

Trade Publications

Hyatt Roller Bearing Co., Newark, N. J. Catalog, Section No. 604D, Hyatt Roller Bearings as Applied to Mine and Industrial Cars. 16 pp., 7x10 in.; illustrated.

The Goulds Manufacturing Co., Seneca Falls, N. Y. Bulletin 107, Deep-Well Triplex Pumps. 12 pp., 7¾x10 in., illustrated.

Bulletin No. 108, Deep-Well Working Heads. 12 pp., 7¾x10 in., illustrated.

Bulletin No. 109, Pumps for Special Services. 20 pp., 7¾x10 in., illustrated.

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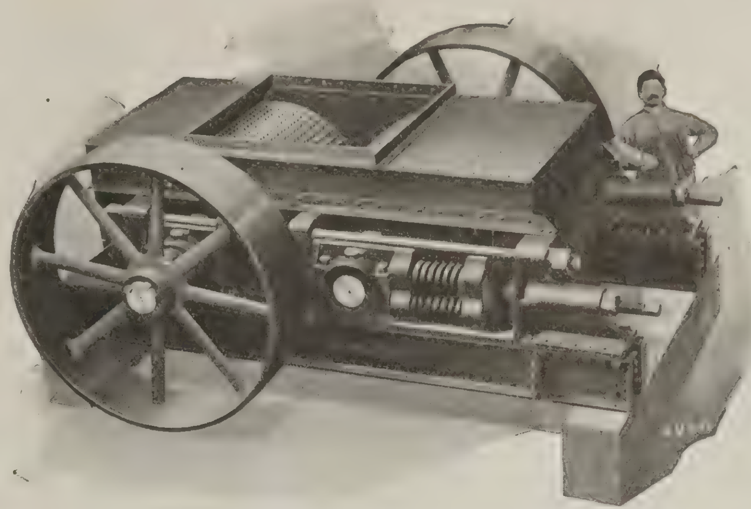

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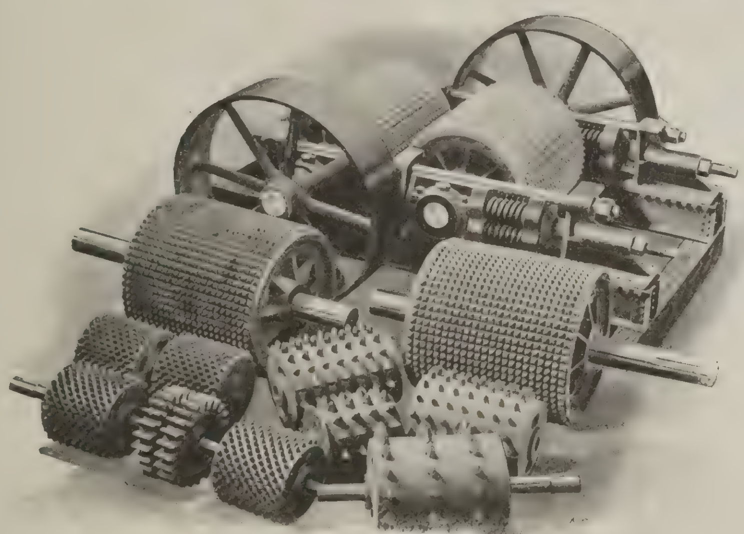

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Classified Index to Articles Advertised

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 15.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, JANUARY 20, 1912

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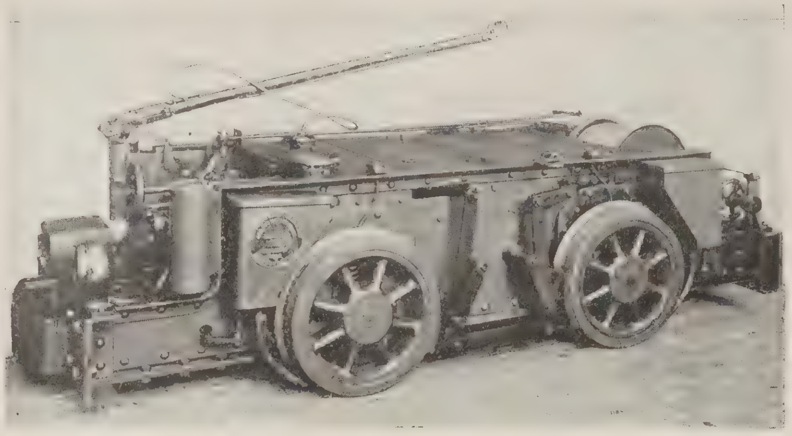

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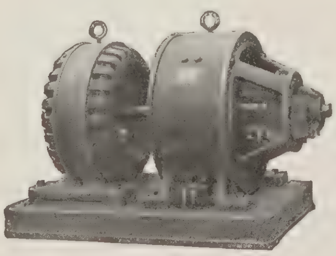

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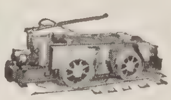

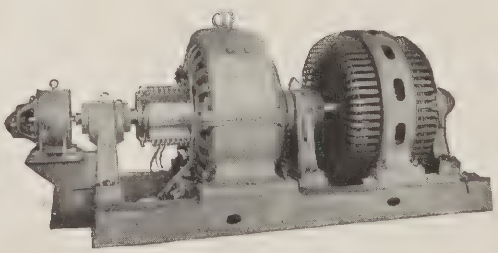

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COAL AGE

Vol. 1 NEW YORK, JANUARY 20, 1912 No. 15

THERE are some questions pertaining to the operation of coal mines that are as old as the industry itself, and still have not been settled.

When emergency arises, and lives and property are endangered, it is immediate and definite action that's wanted, not discussion and conjecture.

Positive plans to combat every possible peril should be clearly in mind. Accidents that are foreseen are already half overcome. The man who completes a job in his head before he puts hand to it, is master in fact.

* * *

Mine fires furnish a problem on which we largely disagree. A case in hand that typifies the situation is indicated by a letter we received a few days ago from the manager of a large coal company.

He says: "At 8:15 on Wednesday morning, I was called to our No. 7 colliery because of a fire that had broken out in the last crosscut connecting the 10th West entry with its air course. On arriving at the shaft, I learned that all the men had gone to their places in the distant workings. The mine generates some gas, but is not considered dangerous. Open lights are used.

"At the shaft, hoisting of coal had already begun. I went underground immediately with the superintendent of No. 7 and was also accompanied by the superintendent of our nearby colliery, No. 4. The superintendent of this latter mine had been summoned because of his familiarity with the No. 7 workings, since it was he who had originally opened the mine and who had been in charge of its development up to within a year.

"On entering the 10th West entry, we encountered smoke and a high temperature, and were informed by our foreman and fireboss, who were directing hastily formed relay squads in fighting the fire, that the flames were likely to get beyond control.

"I called a hurried conference to determine the best plan of action in case we would have to isolate the fire. The superintendent and foreman of No. 7 advised placing the first stopping on the No. 10 main, or intake side of the trouble; the No. 4 superintendent and the fireboss at No. 7 were agreed that the first wall should be erected on the No. 10 air course or return side of the fire.

"A little later the flames were extinguished, but I have not forgotten the difference of opinion concerning the proper plan of attack. Therefore, disregarding local conditions that modify any specific rule, is it not possible to prescribe in general whether a fire at the face of a pair of entries should be sealed off, first on the intake, or first on the return side?"

* * *

Of all the serious problems that confront the coal industry, none is more deserving of immediate attention than this question of overcoming a mine fire. It is an interesting subject and one that cannot be dismissed with a wave of the hand or a sentence of speech.

We believe, therefore, that great good will result from a discussion of the problem, and we want every reader of COAL AGE who has an idea on the subject to write us his views.

Conditions differ today from what they were years ago. Rescue helmets enable us to work in smoke and gases—a feat heretofore impossible. Theories, like machines and men, wear out. To succeed we must fall in with time's changes. Those who swim against the current will go down in the eddy.

Were the superintendent and foreman at No. 7 right in their judgment, or do you agree with the opinion of the No. 4 superintendent and the No. 7 fireboss?

Coal Mine Ventilating Equipment

By W. M. Weigel *

Of the three classes of mechanical ventilators, the positive blower is least adapted and the centrifugal fan best adapted for use in ventilating mines. The second article of a series on mechanical ventilators.

*Associate professor of mining, Pennsylvania State College, State College, Penn.

Mechanical ventilators may be classified according to the principle on which they operate, as follows: 1. Positive blowers, which admit, confine and then displace a fixed volume of air at each revolution. 2. Centrifugal fans or blowers, which by rotating at a high velocity, impart a centrifugal motion to the air between the blades and thus tend to create a partial vacuum at the center of the fan. 3. Disk or propeller fans, which by means of revolving vanes or blades, set at an angle to the plane of rotation push or propel the air away from one side of the blades, thus creating a partial vacuum on the opposite side.

Positive Blowers

Positive blowers of either the rotating or reciprocating type are now seldom employed as mine ventilators. Their excessive weight for a given capacity, and the large amount of machine work required in their construction make the cost of machines having a large volumetric capacity prohibitive when compared with that of fans. Furthermore, they require skilled attention and careful adjustment, which increases their cost of operation.

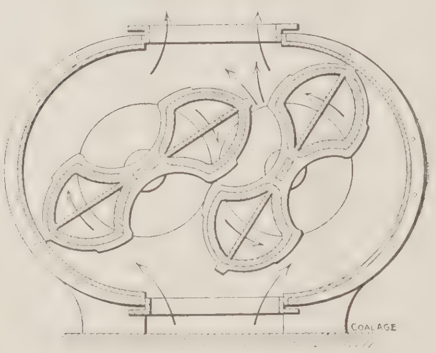


Fig. 1. Sectional View of Green Blower

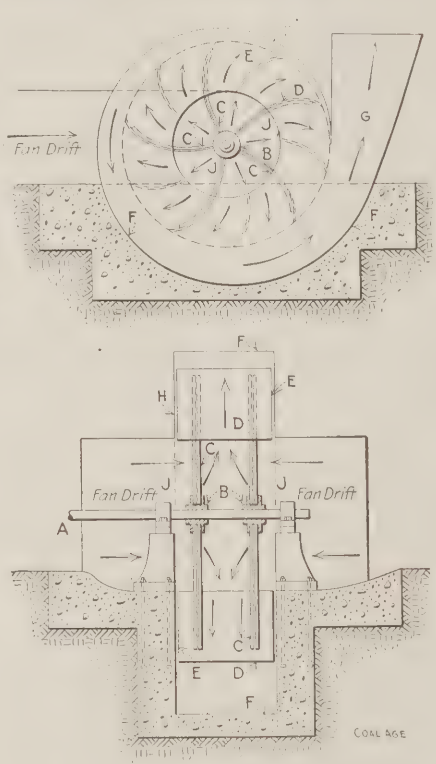


Fig. 2. Sectional Views of Centrifugal Fan

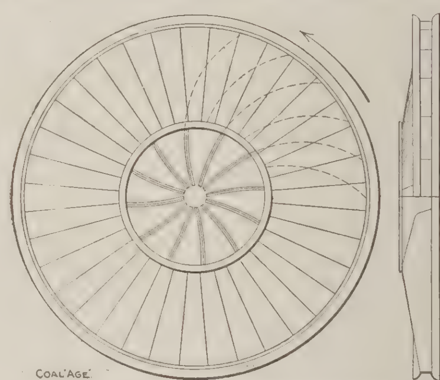


Fig. 3. Waddle Centrifugal-fan Wheel

Among the rotary blowers of this description are the Root, Connorsville, Green and Baker. The first three of these are quite similar in construction, and consist of two interlocking impellers, which revolve side by side, or one above the other, in an inclosing case without, however, coming into sliding contact with the sides of the case. Both the casing and impellers are made of cast iron accurately machined, and the fact that these surfaces must be mathematically true, adds greatly to their cost of manufacture. Perfectly made and designed impellers should roll together without friction, the points of each which may be in contact at any time always traveling at the same speed. Fig. 1 is a sectional view of a Green blower taken at right angles to the axis of the impellers; the arrows show the direction of rotation and movement of the air. At every half revolution, each impeller incloses the air between itself and its side of the case and discharges it through the outlet at the top. The impellers are geared together outside the case, preferably at both ends. These gears are accurately cut to reduce friction, insure quiet running and perfect uniformity of rotation of the two impellers. Fig. 4 shows a Connorsville blower direct-connected to a horizontal engine on the same bedplate.

The Baker positive blower differs from the Root type in having one main impeller which receives its power from the engine or motor and two auxiliary impellers or rotating valves, which admit the air during the intake part of the revolution and prevent its escape during the discharge period.

Reciprocating blowers are similar in construction and operation to blowing engines or air compressors, that is, the air is alternately drawn into and discharged from a cylinder by means of a piston, which may be driven by any form of motor, but is usually directly connected to a steam cylinder. However, their application is so limited as not to warrant further discussion.

All positive blowers are primarily intended to operate against pressures of 1 lb. or more per square inch. They do not however, discharge the air at a greater pressure than that necessary to overcome the resistance. But because they are designed to withstand and maintain such high pressures, their mechanical efficiencies are poor when handling the low pressure required for mine ventilation, which seldom exceeds 20 to 25 lb. per square foot. This fact is due to the excessive weight of their moving parts and their frictional losses.

Centrifugal Fans.

A centrifugal fan is shown in Fig. 2. There is a horizontal shaft supported by suitable bearings and between bearings the shaft is fitted with hubs rigidly keyed to it. From these hubs radiate arms or spokes to which vanes or blades are attached. The wheel is usually inclosed in a spiral casing with an opening in one or both sides at the center and one in the circumference. As the fan revolves, air is drawn in through the center opening. It then passes between the blades into the spiral casing and out through the opening in the circumference. If the fan draws air through its central opening from an inclosed space, such as a mine, it is said to be an exhauster, and if it delivers to an inclosed space through the opening in its circumference, it is then said to be a blower. The action of the fan is the same in both cases. The only difference being that

when exhausting the pressure within the inclosed space is less than, and when blowing greater than the atmospheric pressure.

Fig. 2 illustrates the general construction of a centrifugal fan and also shows the direction of the air currents, through one having an inlet on each side. *A* is the fan shaft; *B*, the hubs carrying the arms, and *C*, the arms which carry the vanes or blades *D*. The cheeks or side plates *E* are fastened to the ends of the blades and rotate with them. Their purpose is to stiffen the wheel and prevent the air from slipping around the ends of the blades as the fan revolves. The spiral casing *F* starts close to the circumference of the wheel and gradually enlarges until, having passed completely around, it widens out into the chimney or discharge opening, *G*. The fan shown in Fig. 2 is designed for exhausting. For blowing the discharge would generally pass off in a horizontal or downward direction. The sides plates of the spiral casing are shown at *H*, and the central air inlets at *J J*. Usually in an installation of this kind, the fan foundation forms the lower part of the spiral.

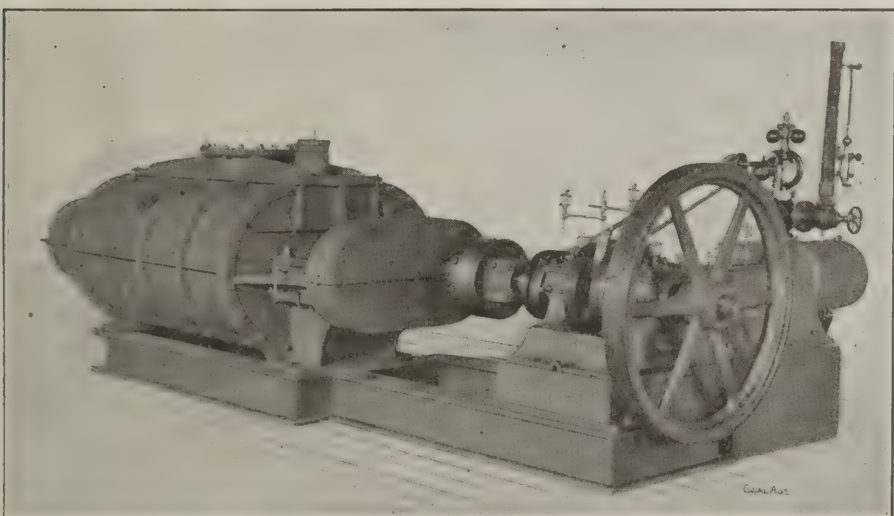


FIG. 4. CONNORSVILLE CYCLOIDAL BLOWER

The blades extend from the circumference of the inlet to the circumference of the wheel. There is no standard practice as to their shape and position. In some fans they are radial planes, in others they are convex toward the direction of rotation and slope backward. Some blades slope backward but have their tips bent forward into a radial direction. Others are planes but instead of being in a radial position, slope backward. In some extreme cases the blades are concave toward the direction of rotation.

The Waddle Type of Fan

A type of centrifugal fan used to some extent in England and Europe has no spiral casing, the air upon being discharged from between the vanes passing directly into the surrounding atmosphere. One form, the Waddle, is shown in Fig. 3, and consists of alternating long and short curved vanes fixed between and attached to two disks, one of which has a circular opening at the center for admitting the air from the mine. The fan drift must fit closely around this opening, and yet allow sufficient play for the free rotation of the fan. The solid disk is a plane, and the other disk is slightly coned, gradually approaching the flat disk toward the circumference. This reduction of sectional area is so regulated that the product obtained by multiplying the angular velocity at any point by the sectional area between any two vanes and the sides is a constant; which fact is supposed to keep the fan full of air. Beyond the tips of the vanes the disks diverge to such an extent that the area of the periphery at the edges of the disks is a little more than double the area at the tips of the vanes. This is done to reduce the velocity of the air as it is discharged into the atmosphere and increase the efficiency of the fan.

Waddle fans are made with large diameters compared to their axial length. The dimensions of a typical fan are:

Extreme diameter	36 ft. 4 in.
Diameter of tips of vanes.....	35 ft. 0 in.
Diameter of inlet............	13 ft. 6 in.
Width of vanes at tip........	1 ft. 1½ in.
Width at extreme periphery...	2 ft. 2¾ in.

In the latest forms the difference between the extreme diameter and the diameter at tips of blades is greater than in the above case. It will be noted that the long blades extend to the center of the fan; and that the portion of the blade between the fan center and the edge of the inlet is nearly radial in position, while the balance of the blade, like all the short blades, is curved backward from the direction of rotation. A few of the blades are shown by the dotted lines in the figure.

As the discharge from these open type fans takes place around their whole periphery, strong winds may interfere with their action at times. Further, the pressure is only one-half that developed by an inclosed fan of the same diameter running at the same speed as will be shown later. This, however, should have no effect on the mechanical efficiency of the fan. Tests of Waddle fans showing a mechanical efficiency of 65 per cent. have been published, but it is extremely doubtful if such results are possible. The error is, however, undoubtedly due to inaccuracy of measurements, especially of the volume and pressure of the air, and not intentional. It should also be noted that this type of fan is suitable only for installation as an exhauster, because it discharges around its entire periphery.

Machinery for Cutting Coal

An interesting paper on coal-cutting machinery, describing various types of rotary and percussive machines and comparing their advantages, was read by W. B. Shaw at a recent meeting of the Manchester Association of Engineers.

Mr. Shaw explained that the power employed for driving the coal cutter is compressed air or electricity, and though machines have been designed for driving by means of a haulage rope, no practical machine of such a type is at present working. The chief recommendation of compressed air is the absence of any danger of firing gas, or risk of possible shock to the machinemen; it is also a simpler apparatus and there is little danger of its being damaged by overloading. Its efficiency in power consumption is much lower than that of electricity.

The suspicion thrown upon electricity in connection with certain recent colliery explosions—a suspicion which was scarcely justified by the facts—has led to much serious thought on the risk in the use of electricity for coal cutting, and is likely to result in legislation imposing considerable restrictions along this line. Though this is leading to a considerable increase in the use of compressed air and has the appearance of being a setback to electrical cutting, it will no doubt be to its benefit in the end. It will result in still greater care and thought being given to the design of electrical cutters, with consequent improvements in those points which make for safety and at the same time reliability With a clearer definition of where electricity might be used, the colliery manager. when he decides to install electrical cutters, will do so with a feeling of greater confidence.

Any method of mining or handling coal that will materially reduce the percentage of slack without increasing the cost of operation is worth taking up.

Railroad Tracks for Soft Coal Mines

By M. L. Hyde*

The railroad-track plan is one of the first problems of a new mining plant. The various considerations that usually determine a layout of this kind are discussed together with several typical examples.

*Contracting engineer with the Roberts & Schaefer Co., Chicago, Ill.

While a great many articles are published from time to time regarding the surface arrangement of modern bituminous mines, only incidental mention is ever made in them of the railroad yards, and no definite information is usually given as to why the particular layouts are adopted. As the track plan is one of the first problems which confront the operator who contemplates building a new plant, the subject deserves more extended consideration.

Under present conditions nearly all bituminous mines are compelled to load from two to six grades of prepared coal in order to realize the maximum returns on the investment involved; and since every grade has a value in direct ratio to its size, it is desirable that each be loaded from the tipple or washer directly into its respective car, with as little handling as possible.

The Cost of Breakage

Particular attention is called to the fact that breakage is expensive to the operator in more ways than one, because not only is the average market value per ton mined reduced as the percentage of small sizes is increased, but also the first cost and the operating cost of the tipple itself are greater for the type which produces much breakage than for that in which the coal is handled in a thin uniform ribbon over shaker-picking tables and screens, from the time it leaves the mine car until it is lowered into the railroad car for shipment. A comparison of the cost of tipples having gravity or revolving screens, storage bins, etc., with that of the clean-cut, low structures, housing an equipment of shakers, will confirm this statement.

The practice of carrying bituminous coal to storage pockets in the tipple and subsequently drawing it out into railroad cars for shipment, should be avoided as far as possible. Coal loaded directly from a bin carries with it 5 to 15 per cent. of material, which has been crushed in the storage process to sizes below the standard, and, in order to hold the trade, this degraded material must be removed by rescreening the coal as it leaves the pockets.

If the full value is to be realized from these lip screenings, as they are called, they should be sent back to the main screens. For example, take a mine shipping the following grades: Three-inch lump, at $1.75 per ton; 1¼- to 3-in. egg, at $1.50 per ton; ¾- to 1¼-in. nut, at $1.10 per ton; and ¾-in. slack, at 75c. per ton. It would not be advisable to take all the 1¼-in. lip screenings from the stored egg coal and throw them into the slack, nor should they be put in with the nut coal. The proper method is to carry them all back to the screens and get as much nut as possible from the mixture. Attempts have been made to mix a small amount of the fines with the larger sizes, or to take egg coal from the run-of-mine and ship it separately while still holding up the value of both coals. With egg at $1.50 and run-of-mine at $1.20, it will readily be seen that this is a profitable subterfuge, but nevertheless one that will eventually bring the perpetrator to grief.

Loading Direct from Screens to Car

All this leads to the conclusion that each grade of coal should be laid directly from the screen preparing it into the car, thus requiring a separate railroad track for each size of coal. Now, while this is a desirable solution, yet, owing to surface conditions, it is not always practicable; in fact, seldom more than three to five tracks can be arranged for, in which case the three to five largest grades of coal should be loaded directly, and the remaining smaller sizes sent to storage bins.

Wherever bins are used it is advisable to build them as low as possible, in order to avoid bringing any greater weight than absolutely necessary on the coal which rests on the bottom. A satisfactory hoppered-bottom bin, having a capacity of 60 tons, or one car, can be built approximately 10x18 ft. in plan and 32 ft. high overall, with 14 ft. clearance from top of rail to discharge gate.

Yard Layout

The layout of tracks for railroad cars at a mine should provide in general for an empty storage yard above the tipple, leading to an independent system of loading tracks under the tipple, and thence in turn to a loaded storage yard below. Both the empty and loaded storage yards should accommodate enough cars for a day's run, requiring 1000 ft. of track in each yard per 1000 tons capacity of the mine. If the operation is large enough to own a switching locomotive, or to be served several times a day by the railroad, the size of the yard may, of course, be decreased, although it is usually not advisable to do so.

The empty yard should be laid off with a grade of 1¾ per cent. in favor of the empties, and should preferably have as many tracks as there are loading tracks under the tipple. In Fig. 1 is shown an empty yard with a scissors cross-over, allowing cars on any track in the yard to go to any track under the tipple. This affords a desirable layout, since in most cases all cars will be handled in a straight line. Moreover, it gives a maximum amount of storage room at a minimum distance above the tipple. One disadvantage of this yard, however, is that scales are required on every track, in case the cars must be weighed at the mine.

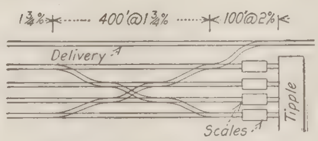


Fig. 1. Empty Yard

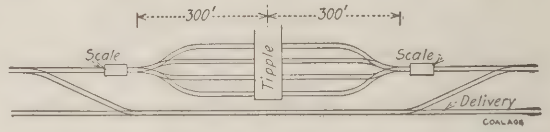


Fig. 2. Tipple Tracks and Scales

Layout for Track Scales

Where weighing is required, the layout shown in Fig. 2 is to be preferred. While this layout requires more room for a given number of cars and forces all but those on one track to round the curve and take the turnout, with a consequent risk of derailment and an increased amount of labor to start them off the scales, and also results in a more congested condition under the tipple, yet, on the other hand, it allows of bringing all the cars to one scale, and thus materially decreases the total cost of the yard.

The yard tracks should be on at least 12-ft. centers, and if the layout shown in Fig. 2 is adopted, may consist of from one to as many tracks as desired. The number will be governed by the ground conditions. Ordinarily, it is cheaper to grade for four tracks one-quarter of the total required length than for one track the full length, and time is saved on the part of the yard men in going after cars.

From a distance of 100 ft. above the tipple to a point 100 ft. below it, the track should be on a tangent, with a favorable grade of 2 per cent., this being required to insure that the cars will move forward readily a few feet at a time during the loading process. From this latter point the ladder should be run in on a 1¾ per cent. grade, and the loaded yard entered on a 1½ per cent. grade. After

a couple of hundred feet the grade in the loaded yard should be reduced to 1¼ per cent. It will be noted that in the arrangement shown in Fig. 2 only one empty and one loaded track scale are required.

Objections to Scales under Tipple

While at some mines the scales are placed directly under the tipple, this is not an economical method of weighing. In the first place, a separate scale is required on each track and in order that the empty car may be weighed with its front end under the loading chute and the loaded car weighed with its rear end under the same chute, the scales must be at least 75 ft. long. This is not only an expensive arrangement but it interferes with the continuous operation of the tipple since a fresh empty cannot be spotted until the loaded car has been weighed and pushed off the scale, thus involving an unnecessary loss of about a minute between each car, and also requiring an extra man.

In laying out the yards 80- or 90-lb. rails on 6x8-in. sawed oak ties with No. 7 turnouts and 12½-deg. curves should be used. This equipment will insure the grades remaining uniform and the curves will be sufficiently easy not to bind the cars. The ties should be spaced on 18-in. centers throughout the yard and their size should be increased to 6x10 in. wherever turnouts are located.

The track centers under the tipple should be 16 ft. between the lump-coal track and the next one inside, and 14 ft. between all others. The 16-ft. centers are required for the proper placing of the lump-coal loading chutes (especially where box cars are to be loaded) and for the tipple platforms, which are built on a level with the brakemen's step on the car to enable trimmers to pass from one track to another without loss of time and without danger.

The centers between the lump and the run-around tracks should be 14 ft. if a box-car loader is not used, and 30 ft. if it is. The run-around track should be so placed that the locomotive will never have to pass over the track scales and can deliver the empties and remove the loads with a minimum loss of time and without obstructing the ladder track.

Care should also be exercised in laying out the tracks, that cars carrying supplies may be switched onto a siding until unloaded and then fed over the empty scales to the tipple and used for coal if desired, all without interference with the flow of cars to and from the tipple.

Method of Handling Cars

One of the best methods of handling cars will be found to be as follows: The locomotive engineer in getting his trip of empties together places any supply cars there may be at the rear end, next to the locomotive, and then pushes the trip onto the run-around track and thence into the empty yard, after which he leaves the supply cars on their siding. He then travels over the run-around track to the far end of the loaded yard and pulls the loads away, or in some cases he pulls the loads from the rear end of the yard back onto the run-around.

After the cars have been placed by the locomotive in the empty yard, either one or two yardmen run them over the scales in trips of three to six and distribute them on the loading tracks, two or three cars to each track, riding each lot until the front of the first car is under the tipple loading chute, at which point the cars should be connected to a rope leading to a car retarder. This latter is an ingenious device, costing about $150, by means of which trips of from one to three cars are handled during the process of loading. It can be operated by the trimmer or dumper without requiring a man on the car.

The general idea of the retarder is that of leading a rope to the front car of the trip, and thence back to a small winding drum controlled by a band brake. With a grade of 2 per cent. under the tipple and all the brakes off, the cars will tend to run and thus maintain a tension in the rope. By easing up on the brake, the trip is allowed to move forward under the control of the operator until all three cars have been loaded, when the rope is detached and automatically rewound on the drum until the hook end comes back to the tipple and is attached to a second trip of empties. With a retarder for each track one man can control three car trips on two tracks at the same time or two men can control three car trips on four tracks. The yardmen jump the trip after it is unhooked and take it over the scales to the loaded yard. This system will allow of handling cars under a four-track tipple with only two spotters and two yardmen for a 3000-ton plant.

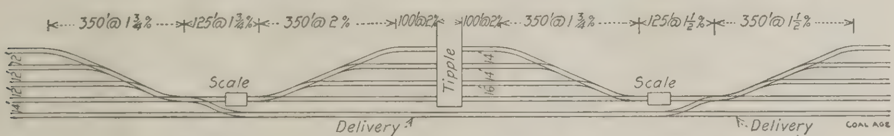


Fig. 3. Complete Track Layout, Empty and Loaded Scales

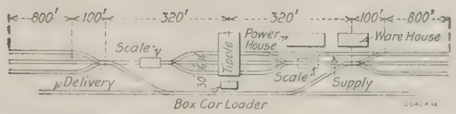


Fig. 4. Yard Plan

General Considerations

All railroad ties should be of sound, live white oak 6x8 in. by 8 ft. long, set on 18-in. centers. Six hundred and sixty-seven ties will be required per 1000 ft. of track. Switch ties are furnished by the lumber mills, already cut to suit the given switch, and should be of 6x10-in. material. For a No. 7 turn-out 2600 bd.ft. are required and for a No. 10 turnout 3200 ft. board measure.

Rails should be of either 80- or 90-lb. sections and 24 tons of 80-lb., or 27 of 90-lb. rails are required per 1000 ft. of track. Assuming average lengths of 30 ft. for the rails, 67 pairs of splices and 268 track bolts will be required per 1000 ft. The angle-type splice plate, such as the Bonzano, is to be preferred. Track bolts should be 4¾x⅞ in. with oval heads. They are furnished in 200-lb. kegs carrying 149 bolts each.

With 667 ties required per 1000 ft. of track, 2668 5½x9/16-in. railroad spikes will be needed, amounting to 7 7/10 kegs of 200 lb. each. The plain uniform spike with a clean-cutting wedge-shaped end will give the best results. No. 7 turnouts, complete with rigid frogs, point switches and stands, will cost about $100 laid. No. 10 turnouts, complete with spring-rail frogs, point switches and stands, will cost about $150 laid. The former can be used throughout the entire yard except at the cross-over to the main line, where the No. 10 should always be furnished. Stub switches should never be used.

A 44-ft. long 60-ton track scale for empty cars, set in a concrete pit, will cost approximately $1500. A 50-ft. 125-ton track scale for loaded cars, set as above, will cost $1750. These prices cover excavation, concrete, lumber, the scale and setting.

The surfacing of the yard will ordinarily be done with refuse ballast from the mine. All ballast should be crushed to pass through a 2½-in. ring and should be laid 6 in. deep under the ties. On this basis 250 cu.yd. of ballast will be required per 1000 ft. of track.

The advisability of having a yard laid out by competent engineers cannot be too strongly emphasized. Once a yard has been poorly laid out and graded, it means a great deal of money and lost working time to put it in shape.

A remarkable record was recently made by a puncher coal cutter made by the Hardy Patent Pick Co., of Sheffield, Eng. The work was done on a longwall face in a Durham colliery on a seam 3 ft. thick. The machine, which was handled by two men, started at 8:15 a.m. and finished at 3.20 p.m. The air pressure was from 45 lb. to 50 lb. per sq.in., and the length of the face cut was 47 yd., the depth 5 ft., and the maximum cutting speed was 180 sq.ft. per hour.

A Test for Coal Washing Economy

Special Correspondence

An apparatus is described by means of which a characteristic curve may be obtained for any coal. This curve shows at a glance what results may be expected from washing the coal in an effort to bring its percentage of ash within a certain figure.

Devices for mechanically washing coal make two products which are commonly termed coal and rock, although neither is entirely one or the other; and the object of the process is to leave in the coal exactly the amount of ash specified by the purchaser, while at the same time discarding a minimum amount of coal with the refuse.

Of the numerous fuels which we have had occasion to study, none has contained particles of either absolutely pure coal or of rock entirely free from carbonaceous material; the particles of fuel are all more or less mixed with schists, and their ash content increases progressively, from those which are most nearly pure coal to those which are practically all rock.

If Y is the yield in coal from the washing operation and X the ash content of the washed coal, we have:

$$Y = f(X)$$

This function varies considerably with different fuels and by determining its values we are able to tell exactly the greater or less amount of waste which is entailed by reducing the percentage of

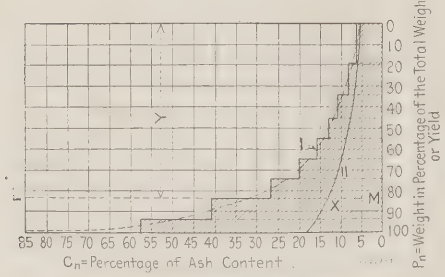


Fig. 1. Diagram for Deriving Characteristic Curve

ash and consequently enriching the coal.

These values can be obtained only experimentally; and in order to find them the apparatus which is here described was designed. It was constructed in the Van de Wyer shops, rue Haute, 17, Anvers, Belgium.

Description of the Apparatus and Method of Use

A bronze cylinder B of exactly 100 mm. (3.93 in.) inside diameter is plunged into a reservoir D filled with water, as shown in Fig. 2.

At the bottom of the cylinder a grate E, covered with a wire gauze, is held in place by two screws S S.

Having placed in the tube about 1 liter (61 cu.in.) of the coal to be tested, the cylinder is raised in the reservoir, by making use of the handles H, and then let fall quite rapidly; in this way the water flows in the direction of the arrows and the various particles of coal become stratified in accordance with their specific

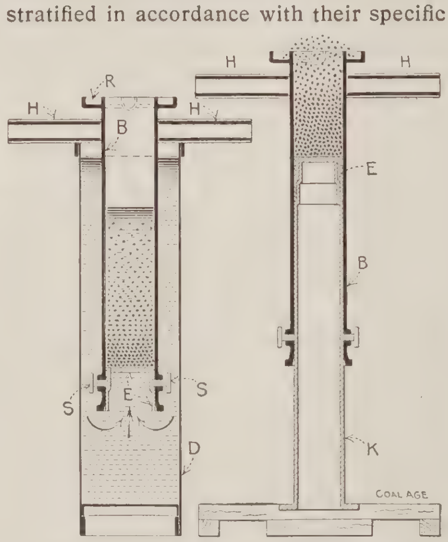


Fig. 2. Apparatus for Preparing Sample

gravities. For samples of very finely divided coal 30 to 40 strokes are necessary.

The deposit thus secured is made up of a series of elementary layers of weight P_n, Fig. 1., and ash content C_n. The apparatus, as we shall soon see, permits an exact division into perfectly horizontal layers practically as thin as may be desired.

Having separated the layers P_1, P_2 . . . . P_n, we dry and weigh them, and then determine their ash contents C_1, C_2 . . . . C_n.

The weights P_n of the separate layers are laid out as ordinates, and arranged in the order of their superposition, the total weight being made equal to 100. At the middle of the height representing the weight of each stratum we lay out, as an abscissa, a distance C_n proportional to its ash content, and we join the points obtained by a curve I, Fig. 1.

This curve gives the law of distribution of the ash in the sample of coal tested, and its area $\Sigma_0^{100}\ C_n P_n$ (represented by the shaded section of Fig. 1) gives the total weight of ash contained in the sample, of which the weight is 100.

The mean ordinate

$$X = \frac{\Sigma_0^{100}\ C_n \times P_n}{100}$$

is the ash content of the raw coal.

Separating the Bed of Coal

Now the industrial operation of washing coal consists in separating the bed of coal into two layers. The upper part is the washed coal and the lower part the waste.

Let $L\ M$, Fig. 1, be the plane of separation; then the upper part will have a mean ash content:

$$X_n = \frac{\Sigma_0^n\ C_n P_n}{Y_n};$$

the yield in the coal will be Y_n, and the loss due to the waste will be $(1 - Y_n)$

By varying the hight of the plane $L\ M$,

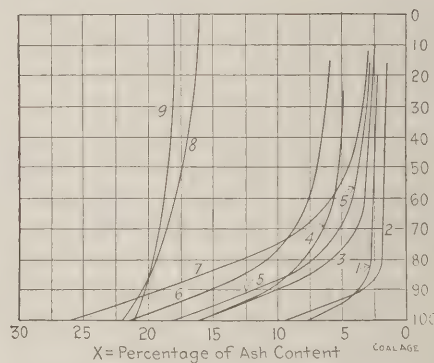


Fig. 3. Characteristic Curves of Various Fuels

a simple substitution gives the corresponding values of the general equation:

$$X = \frac{\Sigma_0^{100}\ C_n P_n}{Y}.$$

The locus of the point X is the required characteristic; and this curve $I\ I$ measures the inevitable loss which has to be sustained in treating a coal containing X per cent. of ash.

The apparatus has been so designed as to permit an easy separation of the layers. In order to do this the tube B is placed on the column K, the grate loosened by unscrewing $S\ S$ and, when B descends, it obliges the coal to fall into the gutter R. The screws $S\ S$ permit this operation to be stopped when deemed proper; in other words, to limit the height of each layer.

By using a cutter which is rested on the top edge of the tube, all the coal which projects is horizontally cut off and

Note—From "Revue universelle des Mines, de la Métallurgie," etc., Liège, Belgium, Article by R. A. Henry, director of the Hasard collieries.

transferred to a receptacle. The successive samples thus obtained are then dried, weighed and incinerated, each of them giving a point of the desired curve.

PRACTICAL APPLICATION

There are collected in the diagram, Fig. 3, a number of curves obtained for fine coals of ⅙-mm. size, coming from different places. It is noticeable that, for example, the samples Nos. 6 and 7, whose ash contents in the raw state (that is, for $Y = 100$ per cent.) are $X_6 = 21.3$ per cent. and $X_7 = 26$ per cent., respectively, will give the same yield in washed coal ($Y = 73$ per cent.) if we bring them to a common ash content of 8.75 per cent.

If it is required to enrich these products to a content of 7 per cent. ash, sample No. 6 will produce 47 per cent. yield and sample No. 7 will give 67 per cent. Thus we arrive at a result which at first thought would have been deemed paradoxical: No. 7, the more ashy in the raw state, leads to a loss almost twice as little as No. 6, to which incineration alone would have led us to attribute a superior value.

We note also that samples Nos. 8 and 9, which seem to be economical fuels, are not successfully cleaned by the process of washing. These curves vary with the different seams of coal, the size of the grains, the contents in pyrites, the presence of washing stones, etc Their interpretation, which is quite easily acquired, permits the engineer to draw conclusions unknown before the use of this method of investigation.

Longwall and Conservation

By Sim Reynolds*

Some interesting facts are brought out and seem to point conclusively to the eventual universal adoption of the longwall system. Comparisons are drawn between it and the room-and-pillar methods, showing enormous losses incidental to the use of the latter.

*Mine superintendent, Marianna, Penn.

With the gradual depletion of our surface coal, the necessity of working to greater depths, and conserving our supplies, the longwall system of mining is continually gaining more prominence. That more coal men are being converted to this system is not to be questioned, and if we may omit the faults, the arguments in its favor are overwhelming. It is not, however, the purpose of this article to cover up the bad features, nor to eulogize the good ones, but to set forth as clearly as possible a comparison of the present methods of working, and changes which might be advantageously made.

In fairness to the reader it should be stated that in Great Britain, which is the home of longwall mining, there were 1600 lives lost in the mines in 1910. A method of mining having such a fearful mortality in one year, is far from being what we would desire, and yet it may be the best attainable. Another detrimental feature which should not be overlooked is that of surface caving, although it may be here stated that the longwall system is no worse in this respect than others.

The success of any method is, of course, contingent on adhering strictly to the approved lines of procedure. The tendency is to leave undone those things we should do, and do those things we should not, and this human perversity is about the only vital feature connected with mining which does not change.

EVENTUAL ADOPTION OF LONGWALL ASSURED

It is becoming apparent that the next decade or two will see certain decided changes in mining methods. The newer generation will look back on the uneconomical systems of the old, and seek to remove the antiquated methods having such wasteful results. While longwall mining may not be the perfect system, it appears to embody the best methods attainable at the present time. The advantages of this system can be best shown by a comparison of the two methods on the same basis.

To the ultra-conservative who are not in sympathy with the impending change, we wish to call attention to the statement of an eminent consulting engineer, located in the Fairmont region in West Virginia, who is in direct touch with numerous mining operations throughout the United States. This authority says that many of the larger corporations, who can afford to make experiments, if thereby they have an even chance of making money in the end, are conducting certain portions of their work under all kinds and conditions appertaining to the longwall system. To prove these experiments takes time, and some day it is to be hoped an article will be published which will cover the more important of these essays into new methods.

NECESSITY FOR ITS ADOPTION

That there are some seams that it will be possible to work only by the longwall method is generally conceded and in the interest of the utmost possible conservation, there will probably some day be passed a sweeping edict covering all coal beds not yet mined. In the meantime, the companies which are trying out the different systems, will, upon the arrival of legislation on this subject, be in a position to say definitely just what they want.

The various conditions of its application would, of course, be determined by the local conditions, ellipse, circle or straight line being used, according to the usual circumstances governing the application of such rules. Whether it will produce the results extreme reformists would have us believe it will, is doubtful, particularly if the strata above it lay more than a good breaking distance in thickness. The opinion of the other side, who see in it nothing but expense and disastrous surface caves, is also equally doubtful.

For the sake of comparison of the results attainable by the different systems, a 1000-acre tract of land, with coal lying at a depth of 400 ft., will be assumed. By taking this depth as a basis, we give a conservative estimate of the possibilities of the longwall system on surface caving, which is about the only real fault that can be charged against it.

LOSSES BY ROOM-AND-PILLAR METHODS

According to all available statistics, a conservative estimate of the average amount of coal recovered under our present systems of working would be about 60 per cent., and less in many instances. The total tonnage on a tract of this size would be 9,680,000 short tons and 60 per cent. of this would give an approximate tonnage of about 5,800,000, which means the loss of nearly 4,000,000 tons of coal. At an average price of $1 per ton, it is readily seen that the nation is $4,000,000 poorer as a result. The glaring fact that our national wealth is $4,000,000 less than it might have been because of development of a comparatively small industrial operation according to established rules, cannot be ignored, especially when it is remembered that this is a loss which no mortal ingenuity can ever repair.

The miner who can look back on boyhood days spent sweating over a "Blow-George," furnishing insufficient air to a brawny South Staffordshireman as he delved in search of a possible thick coal pillar, may be of the opinion that this coal is not entirely lost. But by far the greater part is lost once the strata has broken, while on the other hand, such losses on longwall work are evident and more or less susceptible to remedy.

Surface Caving

In removing the entire seam some damage has perhaps resulted to the farmer, but not much, certainly, at a depth of 400 ft., and nothing beyond easy repairs. Where a total extraction has been effected on a 5-ft. seam having 100 ft. cover in certain of the Pennsylvania fields, the break has extended to the grass roots. Where this extraction has been several acres in extent and the break has been general over the entire area at once, it cannot be said that any appreciable damage has resulted. In this instance there was no packing whatever, as would ordinarily be the case in longwall workings. The conditions were simply 100 ft. of easily breaking roof with a clean fall of 5 feet.

Taking our previous example again, of 6 ft. of coal at a depth of 400 ft. worked by the longwall system and packed carefully, the result would by no means be so serious. Furthermore, it should not be forgotten that there are approximately 1000 square miles of coal in which the seams are 600 ft. or more below the surface.* At this latter depth it is doubtful if the strata would break to the surface, for it has been shown in the British mines that at a depth of 700 or 800 ft. work can be carried on successfully under the sea.

This proves conclusively that in average strata the highest fall reaches an apex far below that distance, and the miner who has had extensive experience in pillar drawing and is familiar with the quick oblique line that the ragged rock edges traverse toward a common juncture, will place the safety point much lower.

Comparison of Results

Turning again to our example of a 1000-acre tract, and assuming this to have been worked by the longwall system which has resulted in certain damage to the surface, a comparison of this surface damage, with the additional extraction obtained, may be made. Taking the mine on a royalty basis of 5c. a ton, the farmer has received $193,600 above what he would have received by the 60 per cent. pillar-and-room method of working. This amounts to $193 per acre, or about twice as much as the farm value of the land. It should also be remembered that the expense of tipple erection, compressors and power plants and the general surface arrangement of a mine opened to develop a track of 1000 acres, is the same for 60 per cent. extraction as for 100.

It is said that in longwall working continuous operation is necessary, in order to properly control the roof, but a little consideration will show that this applies nearly, if not quite as well, to room-and-pillar work, particularly when the mine contains water. The statement of a certain large Western operator, a man who is both practical and theoretical, may be taken, *apropos* of this. He has recently changed a number of his mines to the longwall system, and during a strike lasting over a period of about five months and a half, all of his mines were shut down. On the resumption of operations he had careful records kept of the relative cost of opening the longwall and the room-and-pillar mines. These records showed the cost of opening the room-and-pillar mines to be nine times that of the longwall.

Summary

Longwall mining provides an easier method of ventilation, a more thorough diffusion of explosive gases, a less quantity of timber, a ready disposal of refuse, and a certainty of no creeps or squeezes occurring to ruin the mine. In addition to this it has certain safety features, which should not be ignored, such as the impossibility of a general coal-dust explosion over an extensive area, since abandoned portions are practically closed and sealed off from the live workings, and the lessening of danger from a blownout shot, for, if rightly conducted, longwall requires little or no powder. The concentration of workings and the ease of superintendence should also be considered, for it is well known that in large mines there are portions in which the foreman seldom or never gets, while in longwall work this would not be true. Another item of considerable value is the large increase in the proportion of lump coal obtained, since longwall produces from 10 to 20 per cent. more lump than other methods.

When all the advantages of the longwall system are summed up, it seems remarkable that it has not been more generally adopted in the United States. That longwall will prove the ultimate and complete solution of all our troubles is not, of course, possible, but that it is the only method by which proper conservation of our coal resources can be obtained, seems to be beyond question. It is also thought that it will effect a material decrease in our death rate, but even if it only conserve our coal, it will prove its worth to the nation and the coal industry, and make the change a good one. The inverse ratio of price per acre with the number of acres left, will bring this idea more and more to the fore both in the minds of those who have to buy the coal lands and those who sell them.

*See Twenty-second Annual Report, U. S. Geological Survey, page 178.

New Type of Coal Cutter

Special Correspondence

The advantages of machine mining over pick mining are well known and appreciated. In general it may be said that coal operators have long since recognized the superiority of mining-machine practice to bunglesome pick methods. New problems are, however, constantly arising in regard to the selection of the machine best adapted to certain kinds of work and in connection with the designing of machines for meeting new and untried conditions. The Jeffrey-O'Toole Coal Cutter was originally developed for the mines of The United States Coal & Coke Co. at Gary, W. Va. It is the result of a suggestion of Mr. E. O'Toole, general superintendent of that company, and the co-operation of Mr. O'Toole and the engineers of the Jeffrey Manufacturing Company.

Fig. 1. Coal Cutter Ready to be Run to Another Place

Cuts Seam at Various Heights

The machine is built to cut a kerf at various heights, depending upon the

thickness of the seam, and is particularly useful in cutting thick seams where the presence of dust or gas limits the amount of explosive which can be used for each shot. In such cases the seam is cut at about its center and a small charge is sufficient to bring down one-half at a time. When small bands of impurities occur in the coal, the cut may often be so directed as to remove them, permitting the coal to be taken out without becoming mixed with the dirt.

This coal cutter can readily be removed to another room after finishing a cut. When the coal face is narrow, much time and labor is often consumed in moving machines of other types to and from their cutting positions, loading them onto trucks, etc. With this machine it is only necessary to connect up the driving chain, release the jacks, and move it from the room under its own power. In the illustration, Fig. 1, the machine is seen in position ready for removal to another place.

The room track should, if possible, be placed in the center of room, but if this is not practical on account of the space required for refuse, the end of the track may be curved so as to bring the machine to the center of the room when up at the face. The machine is mounted on a self-propelling truck, and as soon as the truck chain drive is disconnected it is ready for work. The runner immediately starts the motor, and while the cutter arm is swinging over from its position parallel with the track to the point where it starts to cut, the helper sets the jacks.

The room face is cut in a semi-circle 18 ft. in diameter, and the machine advances 5 ft. for each cut. The cutter arm is provided with a rachet feed which may be varied by an arrangement that causes the engagement of one or more teeth per stroke of the operating eccentric. The total time required to feed the arm in a complete semi-circle is from 7 to 28 min., depending upon the rate of feed used. The fast feed is always used to bring the cutter arm up to the coal and from the coal back to the center position. At the beginning of a cut a higher feed can be used than at its central part, when the arm is fully under the coal. The machine operator can readily stop and start the feed by means of a disc friction clutch, which also acts as a safety slip in case the machine encounters material that it cannot cut.

Construction and Operation

The construction and operation of the machine may be briefly described as follows:—The bed frame consists of a circular steel casting upon which is mounted the motor, all gearing and the cutter arm. This bed frame rests upon and revolves inside of a large steel ring, which forms the stationary frame. Riveted to this ring at three points, 120° apart, are cast-steel screw brackets, through which pass large adjusting screws. These screws are bolted to the steel top plate of the truck as shown in Fig. 2 and are fitted with adjusting nuts which are used to vary the height of the ring above the truck, and also serve to tilt the cutter-head to any desired angle.

The feed mechanism consists of a ratchet and lever operated by an eccentric on the main drive shaft. On the same shaft with the ratchet wheel is a worm which meshes with a worm wheel on the drum shaft. A disc friction clutch mounted on the drum shaft engages a rope drum, on which is wound a steel rope. One end of this rope is fastened to the hub of the drum and the other end hooked to the stationary steel ring.

Around the periphery of the circular bed plate are sheave wheels, over which the steel rope passes, and as the ratchet turns the worm, the drum revolves, winding up the cable and pulling the cutter-arm around in a circle. The disc friction clutch on the drum not only acts as a safety slip but allows a variation in the feed. As previously noted the ratchet is also arranged to engage one or more teeth at each stroke of the eccentric, thus permitting the feed to be varied at any time while the cutting is in progress.

The complete coal cutter is mounted permanently upon a steel truck which is provided with a self-propelling mechanism and an automatic reel for winding up and paying out the electric cable, as shown in Fig. 3. The machine can cut entries as well as rooms. When cutting entries, it is placed close to one rib and the cutter arm, starting in on the other rib, is sent under the coal until it cuts up to the rib by which the machine stands.

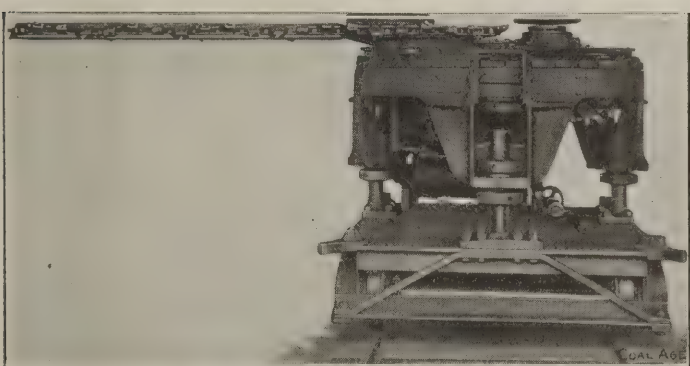


Fig. 2. Jeffrey-O'Toole Coal Cutter

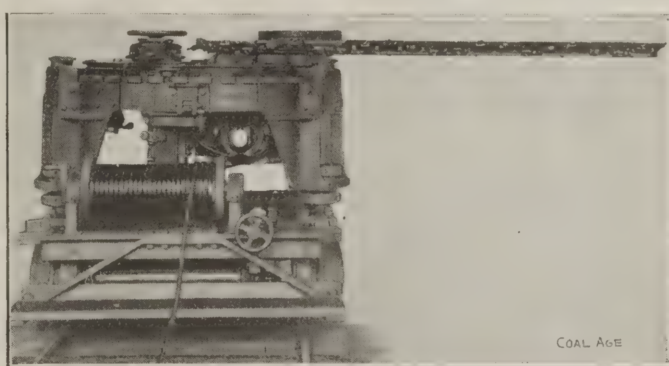


Fig. 3. Rear View, Showing Cable Reel

The Peat Industry of Russia

In a recent report of the Baku naphtha industry there are given some interesting data concerning the exploitation, development and consumption of peat in the central industrial district of Russia. As the price of liquid fuel has risen beyond the limit at which its use is satisfactory to industrial concerns, the question of replacing naphtha with other combustibles has come prominently forward, and it appears that for a number of purposes peat is just the fuel required.

The peat industry has by now secured an unquestionably firm position. In 1908 there were 73 firms engaged in the production of this fuel and they put out that year a total of nearly 52,000,000 cu.ft. These operations are chiefly in the departments of Moscow, Waldimir, Nizhni-Novgorod, Rjasan, Kistroma and Tambow. In 1907, according to the superintendent of the Moscow mining district, the central industrial region of Russia produced 181,500 tons of peat. In 1908 the quantity delivered was equivalent to 544,500 tons of hard coal, and the number of men employed in the industry was 17,000.

It should be mentioned that the processes of peat cutting and preparation used in central Russia, include practically none of the improved methods which have recently been brought into use elsewhere, and there is a wide field for future improvement and development.

In regard to the extent of the deposits, it may be said that the present workings are estimated as being sufficient to supply all demands for at least 40 or 50 years. There are, moreover, in this district many bogs which have not as yet been touched.

Ignition of Gas by Electric Lamps

Special Correspondence

Tests of portable electric lamps made at the Frameries experimental station, Belgium, show that under certain conditions all electric-lamp filaments ignite firedamp. Composition of the gas, size, shape and nature of the filament, and voltage of the lamp are governing factors.

NOTE—From *Annales des Mines de Belgique.* Article by Emanuel Lemaire, professor at University of Louvain and engineer, Frameries experimental station.

Portable electric lamps offer important advantages over ordinary safety lamps for lighting in gaseous mines. Their degree of safety is higher, since their luminous element has no communication with the mine air and therefore the danger of ignition does not increase with the proportion of methane and the speed of the air current. They have no delicate parts, such as metallic gauzes, which easily deteriorate and require careful daily inspection. They do not go out, and so the necessity of relighting inside the mine is avoided, a quality that is valuable in assisting the retreat of the miners after an explosion or mine fire.

They have, on the other hand, the disadvantage of being considerably heavier than ordinary safety lamps, and they do not indicate the presence of gas. However, this last inconvenience may be remedied by using at the same time a few ordinary safety lamps to serve as gas detectors.

An electric mine lamp well constructed, that is to say, strong without possible short circuits and one in which the sparks caused by opening and closing the circuit can only occur in an inclosed place, presents but one danger; that is, the breakage of the bulb. The existence of this danger, which may usually be remedied by surrounding the bulb with a protective envelop of thick glass isolating it from the surrounding atmosphere, has even been disputed, and contradictory opinions are offered on this subject.

We give in the present article the details of tests that have been made at the Government experiment station at Frameries, to clear up this point, to which the accident of July 7, 1905, at the colliery of Bois de La Haye, at Anderlues, had drawn particular attention.

The Ignition of Combustible Gases by Incandescent Metal Wires

It has long been known that incandescent metal wires may ignite combustible gases and that the temperature to which they must be carried to produce this effect depends on their diameter and the nature of the gas.

Davy showed, in fact, that an iron wire, 1/40 of an inch in diameter, if brought to a cherry-red heat, ignited a jet of hydrogen escaping into the air but did not set fire to a jet of ethylene. The latter ignites on contact with wire of 1/8 in. diameter brought to the same temperature. An iron wire 1/500 in. thick does not ignite hydrogen at less than a white heat; at a dark red it ignites a jet of phosphureted hydrogen. At white heat a wire of 1/40 in. diameter does not ignite firedamp; at a red heat it ignites carbon monoxide.

On the other hand, experiments of M. Hauser, professor of the School of Mines at Madrid, on the ignition of gas by incandescent electric wires, have given the following results:

1. Ferronickel wires, 0.3 mm. (0.0118 in.) diameter, did not ignite the most sensitive mixtures of artificial firedamp whether the metal was fused or not.

2. With a platinum wire, 0.5 mm. (0.0197 in.) diameter, gradually heated to a red heat, the ignition of a mixture of 7 or 7.5 per cent. of natural firedamp was produced six times without a miss and without fusion of the wire, which burned brightly at the moment the explosion occurred. With platinum wires of 0.2 mm. (0.078 in.) diameter and natural firedamp, there were two ignitions in three tests.

3. With soft-iron wires of 0.9 mm. (0.035 in.) diameter, the results are particularly interesting. When using a straight wire placed horizontally or inclined, or a curved wire turned sometimes upward, sometimes downward, natural firedamp of 7.2 to 7.5 per cent. was ignited six times out of 17 trials, that is, in one-third of the cases. The wire did not melt when there was no ignition, but melted in the cases where this occurred.

Influence of Shape of Filament

On the other hand, when using an inclined wire with a spiral in the middle, there were five ignitions in as many tests, and without fusion of the wire. In three of these tests the same wire was used three times successively and in a fourth test the twisted spiral wire ignited a mixture which had resisted a straight wire up to fusion.

4. As verification of the foregoing experiments, others were made with a steel wire of 0.6 mm. (0.0236 in.) diameter in pure artificial firedamp without obtaining an ignition in four tests where a straight horizontal wire 15 mm. (0.59 in.) long was employed, while ignition was produced by a wire 25 mm. (0.985 in.) long, incurved upward.

With an oblique wire coiled in three spirals, two trials were followed by explosions and in one of these cases the same gaseous mixture had already served three times successively for tests up to fusion of a straight horizontal wire 15 mm. long. This last experiment was repeated with the same result in natural firedamp.

It follows from these experiments by Professor Hauser that incurved wires or coiled wires ignite the firedamp more readily than straight ones, and that the susceptibility to ignition of gaseous mixtures is not the same with all metals.

Using iron wires of 0.05 to 0.35 mm. (0.00197 to 0.0138 in.) diameter, Messrs. Couriot and Meunier did not succeed in exploding firedamp mixed with air, even under conditions most favorable to explosion. Taken in connection with the foregoing experiments, these latter confirm the opinion that the finer the wires are the more difficult is it to produce ignition of explosive mixtures.

It is known that a combustible gas does not ignite in the presence of air unless brought to a certain temperature. In order that the ignition, when started at a point in the combustible gas and air mixture, shall be propagated throughout the bulk of the gas it is necessary that the heat liberated by the combustion of the first particles, which ignite in contact with the initial source of heat, shall be sufficient to raise to the temperature of ignition at least an equal mass of neighboring particles.

Proportion of Combustible and Size of Wire

If the proportion of combustible gases in the mixture is small and less than 6 per cent. for mixtures of air and firedamp, the mixture simply burns in the immediate neighborhood of the source of heat, forming around this an aureole more or less well developed, but the heat liberated by this combustion is too small to bring the neighboring masses of gas to the required temperature, and the ignition is not propagated.

Certain facts, and notably the fact that fine incandescent wires less readily ig-

nite firedamp than those of larger diameter, tend to prove that even in an explosive mixture, it is necessary that a certain mass of combustible ignite at one time in order to propagate the ignition. If this mass of gas is too small, the heat freed by its combustion is dispersed too rapidly in the surrounding medium to bring the neighboring gases to the temperature of ignition.

The larger the wire and the higher its temperature, the larger the quantity which takes fire on contact with it. It may be inferred from this that wires of large diameter ignite explosive mixtures more readily than finer ones.

During safety-lamp tests in gaseous currents, a sharp, needle-like flame is sometimes seen coming out of a crack of the chimney without igniting the surrounding explosive mixture. It is necessary to assume that this flame communicates the fire to too small a quantity of the explosive mixture to propagate the explosion.

The fact that spirally coiled wires more readily ignite the firedamp than straight wires seems due to the circumstance that the mass of combustible gas which traverses the coil formed by the wire is heated on all sides by the filament and by the heat set free in the combustion produced on contact with the wire, and thus the gas may more easily be brought to the temperature of ignition.

The influence of the mass of the combustible materials fired at one time by the initial cause of ignition has already been placed in evidence by the study of dust explosions. Resting on what has been said, we may foresee the possibility of firing combustible gases by the finest wires if only their temperature be sufficiently high. However, certain substances are liable to melt before the necessary temperature has been reached.

The experiments made at the Frameries station on incandescent lamps have shown that this is true. In fact, it has been possible to ignite explosive mixtures of air and firedamp by means of the filaments of all the lamps tried, by sufficiently raising the temperature, although these filaments were only a few hundredths of a millimeter in diameter.

Experiments with Carbon-filament Lamps

The experiments with carbon filaments were conducted with lamps of two and four volts. The bulbs, mounted on Sussmann lamps or connected to a battery of storage cells, with or without interposed resistance, and arranged to permit one or more elements to be put in circuit, were opened before their introduction into the test apparatus or else broken in the gaseous current itself by compression between the jaws of a vise. The experiments were made in gaseous currents of 0.5 to 10 m. per sec. velocity, containing 8 to 10 per cent. of methane.

The voltage and amperage were regulated on the lamp intact before the test; the voltage was measured at the contacts of the lamp, or, to speak more exactly, at the binding posts where were connected the large-diameter wires that brought the current to the lamp.

The electric current was cut off after each ignition of gas, to avoid the combustion or destruction of the filament during the time required for extinguishing the flames in the test apparatus; immediately afterward it was turned on again.

In a certain number of tests the temperature of the filament before rupture of the bulb was measured with a Féry absorption pyrometer. It is best to make some reservation on the subject of these temperature measurements, which were rendered difficult by the small size of the filaments with which experiments were made.

The experiments made by K. G. Falk in the laboratory of the Physico-Chemical Institute at Berlin and those at Columbia University, New York, have shown that the temperature of ignition of combustible mixtures varies with the composition of these mixtures. So it is that a mixture containing 50 per cent. of hydrogen and 50 per cent. of oxygen takes fire at 788 deg., while a mixture of 80 per cent. hydrogen and 20 per cent. oxygen ignites only on reaching 878 deg. A mixture of 66 per cent. carbon monoxide and 34 per cent. oxygen ignites at 875 deg., but a mixture of 50 per cent. carbon monoxide and 50 per cent. oxygen ignites only at 915 degrees.

For mixtures of air and gas, the experiments carried on at Frameries as a preliminary to the tests on the explosives, have shown that the compositions of greatest inflammability contained between 7.5 and 8 per cent. of methane. It is this composition which was used in the majority of the tests to which the carbon-filament lamps were submitted.

These tests have shown that it is possible to ignite explosive mixtures of air and firedamp by the incandescence of a carbon filament; numerous gas ignitions were obtained without rupture of the filament.

It is therefore learned that an incandescent carbon filament may ignite firedamp, and that this ignition is not necessarily produced by a spark resulting from rupture of the wire.

Conditions Affecting the Experimental Results

Contrary to what might be supposed, the combustion of a carbon filament in air sometimes takes several minutes; the time necessary depends on the temperature to which it is brought, but this time is always appreciable.

The temperature to which the filament is normally submitted varies with the type of lamp; at least such was the case with the low-voltage lamps used for the experiments. Further, some lamps of the same type have a greater electric resistance than others and the temperatures of their filament may therefore differ for the same voltage applied to their binding posts. This is a primary cause of failure to obtain absolute agreement in the results.

There is also another cause of discrepancy. At the moment when the air enters the bulb, a cooling by convection is added to the cooling by radiation, and the temperature of the filament instantly falls. When we close the jaws of the vise slowly and carefully, the bulb is sometimes broken into only two or three pieces. In one test it was seen that these fragments, held by the jaws, remained so well in contact that the flame could not pass out. It may be inferred from this that in certain cases the exterior air may enter the bulb and lower the temperature of the filament before the cracks between the fragments are of sufficient size for the explosion to pass out. The manner in which the bulb breaks may, therefore, have an influence on the results.

The temperature of normal operation of the carbon-filament lamps for a consumption of 3.5 watts per candlepower is valued at about 1400 deg. by certain authors and about 1600 deg. by others. The U. S. Bureau of Standards fixes this temperature at 1800 or 1820 deg. C. These differences arise seemingly from the difficulties presented by high-temperature measurements in general, and especially in measuring the temperatures of incandescent filaments.

Temperature of Filament and Rapidity of Gas Ignition

When a bulb is broken in a gaseous medium, or when the current is passed through the filament of a lamp broken in advance, we obtain:

1. Combustion of the filament without ignition of the gas.
2. A retarded ignition, which sometimes takes place after several seconds without the wire necessarily having been ruptured.
3. An immediate ignition.

After a series of immediate ignitions, there are sometimes produced one or more retarded ignitions; sometimes also the filament burns up without lighting the gas. On the other hand, the retarded ignitions are sometimes followed by immediate, or less retarded ones.

The tests on bulbs opened before introduction into the testing apparatus show that by greatly overvolting the lamps we get immediate ignitions; by overvolting them less, we get retarded ignitions, and by not overvolting them at all, or by letting them fall below the normal voltage, the filament more often than otherwise breaks without lighting the gas.

The immediate ignitions require high temperatures of the filament for their production. For lower temperatures the filament burns without lighting the gas, or produces retarded ignitions.

When breaking the bulbs in the testing apparatus itself, we obtain immediate ignitions with lamps working at their normal voltage. The same temperature of the filament may evidently be produced by a weaker current when the filament is in vacuum than when it is in the air.

The minimum temperature necessary to obtain these ignitions is about 2050 deg. C. The majority of the four-volt lamps tested work normally at temperatures above this latter; those whose filaments have a lower temperature, have a weak lighting power, and their consumption of energy per unit of luminous effect is excessive.

It has often happened that when the bulbs were broken in the testing apparatus itself, retarded ignitions were obtained for temperatures very much above 2050 deg., but there is room for believing that the manner in which the bulb was broken influenced these results. As has been explained above, it seems reasonable that the temperature of the wire decreased before the ignition was able to pass to the outside through the cracks between the fragments of the broken bulb. To avoid too frequent breakages of the filament by fall of the pieces of glass when the bulb broke, we coated the jaws of the vise with a cement, so as to hold the fragments. This explains the ease with which they could be held in contact.

Influence of Resistance in the Circuit

The retarded ignitions seem due, in part at least, to the influence of the electrical resistance of the circuit on which the bulbs were connected.

This resistance is composed of:

1. The interior resistance of the battery of storage cells.
2. The resistance of the conductors.
3. The resistance interposed, in the majority of tests, to regulate the difference of potential at the contacts of the lamp.

The electromotive force absorbed in these resistances decreases when the intensity of the current lessens, and this falling off of intensity occurs in the course of the tests when the combustion of the filament reduces its diameter and increases its resistance. During the tests, the difference of potential at the binding posts of the filament therefore increases proportionally as the electromotive force absorbed in the external resistance diminishes, and from this may result an elevation of the temperature of the reduced wire. By observing with a pyrometer the combustion of a filament put in circuit with a resistance, we note that its temperature consistently increases, which is not observed when the tension at the binding posts of the lamp is constant.

It seems, therefore, that the resistance of the exterior circuit of the lamp must be, at least in part, the cause of the retarded ignitions. The temperature of the filament, which is too low at the beginning of the test to ignite the explosive mixture, gradually increases up to the point of ignition and may then cause immediate or less retarded ignitions.

When the filament has been much reduced by a series of successive incandescences, the difference of potential at the binding posts of the lamp differs little from the electromotive force of the battery. The filament then behaves as if the difference of potential at the binding posts of the lamp were constant; its temperature decreases at each incandescence and finally it burns up without lighting the gas.

The experiments made on lamps opened before introduction into the testing apparatus, show that in order to light the firedamp when the speed of the gaseous current is increased it is necessary to increase the superpressure on the lamps. This result, due to the greater cooling undergone by the filament in high-speed currents, could have been predicted in advance.

Experiments with Metallic-filament Lamps

We know that the illuminating power and the efficiency of incandescent lamps rapidly increase with the temperature to which the filament is carried. Taking as a unit the brilliancy of platinum at its fusing temperature, M. Violle found the following relations between the luminous intensities at the various temperatures:

Temperatures	Relative Intensities
775 deg.	0.00007
956 deg.	0.00120
1035 deg.	0.00450
1500 deg.	0.27100
1775 deg.	1.00000

For temperatures above that which corresponds to a consumption of 3.5 watts per candlepower, the carbon-filament lamps are quickly burned out. To improve the efficiency of the lamps, it is necessary to resort to certain refractory metals, such as tungsten, tantalum, iridium, osmium, zirconium, etc., filaments of which can stand higher temperatures without too rapid injury.

Osmium melts only at about 2500 deg., tantalum between 2250 and 2300, iridium at 1900, according to Violle, and between 2200 and 2300 according to Weyle. The temperature of fusion of tungsten is about 3080 deg., according to Burgess and Waidner, and of tantalum, 2910 degrees.

The metallic-filament lamps normally run at very high temperatures. According to the U. S. Bureau of Standards, the working temperature for tantalum lamps is 2000 deg., and that of tungsten lamps 2300 degrees.

By reason of the high temperature of their filaments, it might have been predicted from the start that these lamps would be more dangerous as regards ignition of gas than carbon-filament lamps. All the metallic-filament lamps experimented with have lighted the gas at their normal working temperature, and even at lower temperatures.

In a certain number of cases, several consecutive ignitions were obtained with the same filament, which shows that it is indeed the incandescence, and not only the spark of rupture, which causes the explosion. One filament, notably, gave 14 consecutive ignitions before breaking. In the cases where only one ignition was obtained, it was often noted that a current continued to circulate in the filament after the explosion of the gas, which shows that it was not interrupted. Certain metallic filaments have lighted firedamp at temperatures which with carbon-filament lamps present no danger.

Conclusions

It follows from these tests taken all together that the rupture of the bulb of an electric mine lamp with carbon or metallic filament must be regarded as dangerous in a gaseous atmosphere.

It is possible to manufacture lamps whose filaments will not reach a dangerous temperature, but the lighting power of these lamps will probably be very feeble, and the consumption of power per unit of light excessive.

By reason of the importance of this question of good underground lighting, it is preferable not to follow this method, but rather to seek to obtain electric mine lamps of high lighting power by raising the temperature of the filament up to the limit consistent with the required degree of durability. Under these conditions magnificent lighting powers may be obtained, but in order to get them it is necessary that the storage battery shall deliver during a working shift a current of 1.5 amp. at two volts, or better a current of 1 amp. at four volts.

And it is then absolutely necessary to guard against the danger resulting from a breakage of the bulb, by surrounding this with a thick and strong glass envelop with hermetically sealed joints.

Permanent Roof Sustention

By R. Dawson Hall

The blasting of rock causes it to occupy increased space. This property is utilized to provide support for the roof, chamber filling for miners to work on, and dams for culm flushing.

William Griffith, one of the distinguished engineers appointed by the Scranton Mine Cave Commission to investigate on its behalf the inadequate support of the city by the pillars of the coal mines thereunder, has filed two patents, Nos. 1,004,418 and 1,004,419. The first of these covers, among other matters, one of the recommendations embodied in his report to the city. That report advocated the method of filling up the workings by the blasting of the roof and floor. The greater volume occupied by the blasted rock is relied on to fill the place vacated by both rock and coal, and to support the roof.

Mine Cave Commission

To quote the words of Messrs. Griffith and Conner in their report: "It is a well known fact that loose rock occupies from 1⅔ to twice the volume of the same weight of rock in place. In other words, if a cubic yard of bed rock be broken to pieces, it will occupy a space of 1⅔ to 2 cu.yd. Your engineers have conceived the idea of taking advantage of this fact, well known to engineers, for the purpose of cheaply producing an adequate support of the rock and surface above certain classes of coal beds under the city of Scranton. So far as we know, this method, in its entirety, has never been used before in any coal-mining district, and the suggestion is here made for the first time.

"The process is applicable to beds less than 6 ft. in thickness, and so located that the shock in heavy blasting will not produce ruptures of the measures supporting adjacent coalbeds. It consists simply in blowing up the floor and shooting down the roof of the mine, each to a depth equal to the thickness of the coal bed. This produces a total thickness of loose rock equal to three times the thickness of the coal. The rock would be well packed together and have great supporting power, and moreover the desired ends would be attained in a comparatively inexpensive manner.

"This method might be adopted throughout the Dunmore seams, by blasting down the roof and lifting the floor in the abandoned rooms or in the roadways between the gob piles in the chambers. Wherever it is applied efforts should be made to fill completely the whole width of the chamber or roadway from wall to wall, so that the loose rock may be confined between the pillars, thus greatly increasing the resistance to compression."

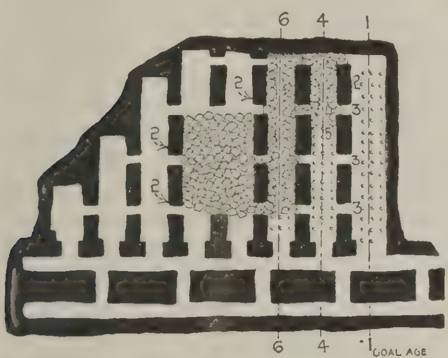


Fig. 1. Room-and-pillar Filling

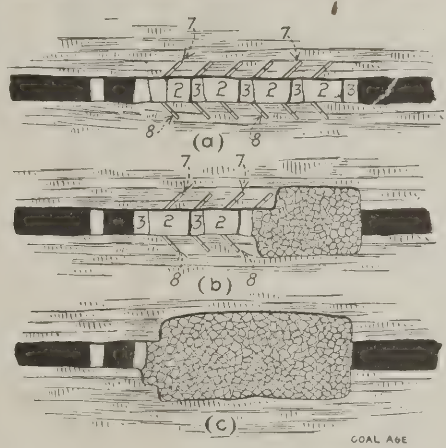


Fig. 2. Vertical Sections of Fig. 1.

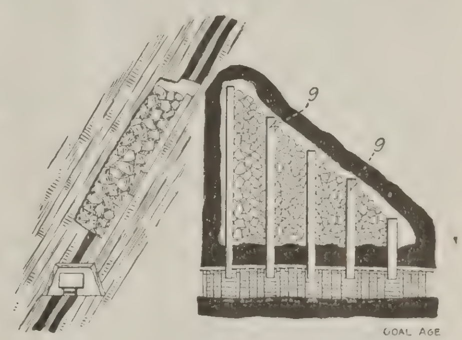


Fig. 3. Filled Longwall Working

Strength of Broken Rock

The following table taken from the same report gives a marked illustration of the value of rock fills for roof support. The measure of strength on which it is based is the number of feet of coal-measure rock necessary to compress the roof supports described, to the percentage of their height given at the head of the columns.

Thus a loose pile of broken sandstone of such size that all the material of which it is composed will pass through a 1¾-in. ring, and containing voids aggregating 40 per cent. of the whole mass and moreover without aid from lateral confinement, will shrink 5 per cent. when loaded with 20 ft. of rock, and 30 per cent. when loaded with 298 ft. of the same.

Rock Blasting in Level Measures

The method of operating under this plan is illustrated in five cuts. Fig. 1 shows a plan of a regular room-and-pillar working where the pitch of the measures is gentle. The room on the right is typical of the average anthracite workings. Fig. 2 (*a*) shows a vertical section along 1-1. In both plan and section, 2 represents the pillars between the crosscuts 3. Fig. 2 (*b*) shows a vertical section along 4-4. From 5 to the end of the room, the proposed method of roof support has been adopted and the whole space has been filled with the débris. In Fig. 2 (*c*) is seen a vertical section 6-6 of the third chamber, the shooting of the top and bottom having reached a further stage. The holes marked 7 in the roof and 8 in the floor are bore holes prepared for the blowing of the roof and of

SUPPORTING STRENGTH OF BROKEN SANDROCK OR SANDSTONE

Loosely Piled

Material	Voids	Percentages of Shrinkage							
		1	3	5	10	20	23	27	30
Sandstone passed through 1¾-in. ring	40 per cent.	..	..	20	53	124	....	...	298
Sandstone voids filled with sand	40 per cent.	..	..	21	53	186	....	...	465
Large-size sandrock	45 per cent.	..	..	45	66	121	....	...	492

With Lateral Confinement

Material	Voids	1	3	5	10	20	23	27	30
Large sandrock	50 per cent.	12	27	45	117	434	...	715	....
Sandstone	40 per cent.	..	44	74	177	680	....	...	3315
Sandstone with voids filled with dry sand	40 per cent.	..	46	77	325	4100	8860	...	...

the floor. The proposals of the inventor are to use this method for different purposes, either on "first" mining to permit complete extraction at one operation or after first mining to provide for the robbing of pillars left in. It is also claimed that the roof will be upheld by the broken rock at all times, so that the surface will have a minimum subsidence. The intention is to use the rock where it is blasted. Mr. Griffith prefers to blow the holes in roof and floor alternately, apparently with the idea of breaking the rock more completely and in order that the rock in falling may fall on an uneven surface and roll over in a manner conducive to the creation of large interstitial spaces. The bore holes being inclined at 45 degrees to the strata, the roof rock will be shattered so that the same purpose of volumetric increase will be assured by that means also.

Mr. Griffith proposes either to fill the workings with broken rock while advancing in long wall or to fill alternate rooms in room-and-pillar workings and to extract from the unfilled rooms the pillars on either side of the same. These unsupported rooms and extracted pillar spaces can be subjected on the retreat to like treatment, the floor and top being blasted as the pillars are removed.

The inventor points out that the method is adapted to old workings as an assistance to pillars left in first mining or as a means of withdrawing those pillars.

Rock Blasting for Support of Miners at Face

Fig. 3 also illustrates the first patent, but contemplates a somewhat different method of mining. The right half of the figure shows the plan of a longwall advancing method in steep measures intended to be pursued only for one panel at a time. From a gangway, a number of openings are driven up the pitch till a sufficient pillar is left to protect the heading. Then the openings are widened out, as is shown, so that no pillars remain between the various openings. To keep the passageway open for the miners and the coal, a chute is built of timber, metal or other desirable material. The miners can enter by any of these chutes. The coal is shown as having a slate split between upper and lower benches. This layer can be taken out and thrown back. If it proves unequal to filling the space behind, the roof is to be blown down, filling the whole area in such manner that complete sustention is assured. On this platform of rock the miner can work without difficulty.

Blasting with Flushing

The second patent No. 1,004,419 contemplates a change in the old-time culm or sand-flushing methods. In Fig. 4 (*a*) are shown three rooms from which the pillars and heading stump pillars are removed. Within the space thus left unsupported, the roof and floor are shot in a roughly circular ring, the shooting being regulated so that the blasted rock will make a complete circular wall, filling not only the place where the coal was excavated, but the space from which the rock itself was blasted. This blasted rock is expected to fall in such manner that it will key itself firmly and resist extrusion. A section 2-2 taken through the chamber is shown in Fig. 4 (*b*). It will be seen how the rock 1 fills the blasted

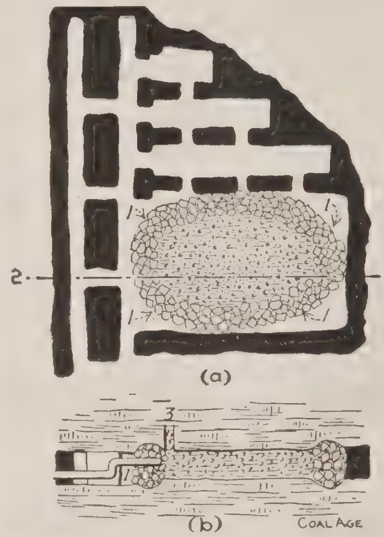


Fig. 4. Continuous Rock Dam for Flushing

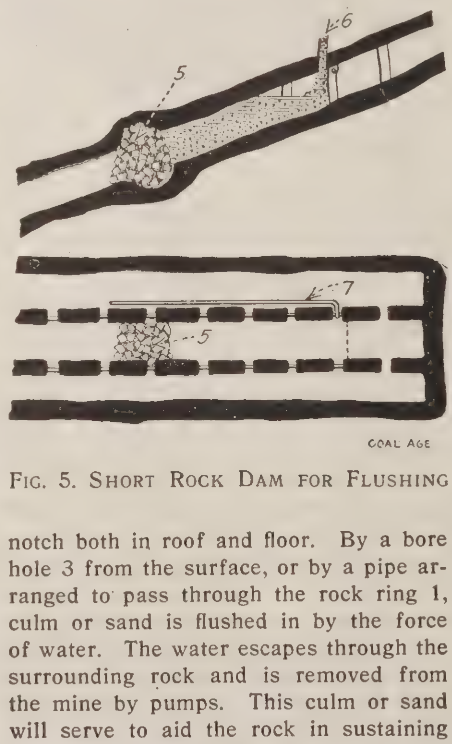


Fig. 5. Short Rock Dam for Flushing

notch both in roof and floor. By a bore hole 3 from the surface, or by a pipe arranged to pass through the rock ring 1, culm or sand is flushed in by the force of water. The water escapes through the surrounding rock and is removed from the mine by pumps. This culm or sand will serve to aid the rock in sustaining the roof. It will then be possible to rely on this artificial pillar and to remove adjacent pillars. The coal pillars thus removed can be replaced by the erection of another artificial pillar like that just described. Fig. 5 is a plan of a heavily pitching chamber with the usual crosscuts on either side. Mr. Griffith proposes to blast a dam 5 by shots in the roof and floor and then by means of a bore hole 6 leading to the surface, or by a pipe 7 passing through a brattice, to flush culm or sand or other material till the chamber is filled, the lateral movement of the filling being resisted by the brattices, as in the case of the foregoing patent. The artificial pillars thus created can be used for maintaining the roof in abandoned workings or during second mining, where merely the sustention of the surface is sought or it may be used in first mining to aid in a final recovery of the coal.

The systems by Mr. Griffith appear a notable addition to the present practice of mining. The need for an increase in the practice of "flushing" or "slushing" or for a system replacing it is keenly felt. The time is passing when it can be confidently asserted that the value of the pillars is less than the cost of their recovery by approved methods.

Italy's Coal Trade

Italy mines annually about 500,000 metric tons of lignite and imports each year 10,000,000 metric tons of various kinds of coal, according to Vice-Consul Alden March, who writes from Leghorn in the province of Tuscany. The United Kingdom practically controls these imports. Cheap freight rates and the opportunity to take home return cargoes count heavily in favor of the British mine operators.

The industrial development of Italy will demand annually greater quantities of coal. In many localities the wood supply for domestic purposes is growing smaller, and the more general introduction of coal stoves makes for a larger consumption of anthracite. These conditions would seem to warrant the serious consideration of American coal men.

In the Leghorn district there is an increasing demand for all kinds of coal. It is used for railways, manufactories, smelters, and to supply household demands. The province of Tuscany, of which Leghorn is the port of entry, consumes annually about 100,000 tons of domestic lignite, 300,000 tons of Cardiff steam coal, 100,000 tons of North Country and Scotch coal, 120,000 tons of Newcastle gas coal, and 50,000 tons of Westphalian coal, to which may be added about 10,000 tons of so called patent fuel. No coal is at present imported from the United States.

Sometimes a good way to promote the market for a given kind of coal is to conduct a campaign of education on the proper way to use it.

Coal Situation in Germany, 1911

By O. H. Hahn*

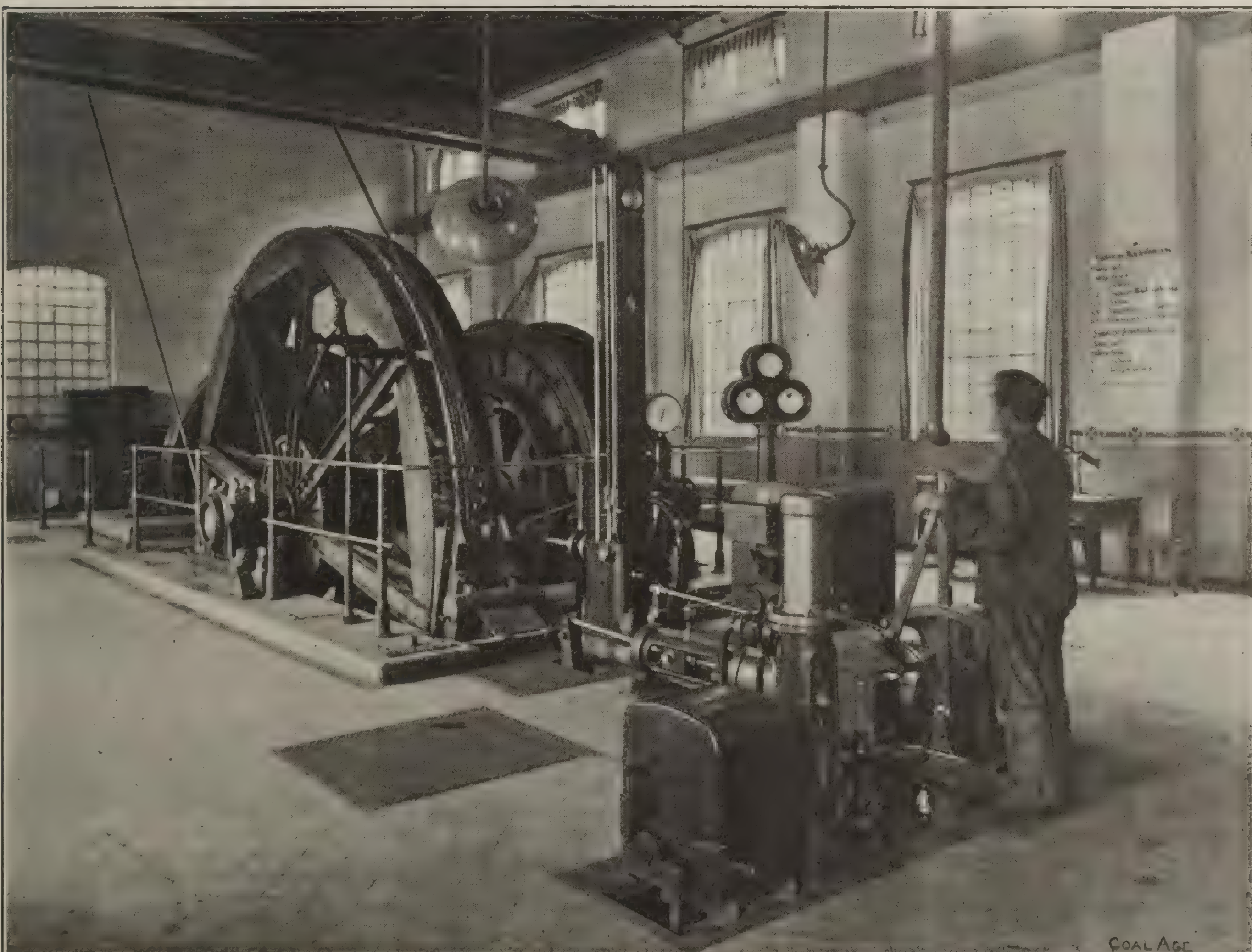
The state railroads furnished an inadequate car supply while drouth in rivers made demand for rail transportation heavy. Silesian coal is being replaced in foreign markets by British. Government admits its error in purchase of Stockheim colliery. Sixty-five million tons of lignite mined.

*Schillerstrasse 6, Jena, Germany.

During the year just past, the regular production and disposal of coal has been greatly hampered, owing to the inadequate supply of rolling stock furnished by the state railways for the transportation of the product of the collieries and iron works. The situation was aggravated still more by the uncommon drouth which put a stop to navigation on rivers and canals for a period of two and, in some cases, three months, whereby additional freight was thrown on the hands of the railroads. The newspapers of the industrial districts published daily lists of cars ordered and furnished, which must have been unpleasant reading to the government officials. Thus, for instance, in Upper Silesia during 14 days in October, out of 43,108 cars demanded per working day, there was a shortage of 3079 cars. At Essen, Rhenish Prussia, of 29,201 cars ordered there was a shortage of 6145, and so forth. The effects of such a state of affairs are manifold and distressing. The surplus output of mines, briquet factories, etc., has to be stored in the yard or outside, which causes extra expense and injury to the quality of the material by weathering. When the limit of space is reached, the output has to be curtailed, and this only can be done by putting the workmen on half time or by laying them off altogether. This means diminished earnings for them, and this is especially hard at the present time, when all commodities of life have gone up in price. Discontent of the workmen will lead to strikes, and signs of unrest have been apparent for some time in the Ruhr district, one of the busiest in the country. As general expense, maintenance of plant, etc., will remain the same, the cost of the products will, of course, become higher. Consumers will also suffer by not being able to rely on their orders being filled. Nevertheless, in the face of these adverse circumstances, the production of coal in 1911 has kept up to the figure of 1910, viz., 150 million tons.

Independent Coke Producers Suffer

Coke is rather a drug in the market at all so called "reine Zechen," which are collieries not connected with iron works. The "Hüttenzechen," or furnace-owned collieries, are competing with the "reine Zechen" in the disposal of their surplus coke. Through lack of shipping facilities the "reine Zechen" have not been able to ship much of their coke abroad. It is true there is a pool, the Rhenish-Westphalian coal syndicate, composed of



Interior of Hoist House, Showing Main-pit Winding Machine at a German Colliery

"Hüttenzechen" to regulate and maintain prices, but the "reine Zechen" would fare badly in joining that organization, as their quota of production would be set as low as possible by the pool.

So it is fortunate that some of the byproducts made by the coke-producing collieries find a ready market. Thus, there is an ever-growing demand for sulphate of ammonia, while tar, benzol, naphthalene, solvent naphtha, toluol, etc., also sell briskly at times. Moreover, gas is often sold for power. The byproducts of the Rhenish-Westphalian district are disposed of by a joint selling agency at Bochum, which is called the "Deutsche Ammoniak-Verkaufsvereinigung." The prices are made up on the basis of the London quotations.

Silesian industry, especially the Upper Silesian collieries, are clamoring more than ever, and with good reason, for a reduction of railroad rates to reconquer the Berlin market for coal, which they have lost to Great Britain.

Misplaced Investments

The kingdom of Bavaria, which is not rich in mineral treasures, especially not in coal, has suffered a serious financial loss in the collapse of its Stockheim colliery. It was purchased by the state from private parties only 2 or 3 years ago for 2½ million marks ($595,000) on the representation that it had a reserve of 5 million tons of good coking coal. After putting up a costly coal-cleaning works and on opening up the mine on a large scale, it was found that the coal was almost worthless. To cut off the recurrent losses the mine was finally shut down, and the government had to make a clean breast of its mistake to the Diet; not a pleasant duty by any means. Besides it had to find employment for the people depending on the mine work for their living.

In Westphalia, the "Stolberger Aktien Gesellschaft" was obliged to close its Lukas colliery, after having spent several years of labor and several million marks in money on opening it. The reasons for so doing have not been made public.

Lignite Tonnage is Large

Germany has an abundant supply of lignite in its tertiary formation. There are 18 distinct districts, foremost of which in production is the Thuringian-Saxonian, with an output of 25 million tons. Then follow the Lower Rhenish and the Lower Lusatian with an equal output of 15 million tons. All told, 481 mines yield about 65 million tons. A large portion of the lignite is briquetted, for in this shape it is better suited to household use. In industrial establishments, where the mine-run coal is used, step-grates are required for burning it. The lignite mines are frequently owned by or connected with beet-sugar factories, cement factories, brick-yards, etc. One of the largest lignite mines is the "Marga," owned by the Ilse Brown Coal M. Co., in Upper Lusatia. It is equipped with 36 briquet presses and the largest steam shovel in Europe, if not anywhere. The sale of briquets is also controlled by selling agencies, in order to prevent demoralization of the markets. The lignite producers have to compete with their Bohemian colleagues to a certain extent, as the latter have cheaper labor and river navigation in their favor. The new law passed by the Reichstag, which authorizes the levying of river toll by the government, may destroy this competition.

Electric Transmission in Coal Mines

By Henry D. Jackson *

The transmission system is frequently a neglected part of the electrical equipment in coal mines. Its proper installation and maintenance are, however, most important factors in reducing the cost of power and securing the operation of electrical apparatus against undue expense for repairs.

Within the past few years the use of electricity in coal mining has increased rapidly, particularly the introduction of alternating-current generating and distributing systems. These usually deliver high-voltage alternating current to substations where it is transformed to direct current for use in and about the mines.

Direct-current generation and distribution have been in use for some time, and have proved in many respects far more satisfactory than compressed air and other forms of power. In many cases they have operated to displace both mules and compressed air as means for hauling coal cars over long distances, although mules are still in general use for bringing the cars from the rooms to the entries or to the electric-haulage system. In gaseous mines, mules and compressed air are still largely employed, but even in this field the gradual displacement of both seems probable as a result of the development of the storage-battery locomotive, which has all its parts carefully inclosed, the controllers operating under oil.

It is a curious fact that in many mines operating by means of direct current, the distribution system is frequently neglected to a far greater extent than is warranted by the conditions. As a rule the stations are fairly well kept up and operated with average economy. The locomotives are kept in fair condition considering the work they have to do and the labor that is employed to operate them; but the transmission system, by which is meant the wires or cables carrying current to the motors and the track or return circuit carrying current back to the station, is often kept in bad shape. So far as I have been able to ascertain, the reason for this is the illogical assumption that, owing to the fact that coal costs the mining operator but little, the power cost is proportionately low. The coal should be charged up to the power plant at a price equivalent to that for which it might be sold, unless it happens, as it does in some cases, that the coal used is the culm pile, under which conditions it would naturally be considered as having no value beyond the cost of taking it from the mine and delivering it to the bunkers.

True Cost of Electric Power

Under most conditions, coal operators seem to consider that the cost of electricity as delivered to the machines or to the line, is the plant operating cost only, that is to say, the cost of the labor, oil, water, coal, and possibly the maintenance charges. This, however, is not true. The cost of power should take into account the interest, depreciation, etc., on the power plant, and in many cases an allowance for pretty heavy taxes. The cost of power plants in the coal regions is not low, owing, among other reasons, to the fact that in many cases the plants are so located as to involve a considerable charge for the delivery and erection of machinery, so that the interest charges are heavy, the repair charges equally heavy, and the total cost of power is greatly in excess of the operating charges alone.

Economical use of the power generated is therefore necessary to reduce to a minimum the size of the units which may be required for such power generation, or, in other words, to secure the operation of the largest possible number of locomotives and other apparatus with the minimum power output. This can be done only by keeping the transmission system always working at an efficient point; by doing away with excessive transmission losses

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due to the use of small feeders, leakage losses due to poor installation and losses in the return circuit through poor bonding and restricted area of the return feeders.

Besides the waste of power, another feature of excessive losses on the transmission line, which is equally bad from the operating standpoint, is the consequent increased heating of the motors and the reduction in the speed or power of the locomotives which results in a marked decrease in their hauling capacity or in the amount of coal that can be handled by a stated number of locomotives. It is a fact that for the best results as regards economy of distribution, the interest and maintenance cost of the copper and the return circuit should be equal to the cost of power lost over them during the year. If the lost-power cost is greater than the interest and maintenance, the circuit is too small; if it is less, the copper is too large. This is true, however, solely from the financial and theoretical standpoints. There are other considerations than these. In a small plant, it is impossible to put in a small enough amount of copper to fulfill the above condition, because such an amount would not allow the operation of the locomotives at all; and in a large plant, the amount of copper called for would be far too small. So, this condition is a point to be taken into account but should be supplemented by considerations which are necessary to insure that the motors will get sufficient power for their operation and will be enabled to work at their full capacity without excessive heating and repairs.

Calculation of Copper Required

In installing the copper for a transmission system, it is advisable to make some calculation as to the probable load that will be brought upon the system, and locate the approximate center of the load. Then, on the principle that the voltage at this center of distribution should not drop below a point at which the motors will operate satisfactorily with the maximum current on the line, the total resistance of the line should be determined from the formula

$$R = \frac{E}{C}$$

where

R represents the resistance;

C represents the current;

E represents the electromotive force.

Then E will represent the electromotive force lost over the wires or the total drop in the circuit. Knowing the dimensions of the rails, the resistance of these can readily be calculated by figuring that each pound of rail per yard is equal to 9000 circular mills of copper. Then, knowing the length of the rails, their total resistance can be figured, and the difference between this amount and the value of R as calculated by the above formula, will represent the resistance which may be allowed for the overhead conductor. If it turns out that it is more expensive to install copper overhead than it is to add it to the return circuit, additional copper may be used for the return, and a smaller amount used overhead. After this copper has been figured, and laid out, it can, of course, be distributed so that it covers the entire line to be electrified, using a heavy section up to a point at about the center of the load and from there on, reducing its size at intervals, in accordance with the length of the line, until finally the trolley wire alone is carried to the extreme end.

Having laid out the copper in this way, a load curve should be approximated, showing as nearly as can be the actual amount of power used from time to time throughout the day, and, if possible, the average for the year. As a matter of fact, the average is not the best figure to use, because the power lost over the wires is equal to the current squared, times the resistance, and the discrepancy will be considerable between the calculated and actual drop in voltage during a period of overload, but for all practical purposes, if the average is multiplied by $1\frac{1}{10}$, this figure will give near enough to the figure required for determining the loss. By multiplying the total resistance of the circuit by the square of $1\frac{1}{10}$ times the average current and by the total number of hours in which it is used during the year, the power lost for the year may be calculated. If by adding additional copper this loss can be reduced to such a figure that the cost of the wasted power will more than pay for the interest on the additional copper required, this copper should be installed as an evident economy.

Rail Bonding

On the return circuit, rail bonds are necessarily used in order to secure a good electrical circuit. These bonds are a continual source of trouble, frequently giving out and resulting in a high resistance on the return circuit. They should always be kept in good condition. It costs but little to keep them so, and the loss due to a single bond when in bad shape is equal in a year to many times the cost of the bond itself; moreover, the operation of the haulage road is otherwise materially affected. A good transmission system, properly designed and worked out so that its losses are kept low, will result in:

1. A decided reduction in the amount of power required to be generated.
2. A low cost of power distribution.
3. A considerable increase in the amount of coal that can be handled.
4. A marked reduction in the motor repairs, both for the locomotives and the cutting machinery, because of the smaller current required for their operation, owing to the higher voltage.

These are points well worth considering, and the transmission system is an item worthy of far greater attention than it now receives.

Electrically Operated West Virginia Mines

By F. C. Perkins*

Electric locomotives as well as electrically driven pumps and ventilators are used extensively at the mines of the Davis Coal and Coke Company in West Virginia. This company owns 160,000 acres of coal land and operates mines, along the lines of the Western Maryland Railroad, at West Virginia Central junction, Elk Garden, Harrison Henry, Coketon, Weaver and Thomas.

At Thomas, W. Va., the Upper Freeport coal is mined by drifts at tipple height above the railroad. Mine No. 23 has been operated for a number of years and has extensive workings but is still a good mine, producing 1200 tons of coal per day from a seam 8½ ft. thick and free from noxious gases. Mine No. 25 is directly opposite with a drift opening slightly to the dip in the same seam of coal, and mine No. 24 is worked by a shaft 20 ft. deep penetrating to the Davis seam of the Lower Kittanning. This group of mines is operated entirely by electric haulage and other electrically driven equipment.

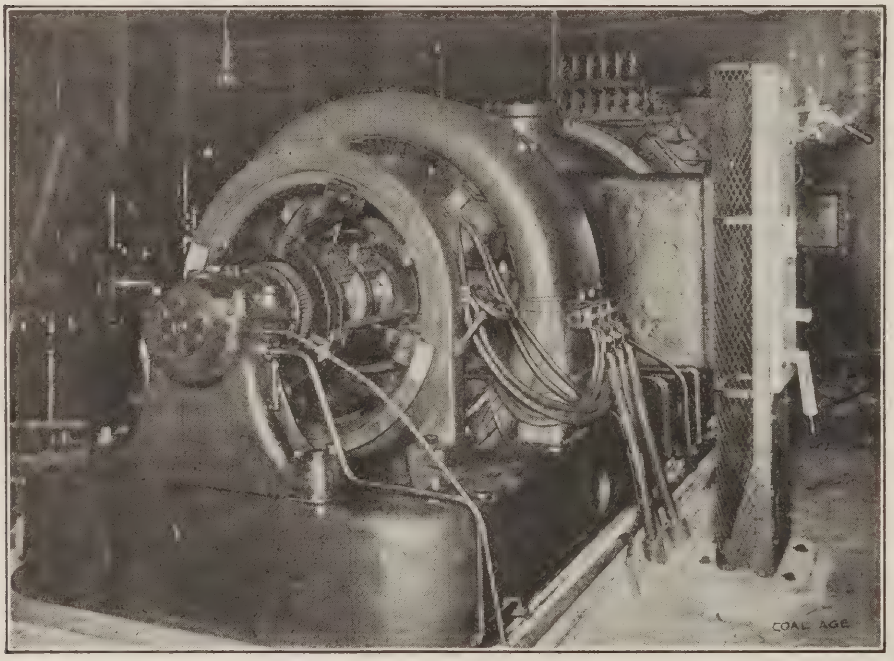
There are also 114 coke ovens at this plant served by electrically operated coke larries of the General Electric type. The results obtained with these larries, which run along the top of the ovens where the heat is at times excessive, and where the fumes would be injurious to horses or mules, have been excellent. It has been found also that they are much quicker in operation than the animal-propelled variety because the control is so perfect that when about to discharge into the oven they can be moved backward or forward an inch at a time. They are used either independently or with trailers, and offer a flexibility not otherwise obtainable.

While the operation of the electrically equipped larries has always been all that could be desired, more or less trouble was experienced from time to time with the haulage locomotives, as the workings in these mines became more and more extensive, the length of hauls greater, and some steep grades necessary. To remedy this condition the capacity of the trolley lines and feeders was increased by the addition of copper in order to reduce the drop in voltage which took place when heavy loads were started up at the working face, the track bonding was thoroughly overhauled, and the rails put in condition.

*Buffalo, New York.

The Turbo-generator

However, it was only upon the installation of the 500-kw., 600-volt, direct-current steam turbo-generator shown in the illustration, that these troubles entirely disappeared. The turbine is of the Curtis horizontal, high pressure type, operates at a speed of 1800 r.p.m. and is directly coupled to a four-pole General Electric dynamo. It is considered to have demonstrated the particular suitability of this type of prime mover for handling the enormous fluctuations in load which occur in mining work. The normal current of this machine at full load is 833 amp. but the unit is continually called upon to handle loads varying from practically 0 to 1450 amp. and these variations recur, sometimes at intervals of a minute or less; for example when a train is picking up cars at the far end of the mine. This installation possesses the steadiness required to stand up under these severe conditions and there has resulted the entire disappearance of the formally frequent burn-outs of motor armatures, etc.



Direct-current Turbo-generator Set, Thomas Mines

The 500 kw. turbine generator provides current for one 20-ton and eight 13-ton electric locomotives and for the coke-oven larries.

Direct-current series motors were adopted at this mine for haulage and hoisting purposes because of their characteristically high torque at starting, and it was decided to generate power at a potential of 600 volts owing to the long distances to which it had to be transmitted. It is maintained that the objection of increased danger to men and animals, where the latter are still used for gathering purposes, which might be raised against this high potential is more imaginary than real because of the fact that the current is turned off while the shifts are changing and, as a matter of fact, there has been no loss of human life from electric shocks in the company's entire history.

While 600-volt direct current is used for haulage in all of the various workings, three-phase alternating current is employed for practically all other purposes around the mine. For street lighting, single-phase alternating current, derived from constant-current tub transformers, is used. The power plant is equipped with two 100-kw. three-phase 60-cycle alternators, for operating the tipple machinery and the pumps. There are three of the latter in use, one having a 3-in. suction and 2½-in. discharge, one a 6-in. suction and 5-in. discharge and one a 10-in. suction and 8-in. discharge.

Automatic Water Purifying System

The purification of water for boiler feed and other industrial purposes is quite essential in many plants. Numerous machines and devices for this purpose are on the market and the selection of one for any particular case depends largely on the cost of installing and operating the same.

An apparatus for water purifying, which is entirely automatic in its operation and one which may be installed for a comparatively moderate price has recently been put on the market by the Geo. W. Lord Co., of Philadelphia, Penn. The apparatus consists principally of one large settling and filtering tank, two mixing tanks, one chemical storage tank, and two measuring chambers.

The incoming water first passes over a waterwheel which furnishes the power to operate paddles in the mixing tanks and chemical storage tank. From the wheel, the water flows to either one or the other of the two mixing tanks directly below, where it comes in contact with the chemicals flowing in by gravity from the chemical storage tank. The solution of chemicals is measured out by an automatic measuring valve, and the speed of operation of this valve varies with the flow of the water. Hence, the correct amount of chemicals is mixed with the water, no matter what the rate of flow may be.

From the mixing tanks, the water flows through a large cylindrical tube, to the bottom of the settling and filter tank where it drops the bulk of the precipitates which are formed, into the cone-shaped hopper bottom of the tank, whence they are removed through a sludge valve designed for this purpose. The water then rises, and after passing through an excelsior filter flows off through the outlet pipe at the top of the tank.

The inlet and outlet pipes of the two mixing tanks are controlled by lever valves, which are automatically operated so as to cause the water to flow first into one and then into the other of the tanks. These valves, as well as the chemical measuring valve, are operated by sets of levers which are shifted by a dumping bucket, the latter being actuated by the weight of water run in from overflow pipes.

A valve in the inlet pipe, which is governed by a float in the filtering tank, controls the entire operation of the apparatus.

Rules for Firing Shots

The following drilling and shot-firing regulations make for efficiency and safety as well as economy of time, labor and powder:

(1) Holes drilled in solid faces should be 6 ft. apart horizontally.

(2) Extract all coal dust from the drill holes before charging.

(3) Undercutting should extend at least 6 in. beyond the drill hole.

(4) Drill holes should be at the least 2 ft. 6 in. deep.

(5) The bottom of holes drilled in a solid corner should come within 1 ft. of the rib line.

(6) Giant powder should never be issued to miners while it is frozen, and should always be carried in canvas bags.

Boyles law states that, "the volume of a gas is inversely proportional to the pressure upon it, providing the temperature remains the same," hence variations in atmospheric pressure have a marked effect upon the quantity of gas given off by a coal seam. When a reduction in pressure takes place the amount of gas given off increases and gob gas overflows.

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Of this issue of Coal Age, we will print 6250 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Investigation of Explosives

Recent discussions by English engineers show that there is the same diversity of opinion on coal-mining problems in Europe as exists in America.

At a December meeting of British mining men, J. J. Prest in speaking of methods for laying coal dust said: "The one fact that stands out to my mind in all these experiments, is that a sufficiently large sum of money has not been placed at the disposal of the experimental committee of the government, to ascertain whether it is not possible to obtain an explosive that will not ignite coal dust.

"We seem to have gone on the other tack of spending thousands of dollars in demonstrating the inflammability and danger of coal dust. Experiments have been repeated, *ad nauseum*, to demonstrate only that coal dust is dangerous, whereas, if a tithe of the money had been spent in the direction of endeavoring to produce an explosive that will not inflame, or cause an explosion where coal dust is present in large quantities, then some of the money would have been usefully spent. I do not think it humanly possible to remove coal dust from the workings of a mine, and all the experiments and suggestions which have been made are simply playing with the subject."

While we do not agree entirely with the views of Mr. Prest, because the money recently expended in this country by the Bureau of Mines on investigations of explosives, has resulted in much good; it is a fact that the greatest basic danger to coal mines would be remedied if explosives could be made absolutely safe.

There has been a considerable advance in the manufacture of mine explosives during the past two years, but the best powders we have today still flame, and when conditions are right, an ignition of gas or dust is liable to occur.

We believe with Mr. Prest that a greater proportion of the money now being spent on investigations leading to safety in coal mining, should be diverted to a serious solution of the explosives problem. The present terms, "permitted," "safety," "flameless," etc., only mean that one powder is a little less dangerous than another brand.

Some More Electrical Don'ts

The following "don'ts" are submitted for addition to the electrical warning list, recently issued by the Bureau of Mines.

(1) Don't permit the use of timber near your underground electrical pumps and other stationary motors. A fire took place, July 17, 1910, at the Devon colliery of the Alloa Coal Company, Clackmannan, Scotland, in a pump room containing a 70-hp. motor driving a triplex pump. This fire could not have been started by lamps for none were present. It evidently originated at the motor controller because that was the only part seriously burned. The controller was filled with oil which is believed to have ignited, setting fire to the timber and thus filling the mine with a dense cloud of smoke.

How this fire occurred is open to doubt. Either a fuse, in blowing out, ignited the fumes from the 10 or 12 gal. of oil which the resistance and switchbox contained, or else the oil was ignited by a short circuit between the terminals just inside the box. Two men were killed by passing through the smoke. Two other fires occurred: one on Aug. 17, 1910, at Pleasley colliery, Derbyshire, and the other on Oct. 1 at the Manvers Main colliery, Yorkshire. Both these fires were caused by the fusing of a cable at or near the entrance of a pump room, the resulting arc setting fire to the adjacent timber. In 1909 at the Blaenant colliery in South Wales a similar accident occurred with fatal results, and a number of fires have been caused by the same agency.

(2) Don't put a trolley wire or other bare conductor where it may, on falling, cross another bare wire which is not usually charged or is generally charged at a lower potential.

An insulator on an overhead electric line broke and permitted the wire to come in contact with a steel stay. Some cars left the track and made a contact with the

latter. A yard foreman who assisted the driver of the trip received a fatal shock. It is needless to point out how essential it is to protect electric wires from non-electric or from other electric wires of a different potential. Signal wires and shot-firing wires should be kept away from trolley wires.

(3) Don't put a bare wire such as a stack or other stay wire, where on failing it will cross-circuit a trolley wire or bare conductor. This is dangerous because, if the wire breaks as it probably will, between the ground and the trolley wire, there will be no direct grounding, and the return may cause a fire, and electrify a conducting body which normally is harmless.

(4) Don't leave unsafe trees near trolley lines. A motorman in the southern part of West Virginia received a severe shock from a fallen trolley line, the line being brought down by the fall of a rotten tree in a heavy gale.

(5) Don't install your fuses near an oil controller box, for if a fuse burns out ignition of the fumes from the oil may result.

(6) Don't install oil controller boxes when using a low-potential current in mines where naked lights are permitted. In such a case they are a menace without compensating advantages.

(7) Don't hang wires insulated or uninsulated on weak roof unless the roof is protected by adequate timbers.

(8) Don't hang wires, if it can be avoided, on collars supported by posts which are not set back in the rib. This applies especially to curves, where derailments are more frequent than elsewhere. Crossbars set in the coal are to be preferred. If this arrangement is not practicable, put heavy 3-in. plank at the level where the frames of the motor or the flaring of the cars would be likely to strike the timbers on derailment. Then block the timbers securely in place. The electrician would do well to note the condition of the track and timbers in such places.

On May 12, 1910, at the Blantyre Ferme colliery, belonging to Messrs. A. & G. Moore & Co., Scotland, a runaway car displaced some props, which brought down a girder. This cut a cable carrying a three-phase current of 400 volts, but as the neutral point of the system was connected to earth, the displaced girder was charged with only 230 volts. As the girder fell one end was caught on the cable; the other fell on a tie without making a sufficient ground. A workman tried to lift the girder and received a fatal shock. One recent explosion in England was alleged to have been the indirect result of the derailment of a motor. The motor tore down some posts and thus ripped down several feet of trolley wire. A dust explosion was said to have resulted.

(9) Don't omit to keep rubber gloves on hand on all motors and at all electrical pumps and substations for use in emergencies. On March 4, 1910, a motorman at Blackrigg No. 3 colliery of the United Collieries, Ltd., Scotland, got off his motor to work on an electric cable. The cable had a defective joint, which, being insulated by waterproof tape only, permitted the motorman to come in contact with the bare cable. A man offered to pull the motorman off, but this he would not permit. He instructed this man to shut off the current. This the latter failed to do, not knowing which switch to operate. Another man got some india rubber gloves and pulled the motorman off the wire. But by the time this was accomplished he was dead.

(10) Don't omit to ground properly all motor and generator bed plates, transformer coverings, mining-machine frames, boxes for inclosed switches and for junctions and such other exposed parts as are suitable for grounding.

On May 12, 1910, at the Auchengleich colliery, of Messrs. James Nimmo & Co., Scotland, a workman placed his hand on a transformer case in a longwall working. He was standing on an iron plate. The transformer took current at 400 volts and transformed it to 100 volts for use in lighting, the higher pressure being used for a conveyor operating along the face. It appeared that the cable had become worn at the brass bushing where it entered the case. The transformer case was thus electrified. The armoring of the cable might have served for grounding purposes, but apparently was so attached that it was not effective. The cable should be arranged so that there may be no stress on it where it enters the bushing or else a lug on the transformer should be connected to the armoring in such manner as not to be subject to any mechanical stress. A separate ground for the transformer would serve the purpose as well as any other method.

(11) Don't fail to ground the armor of your armored cables frequently, about every 300 to 500 feet.

(12) Don't omit to notice the condition of cables where two wires of different potential enter the cable.

(13) Don't omit to examine the openings or bushings of controllers, transformers, and switch boxes to see that the insulation of the entering cable has not been destroyed by rubbing.

(14) See that all switch boxes and all transformer cases completely inclose the conductors and wiring so that no inquisitive person is liable to be injured.

A boy at Bardykes colliery, belonging to the Summerlee Iron Co., Ltd., in Scotland, May 5, 1910, pushed a wire into a switchbox carrying 500-volt, 3-phase current with fatal results.

(15) Don't place naked live wires where, in oiling, the engineer or machine-runner may come in contact with them. The oiler may be able to turn off the current, but he may neglect to do so.

Employer's Liability Act

After almost a year's consideration, the U. S. Supreme Court, on Jan. 15, sustained the Employer's Liability Act of 1908. This act replaced one which had been declared unconstitutional, because it attempted to protect intrastate as well as interstate labor.

The act, thus sustained, abolishes the common law concept, which held that the employer was not responsible for the injuries inflicted by a coemployee. Interstate employees must now be defended in their work against the acts of their fellow servants.

Another interesting feature of the law is that it frees the employee or his dependents in some cases from facing the defense of "contributory negligence." In other cases it limits the effect of that doctrine.

The old common law regarded a contract of service as an agreement on the part of the employee to shoulder all the risks incident to that service if the dangers were known to him. The Supreme Court sweeps aside that common-law ruling and permits Congress to make laws which remove such consideration in the settlement of liability cases. No recent act is of more importance to the coal industry, than this latest ruling of our Supreme Court.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions for Beginners

Composition and Properties of Black Powder

Ques.—(a) What is the composition of black blasting powder? (b) What are the chief properties of this powder?

Ans.—(a) The theoretical composition of black powder is potassium nitrate (niter or saltpeter), KNO_3, 75%; carbon (charcoal), C, 12½%; sulphur, S, 12½%. Manufacturers, however, vary these proportions slightly and, in many instances, substitute for potassium nitrate the cheaper nitrate of soda ($NaNO_3$). The proportion of the several ingredients varies in different makes of black powder, as follows: Niter, from 74 to 77%; carbon, from 12 to 20%; sulphur, from 10 to 20%.

(b) The specific gravity of black powder varies from 0.89 to 0.94, so that a cu.ft. of the powder would weigh an average of $62.5 \times 0.92 = 57.5$ lb.; and 1 lb. of powder well rammed occupies $\frac{1728}{57.5} = 30$ cu.in. Exposed to dampness the nitrate salt dissolves, and the powder loses much of its strength. The soda powders are more susceptible to dampness than the niter powders. When powder is heated to 212° F. some sulphur is driven off and the powder loses some of its strength. At 668° F. the sulphur is ignited and the powder explodes. A good gunpowder ignited on a sheet of white paper should burn without blackening the paper.

Composition and Properties of Dynamite

Ques.—(a) What is the composition of dynamite? (b) What are the properties of dynamite?

Ans.—(a) Dynamite is nitroglycerin absorbed in some inert porous substance such as sawdust, wood pulp, or infusorial earth, which makes it less liable to accidental explosion when being handled. Nitroglycerin is a chemical compound formed by the action of nitric acid on organic matter. Its symbol is $C_3H_5(NO_3)_3$.

(b) Nitroglycerin is readily exploded by percussion or when heated to 250° F. The dynamite is wrapped in tough oiled paper, forming cartridges about 8 in. long and varying from ⅞ to 3 in. in diameter. The weight, in ounces, of an 8-in. dynamite cartridge is practically five times the square of its diameter in inches. Nitroglycerin freezes at —42° F., and when frozen is difficult to explode; exposed to a heat above 100° F., it evaporates freely, and the dynamite thereby loses its strength.

Tape Fuse in Blasting

Ques.—What is tape fuse?

Ans.—There are different kinds and grades of tape fuses adapted to the uses for which they are intended. These all consist of a continuous train of finely powdered gunpowder twisted or enfolded in paper, cotton, hemp, gutta-percha, or other similar covering. In coal mining, single- or double-tape fuse is commonly used, the latter being preferred because of its heavier coverings and better protection against injury in handling and tamping.

Gases Formed by Explosion of Powder

Ques.—What gases are formed by the explosion of black powder, and what is their relative volume?

Ans.—The principal gases formed are carbon dioxide, carbon monoxide and nitrogen, with varying smaller amounts of hydrogen sulphide, free hydrogen and marsh gas. These gaseous products vary with the conditions under which the powder is exploded.

The volume of the gases formed by the explosion of black blasting powder, measured at atmospheric pressure and a temperature of 32° F., is practically 360 times the volume of the original powder.

Pressure Due to Explosion of Powder

Ques.—What is the pressure that may be expected to be produced by the explosion of black powder in blasting coal? Show briefly how this pressure may be estimated.

Ans.—A pound of black blasting powder occupies about 30 cu.in. If this powder could be exploded instantly, in a confined space, the gases of the explosion would fill two-thirds of the space and have an estimated temperature, at the instant of explosion, of 3600° F. (the computed or theoretical temperature is 4400° F.). The remaining one-third of the space occupied by the powder is filled by the solid products remaining after the explosion. But the large grains of blasting powder burn slowly, in comparison; and, as a consequence, partial rupture of the coal occurs and expansion of the gases takes place with a reduction of temperature to about, say 2000° F., instead of 3600° F.

Since the volume of gases (at 32° F. and 14.7 lb. per sq.in. pressure) is 360 times the volume of the powder (30 cu.in.), there would be in this case $360 \times 30 = 10{,}800$ cu.in. of gas compressed into 20 cu.in. of space, which would increase the pressure in the ratio $\frac{10{,}800}{20} =$ 540 times. But the pressure is also increased by the rise of temperature in the ratio $\frac{460 + 2000}{460 + 32} = \frac{2460}{492} = 5$ times.

The total increase of pressure therefore may be estimated at $540 \times 5 = 2700$ times the original pressure, which, in this case, is $\frac{14.7 \times 2700}{2000} = 19.845$, say 20 tons per sq.in. The actual pressure may be more or less than this, according to conditions, but this may be assumed to represent a fair average, in mining coal.

Weight of Charge in Blasting

Ques.—What weight of black blasting powder should be used in blasting coal?

Ans.—The weight of a charge of powder to be used in breaking coal depends on the strength of the powder and the hardness of the coal, the thickness of the seam, character of the coal strata, size and depth of hole and its position in the seam. In general, these data vary so much that no hard and fast rule can be given, but experience alone must determine the weight of charge that will be safe to employ. The grade of powder used should be in accordance with the hardness of the coal. A shot is well placed when the depth of the center of the charge from the free face of the coal is about equal to the thickness of the stratum of coal to be removed by the shot, provided the coal is not undercut. The axis of the hole should always be inclined to the face of the coal, unless the coal is mined or sheared (sidecut); but always a line drawn from the center of the charge perpendicular to the axis of the hole should strike a face of coal in a distance less than the height of the coal.

If these rules are followed the weight of charge required will never exceed two pounds of black powder, or less, when one of the so called permissible powders is employed that is specially adapted to the coal in question. Approximately, 4 in. of a 3-in. hole, 6 in. of a 2½-in. hole, or 9 in. of a 2-in. hole will contain 1 lb. of powder well rammed.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

American vs. English Mine Fatalities

I want to say that I appreciate the article by James T. Beard on the death rate in the mines of the United States, per thousand men employed, in comparison with the same statistics in Great Britain. He states that the comparison should be on the basis of tonnage rather than on the basis of the number of men employed; and, using the figures in his table, I find for the same three years, 1908-1910, inclusive, the average tons mined per life lost in the anthracite district of the state of Pennsylvania was 134,047 tons, while in the bituminous district 247,318 tons were produced for every life lost. In Great Britain for the same period, I find the number of tons mined per life lost was 174,373 tons.

In comparing the production of coal in Pennsylvania with that in Great Britain, it would be manifestly unfair to consider the production in the anthracite field and attempt to compare this with the production for the same period of time in the bituminous mines of England, any more than we would attempt to draw a comparison between the anthracite and bituminous mines of Pennsylvania or any other state.

For example, the production of coal per life lost, 1908-1910, in the anthracite mines of Pennsylvania, is, as I have just stated, only 134,047 tons, as compared with 247,318 tons, during the same time in the bituminous mines of the state. The reason for this increased death rate in the mining of anthracite coal is to be found in the fact that every pound of anthracite coal must be mined by the force of powder. In Great Britain and in the bituminous mines of this country it is quite different, as the coal is undercut and less powder is required or used.

I have worked in the mines of Great Britain for twenty years and know what I am talking about in this regard. While there is considerable powder used in mining coal in Great Britain the amount per ton of coal mined is as nothing compared with the item in the anthracite district of Pennsylvania. The strength of these statistics is easily proved by comparing the tons of coal mined per life lost, in the anthracite district of Pennsylvania, with the same data in the bituminous district of the State, as I have shown above.

In the bituminous district of Pennsylvania 50 per cent. of the coal is mined with pick, while in the anthracite district every pound of coal mined is blasted with powder. Taking the average of the bituminous and anthracite mines, as Prof. Beard's figures clearly show, we have in the state of Pennsylvania 186,937 tons mined, for every life lost; while in Great Britain there were but 174,373 tons mined per life lost or, in other words, the production, including both anthracite and bituminous coal, in the state of Pennsylvania, per life lost, is still higher than the bituminous production alone, in the British Isles.

Pittston, Penn. W. D. Owens.

Timber Framing for Side Pressures

In reply to "Timber Foreman," in Coal Age No. 6, p. 188, I have found in framing for side pressures, that the ordinary notch invariably splits the cap, as shown in Fig. 1. This often happens before the post has taken the full weight of the side pressure.

Fig. 1 Fig. 2

Method of Framing

To avoid this, I have added 2 in. to the thickness of the leg and cut my cap at 45 deg. and the leg the same plus the batter. Then by nailing the piece cut from the leg in the corner, and driving two small track spikes in the cap and two in the leg, as shown at *N N*, Fig. 2, a strong durable joint is obtained.

This is a quick and simple way, and I have never known it to fail.

Joseph Virgin.

Plymouth, W. Va.

Textbooks at Examinations

In your issue of December 23 you advocate that aspirants be granted the privilege of using their textbooks at fireboss' and mine foreman's examinations. I cannot grasp your argument. Do you think that failure to pass is merely a sign of weakness of memory? To my mind, the defect is rather that the applicants for certificates don't try to memorize the rules, and they don't study enough to know the whys, the whens and the wheres from which those rules originate. I am of the opinion that the examinations should become more technical, so that those who desire to pass will read and study more. I think also, that a person seeking a certificate as fireboss should have at least ten years' practical experience in coal mines and he should serve two years as fireboss before being granted the further distinction of mine foremanship.

We are becoming more enlightened and progressive year by year. Yet we believe that a man can get a sufficient experience in a few years. We used to go to work with our fathers and learn by long experience what were the difficulties to be met with in mining and we would profit by what we were told. But now so short a period of time is spent in learning the problems at the face that there are many who are seeking certificates who have not materially benefited by others' experience or theories.

Moreover, even if the examinations are too trying mathematically for the practical man it must be admitted that all the examining boards deal leniently with him, believing that figures are less important than the facts of actual practice. They don't expect him, or themselves, to know all the latest developments of science or its more profound depths.

I should like to hear someone else express his opinions, someone who has worked such long shifts in the mines that his dinner bucket dragged the ground as he struck the trail for home after working for 10 or 12 hours, and who has nevertheless memorized the rules and formulas and needs no book in hand to solve the problems presented.

Iago.

Marion, Ill.

An Efficient Arrangement

In one of our gaseous mines where all hauling on the intake entries is done in the day time, we have found that a combination of steam jets and water sprays is the best method of laying the dust. When hauling is being done the water sprays are used. During the night, when haulage has ceased, the steam spray is turned on and the main entries and intake are thoroughly moistened.

Birmingham, Ala. Foreman.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Size of Rope, Deep Shafts

Please give me a formula for calculating the size of a wire rope that will be capable of hoisting a given load, say 5½ tons, including the weight of the cage, car and coal, making due allowance for the weight of the rope and friction, assuming a certain depth of shaft, say 150 yards. What is meant by factor of safety?

MINE FOREMAN.

Dunfermline, Ill.

Add one-tenth of the load to be hoisted, to allow for the friction of the hoist, which makes the total load at the end of the rope, in this case, $5.5 \times 1.1 = 6.05$ tons. The load on the rope at top of shaft is greater than this by the weight of the rope, which depends on its diameter (d), in inches, and the depth of the shaft (D), in feet.

Since the weight of a 1-in. wire rope is 1.58 lb. per foot, and the weight varies with the square of the diameter of the rope, the weight of any wire rope whose diameter is d is $1.58\,d^2$ lb. per lineal foot. The weight of the rope hanging in the shaft is then $(1.58\,d^2)D$ lb.; or for a shaft 150 yd. (450 ft.) deep the weight of rope is $1.58 \times 450 \times d^2 = 711\,d^2$ lb.; or dividing by 2000 to reduce to tons, $\frac{711}{2000}\,d^2 = 0.3555\,d^2$ tons. The total load on rope, including its own weight and the friction of the hoist, is then,

$$(6.05 + 0.3555\,d^2) \text{ tons.}$$

The breaking load of wire ropes depends, of course, on the material, as being iron, crucible or cast steel, extra-strong crucible steel, or plow steel. The strength of ropes, like their weight, varies with the square of the diameter. Here also, the strength must be calculated from the strength of the 1-in. rope, which is given below for different kinds of haulage and hoisting ropes.

BREAKING STRAINS OF DIFFERENT WIRE ROPES, 1 INCH IN DIAMETER

Kind of Wire	Breaking Strain, In Tons: Haulage Ropes, 6-strand, 7-wire	Breaking Strain, In Tons: Hoisting Ropes, 6-strand, 19-wire
Iron	16	17
Cast-steel	32	34
Extra-strong cast-steel	37	39
Plow-steel	42	44

Since the breaking strain of a 1-in. extra-strong, cast-steel hoisting rope, in the table, is 39 tons, the breaking strength of the same kind of rope whose diameter is d is $39\,d^2$.

The given working load, in this case, is $(6.05 + 0.3555\,d^2)$ tons. If we allow here a factor of safety of, say 6, which means the allowable working load is only one-sixth of the breaking strength of the rope, the breaking load would be $6(6.05 + 0.3555\,d^2)$ tons.

Then equating the breaking strength of the rope ($39\,d^2$ tons) with this breaking load and finding the value of d, we have for the required diameter of the rope

$$39\,d^2 = 6(6.05 + 0.3555\,d^2)$$

$$d^2(39 - 2.133) = 36.3$$

$$d = \sqrt{\frac{36.3}{36.867}} = \sqrt{0.9846} = 0.99, \text{ say } 1''$$

A 1-in., 6-strand, 19-wire, extra-strong, cast-steel rope will, therefore, be capable of hoisting a gross load of 5½ tons in a shaft 450 ft. deep, making due allowance for the weight of the rope and friction.

Mine Timber for Airways and Rooms

In our coal tract there is a considerable acreage of good oak timber, with a large proportion of hickory. We are anxious to use this timber to the best advantage in the mine. Will you kindly give us a little advice in regard to the cutting, storing and use of this timber in the mine?

MINE OPERATOR.

Oskaloosa, Iowa.

Mine timber should be cut in the winter months, from, say December to February, inclusive. The reason for this is that during this period of practically three months, growing timber contains less sap than at any other time of the year. Commonly, the sap ceases to run late in November and does not start again till late in February or early in March, depending upon location, exposure and progress of seasons. Timber cut during the period named is more readily seasoned and endures longer in the mine than timber cut while sap is running.

The cut timber is sawed or cut into lengths suited to the requirements of the mine, either at the time or shortly after cutting. Prop timber is best stored in a dry yard or shed, standing the posts on end, which allows better drainage and more complete seasoning than when piled in horizontal layers.

In cutting, as far as practicable, the large logs should be reserved for timbering shaft or slope bottoms, or landings and partings. The 6- and 8-in. timber make the most serviceable posts; the 4- and 5-in. sticks make good ties and the lighter 3-in. stuff can be used for lagging. Cap pieces should be 16 or 18 in. long, about 8 or 10 in. wide and 1½ or 2 in. thick. These should be cut from the waste ends of the large logs. All posts should be properly squared on each end.

The hickory timber should be used, as far as practicable, in rooms and other places, on cross-entries and temporary roads where the long life of the timber is not as necessary as on the main airways and haulage roads. A hickory stick makes a good room post. The oak timber should be reserved for all main roads and air-courses. Cap pieces should generally be made of the softer wood, and wedges of oak.

Mine rails for use in rooms must be sawed from large oak logs, selected carefully for their straight grain and freedom from knots. The size in common use is 2x4 in., in 12 and 16-ft. lengths.

Hospitals at Anthracite Mines

Will you kindly tell me if the Pennsylvania laws, with reference to hospitals, are observed in letter by the anthracite coal companies.

Philadelphia, Penn. W. R. C.

The hospitals of the anthracite mines of Pennsylvania fulfill not only the letter of the law, which compelled their establishment, but its spirit as well. The maintenance of good hospitals has become a matter of pride with the anthracite companies. The equipment is simple and easily kept clean. It usually consists of one or two tables, a reclining Morris chair, stretchers and a box of supplies, which is usually very much more complete than is required by the law. Wherever possible the underground hospitals are steam-heated, lighted by electricity, and provided with hot and cold water. The floors are cement and the walls whitewashed. In order that the injured may be carried to the hospital or to the surface with the minimum of discomfort, the Lehigh Valley Coal Company uses an ambulance car. The frame is similar to that of an ordinary mine car but the car body is supported by springs to reduce the jar of movement. Each car has two stretchers attached, also a seat at each end of the car for attendants.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Opinions have already been expressed here rather freely in criticism of the plan announced by the Lehigh Valley R.R. Co. for dealing with the stock of the Lehigh Valley Coal Co. in order to bring the present organization into conformity with the commodities clause of the interstate commerce law. A study of the details of the plan as announced in New York has led government officials to the view that whether the plan is legal or not, it will require a somewhat lengthy litigation to demonstrate its legality or the reverse.

In fact, there are a good many persons here who believe that it would be advisable for Congress to undertake further legislation on the commodities clause in order to make the meaning plainer and to give effect to the intent of those who originally framed the proposition. Such action has been suggested for some time past and in this connection it has been urged that the Department of Justice should draw up a provision embodying the commodities clause in a revised form and intended to cover the whole requirements of the situation as understood by the government today. It is decidedly doubtful, however, whether anything could be done on the subject at this session of Congress, and meanwhile attention will be given by the law officers of the government to the Lehigh plan as now stated, in order to determine whether or not it is incumbent upon them to seek a further test in the courts.

Scheme of Organization

There is a decided opinion among these officials that although the scheme is undoubtedly ingenious, it is, nevertheless, obviously a method of evading the plain intent of the law as understood here. The understanding of the scheme among those who have been devoting their attention to it is that under the new plan the coal company continues to hold and operate the coal mines as a corporation of the State of Pennsylvania and a new concern called the "Lehigh Valley Coal Sales Co." is organized. This coal sales company has no organic connection with the Lehigh Valley Coal Co., but is to make a contract with the latter, and by the terms of this contract, the sales company will purchase and sell such coal as may be owned or acquired by the coal company, whether already on hand, purchased or mined.

Meanwhile a dividend has been declared which is sufficient in amount to pay for the stock that the coal sales company will issue, and this stock will be apportioned among the railroad's stockholders. While, of course, the railroad stockholders will not be obliged to purchase the stock of the coal sales company, and provision will be made for issuing these shares through the intermediation of an underwriting syndicate, there will, nevertheless, thus be established a mining company with shares that are the direct property of the railroad, and this mining company will contract to sell its coal to a sales company whose stockholders, probably, will be almost identical with those of the railroad company.

A Parallel Case

An analogy has been drawn between this scheme and the situation created by the connection between the National City Bank and the National City Co. which was last summer held to be illegal by Attorney General Wickersham. This illegality was not charged on the ground of any direct prohibition contained in the national-bank act, but was based on the fact that the plain intent of the bank act was being defeated by means of the plan in question. It is alleged that the same objection would hold good in regard to this scheme in connection with the mining and selling of coal, it being said to be in direct contravention of the obvious intent of the commodities clause, whether or not against the letter of the law.

Oklahoma Coal Leases

Mr. Carter has offered a bill (H. R. 17,479) that grants to the coal-mining companies of the State of Oklahoma the right to acquire additional acreage adjoining their mine bases. The bill in part provides:

"That the Secretary of the Interior, under rules and regulations to be prescribed by him, may grant to any coal-mining corporation, individual, or individuals, operating a coal mine or mines in the State of Oklahoma, the right to acquire additional acreage from the unleased segregated coal land of the Choctaw and Chickasaw Nations, in the State of Oklahoma: *Provided*, That the land sought to be acquired adjoins and is contiguous to the coal-mining property in operation:

"Provided further, That the right to acquire such additional lands shall extend only to coal-mining corporations, individual, or individuals, actually operating coal mines in said state in good faith: *And provided further*, That the lease or leases on such additional coal lands shall not be made for a longer period of time than existing leases, and shall not be made at a less rate of royalty than the rate of royalty paid on existing leases now in operation in said State of Oklahoma."

Alabama

Birmingham — Consolidation of the Woodward Iron Co. and the Birmingham Coal & Iron Co. will not become effective until Feb. 1. The assumption of control by the Woodward company of the recently acquired properties of the Birmingham company is delayed to complete inventories and arrange a number of minor details.

Three hundred and fifty state convicts were removed, Jan. 1, from the Pratt mines of the Tennessee Coal, Iron & R.R. Co. to the Banner mines of the Pratt Consolidated Coal Co., and 250 county convicts were at the same time transferred by the latter company from Banner to Flat Creek mines.

The Sayreton mine of the Republic Iron & Steel Co. holds the state record for the largest production of coal in 1911. The record for output was previously held by the Flat Top mine of the Sloss-Sheffield company, which now ranks second.

Arkansas

Fort Smith—A statute making coal and railroad companies responsible for damages to employees from personal injuries due to the negligence of fellow servants has been upheld as constitutional by the Supreme Court of Arkansas.

Colorado

Cañon City—One hundred miners went on strike, Jan. 4, at the Ocean Wave mine of the Rocky Mountain Fuel Co., at Williamsburg, over differences arising in regard to the rate for removing "brushings." It is said the men have recently become organized by representatives of the union. After a general conference on Jan. 8, all but 40 of the strikers returned to work.

Denver—The state land board has granted a lease of coal lands to R. W. Dymond, of Denver, reserving to the state the right to dictate the price at which coal shall be sold from the land. This is

the first time in the history of Colorado that the state has undertaken thus to fix prices. Dymond will be permitted to sell the coal at 50c. profit per ton. The board will fix the absolute price after finding out how much it costs to mine the coal. The lease applies to 640 acres of coal land near Como.

Erie—So far as can be learned there is no change in strike conditions here, but it is said there is evidence that matters are shaping themselves for a big strike in the southern part of the state. If this is so, there will be no settlement of the Erie strike, and the mine owners are working on this theory.

Illinois

Bloomington—A serious coal famine exists in most of the smaller towns of central Illinois and mines here are besieged with orders.

Staunton—One man was killed instantly, another injured and a half-dozen others, all miners, had a narrow escape in a cave-in, Jan. 6, at the De Camp mine, near here.

Du Quoin—Six prospect holes have been drilled on a 17,000-acre tract of coal land near Waltonville, about 15 miles east of Sunfield and north of Christopher. These show a seam of coal ranging from 6 ft. to 7 ft. 6 in. in thickness, and the property owners have appointed a committee to arrange for the sale of the land.

Carlyle—Tests for oil have revealed the existence of large beds of coal to the west and north of here. The coal has been found at depths ranging from 400 to 425 ft. The veins range from 5 to 12 ft. thick, and in some places two seams 6 ft. thick have been found. The tests indicate that the townships of Carlyle, Santa Fe, Wade, Wheatfield and Irishtown are underlaid by unusually large deposits.

Chicago—It is understood that the Illinois coal operators have joined the American Mining Congress in a body. This means the addition of about 100 members and involves an educational fund of $2000.

Indiana

Indianapolis—The official call for a joint wage conference of coal miners and operators from throughout the coal-producing regions of the United States was issued here, Jan. 11. The conference will convene here on Jan. 25. Miners and operators from Indiana, Illinois, Ohio, Pennsylvania and West Virginia will be represented. Wage contracts in practically all bituminous and anthracite regions expire on Apr. 1. More than 400,000 miners, a large number of whom are members of the United Mine Workers, will be affected. The wage conference will be held in connection with the annual convention of the United Mine Workers.

Brazil—Brazil coal operators are receiving appeals for coal from many cities that are experiencing famines. Rushville and several cities in eastern Indiana that have been depending on natural gas are out of coal. All the mines of this section, which have been running but half time all winter, are now working full time and giving employment to every miner who can be engaged. Much trouble is being experienced by the coal companies in moving the coal on account of the snow and the intense cold.

Iowa

Chariton—J. F. Spiker is negotiating with the Albia Coal Co., of Albia and Oskaloosa, in regard to leasing about 3000 acres of coal land in Lucas County to that company. It is reported that development in this region may be expected in advance of the completion of the new line of the Rock Island R.R.

Kentucky

Henderson—The property of the Southern Coal & Transportation Co., consisting of about 8000 acres of coal rights, together with developments and equipment, was bought by M. V. Denton at a public sale at Robards, Jan. 1, for $93,-335, the appraised value being $140,000. It is reported that the Panama Coal Co., composed of M. V. Denton, O. W. Rash and others, will operate the mines.

Madisonville—The Reinecke Coal Mining Co. has sold its coal mine and property near Madisonville to the Clear Creek Coal Co. The property transferred is one of the largest producing coal mines in the state. It employs about 200 men and has an admirable uptodate equipment. The grantee is a corporation recently organized by Eastern capitalists to take over this and other properties in western Kentucky. There will be no change in the management or operation of the Reinecke mine for the present.

Minnesota

Wells—While digging a trench on the farm of Henry Menerich, of Mansfield township, workmen found a vein of lignite coal of excellent quality. The depth at which the coal was found was about 12 ft., and investigations will be made to ascertain if there is coal in sufficient quantities to warrant mining for commercial purposes.

Missouri

St. Louis.—Contemplating an extension of the Southern Traction Co. being constructed from St. Louis to Belleville, from the latter city to the rich coal fields of southern Illinois, and the completion of the St. Louis and St. Libory road through the southern portion of St. Clair County, the Donk Brothers Coal & Coke Co. of St. Louis, is buying up extensive coal rights in St. Clair, Randolph and Washington Counties, principally north of the Illinois Central Railroad. The company is said to have made exhaustive borings in southern Illinois, where it is operating, and, while the officers have made no statement as to how they expect to reach the St. Louis markets, it is said they are depending on the extension of the Southern Traction Co. lines, which will probably interlace the rich mining and farming lands near Marissa, Tilden and other St. Clair, Randolph and Washington County towns. There is also a report that the Mobile and Ohio Railway is considering the construction of a branch line from Sparta to Marissa.

Montana

Three Forks—That coal in large quantities may underlie the Gallatin valley is indicated by the discovery here of a 7-ft. vein of what appears to be an excellent grade of coal. The discovery was made recently by well diggers on the property of the Milwaukee & St. Paul R.R.

Helena—Argument was concluded Jan. 6 in the case of the Montana, Wyoming & Southern Ry. Co. against the Montana Railroad Commission. The railroad seeks to restrain the commission from reducing the rate on coal between Bear Creek and Bridger from 45c. a ton to 35c., on the ground that the lower rate is confiscatory. The Bear Creek operators contend that they cannot compete with operators of other districts if the higher rate remains in effect.

Ohio

Wellston— Foreign capital, interested by B. F. Howland and C. F. Butterfield, of New York, and E. B. Bingham, of Toledo, will subscribe to most of the stock of a company to be organized at Wellston, for the purpose of developing southern Ohio timber and coal lands and completing a railroad to Lake Erie. For a number of years the men behind the deal have held options on coal and timber lands in Jackson and Scioto Counties. They report having raised $8,000,000 for a railroad from Portsmouth through Wellston to Lake Erie at a point near Sandusky.

Bridgeport—It is understood here that the proposed $25,000,000 merger of eastern Ohio coal properties will be consummated in February, although it is claimed that the merger has been deferred until a decision is reached in the case of the Pittsburg vein coal operators of district No. 8 against the Pennsylvania and Wheeling & Lake Erie railroads. It is said that in the event of a decision unfavorable to the operators, the merger will fall through.

The Lorain Coal & Dock Co. plans to make extensive improvements to its mines

at Crescent, including the erection of a large steel tipple. The work will be started in the early spring.

Columbus—The legal battle of the State of Ohio for exclusive power over freight and passenger rates within its borders opened at Washington, D. C., Jan. 10, when Attorney General Hogan, of Ohio, filed a brief in the U. S. Supreme Court supporting the right of the state to fix rates on coal from certain mines in Ohio to Lake Erie ports within the state. The railroads contend that the coal is not destined for lake ports, but is a part of interstate shipments. The case is set for oral argument on Feb. 19.

The Capitania Development Co., of Toledo, has been organized with a capital stock of $10,000, which, however, is to be largely increased in the near future. The officers of the company are Thomas H. Tracy, of Toledo, president; George M. Jones, of Toledo, vice-president and treasurer; J. J. Robinson, of Toledo, secretary. The men interested in the new company have purchased 21,500 acres of undeveloped coal lands in Belmont County and also the Ohio River & Western R.R. Co., operating a steam line of 112 miles from Zanesville to Bellaire. The purchase price is said to have been $3,000,000. The railroad, now a narrow gage, is to be made standard gage at once and two mines will be opened this spring. The plans of the company contemplate the opening of two new mines each year for some time.

Pennsylvania

Bituminous

New Castle—Two men were entombed and probably killed, Jan. 9, in the cave-in of a small mine, eight miles west of here.

Monongahela—The mines at Van Voorhis, Acme, Ellsworth and Cokeburg are in operation, and are making fairly good time. At Marianna the mines average about three days a week. Hazel Kirk No. 1 and Dunkirk are idle for the present.

DuBois—The new Chickasaw mines of the Shawmut Mining Co., among the largest and most complete in this section of the country, have been organized by the United Mine Workers and will work under their agreement. It is said that the capacity of these mines will be about 2500 tons daily.

Portage—The Puritan mine, now owned by the Martin Coal Co., resumed operations, Jan. 15, on an extensive scale. The company was recently awarded $74,323 in a suit against the Pennsylvania R.R. Co. for alleged discrimination in the distribution of coal cars.

Tyrone—The U. S. Circuit Court of Appeals has refused to set aside the judgment of the Circuit Court awarding $62,658 damages to seven coal companies operating in the Clearfield district in their suit against the Pennsylvania R.R. Co. for rebates and concessions granted competitive companies.

Connellsville — The Thompson - Connellsville Coke Co. has closed a contract with the Inland Steel Co. for 15,000 tons of coke per month. This contract, together with that of the Connellsville company with Jones & Laughlin and others, will take the entire output of the plant and its 800 ovens will be kept in full blast to supply the demand.

Uniontown—The hearing of the case of the Independent Coke Producers' Association of Uniontown against the Baltimore & Ohio and other railroads before the Interstate Commerce Commission, which was scheduled to be called on Jan. 15, at Washington, D. C., has been indefinitely postponed.

Anthracite

Scranton—President Truesdale, of the Lackawanna R.R., admitted, Jan. 10, that the demands of the coal miners, who are threatening a strike, have been received by the operators. He announced that the request of the miners for a conference on the wage scale would be granted and that the meeting would probably be held some time in February.

Wilkes-Barre—The Conyngham colliery of the Delaware & Hudson Coal Co., at North Wilkes-Barre, has resumed operation after being idle for nearly three years following the abandonment of the old breaker. Coal is now carried underground by electric haulage to the company's No. 5 breaker.

While engaged in timbering in the No. 9 slope of the Parrish colliery, of the Parrish Coal Co., Plymouth, in the afternoon of Jan. 9, six men were instantly killed and two severely injured by an explosion. Colliery officials say that the explosion was one of dynamite, but are at a loss to explain how dynamite came to be stored in the slope.

Pottsville—Preparations are now under way to tap a vast underground body of water that is backed up in the old abandoned workings of the Maryd colliery, in the Schuylkill valley, near Tuscarora. A large area of virgin coal will then be mined.

It is reported that the Philadelphia & Reading Coal & Iron Co., aroused by recent fires, has started to equip all its mines and collieries with telephone service.

Washington

Centralia—A 12-ft. vein of coal has been discovered underlying the 40-acre farm of D. W. Leonard, just east of Centralia. The coal appears to be of a superior quality to any yet discovered in this vicinity, and Mr. Leonard is casting about for means to start mining operations and place the coal on the market. The property is only a few hundred feet from the Centralia & Eastern R.R., and near the mines of the Mendota Coal Co., thus making the situation particularly advantageous for mining and marketing the fuel.

West Virginia

Fairmont—Heroic work by miners recently prevented a large loss by fire to Consolidation Coal Co. property, at Montana. Breaking out from an unknown origin the flames destroyed the blacksmith shop at the mines and for an hour threatened the tipple and opening. The tipple was but slightly damaged while the opening was protected. The loss is estimated as being in the neighborhood of $1200. The Montana mine, which is one of the pioneers of the region, has been unfortunate with fires.

Morgantown—The Consolidation Coal Co., of Fairmont, recently made the location for a shaft on the O. J. Eddy farm, about six miles up Indian Creek. This is a part of the Millholland tract of coal land, aggregating something like 12,000 acres, taken over by the Consolidation Co. several years ago. Prospects are good for the development of these valuable coal lands immediately upon the completion of the Buckhannon & Northern and the extension of the Monongahela R.R. to the state line.

Wyoming

The United States Circuit Court of Appeals, Jan. 13, condemned the practice of using dummy entrymen to obtain for a corporation more than its proper share of public lands. In the case of the Owl Creek Coal Co., it was alleged that 14 individuals had filed entries on 1760 acres of government coal land for the purpose of turning the property over to the corporation. The lower court had released the defendants, but the court of appeals reversed this decision on the ground that it would invalidate the whole act prohibiting such practice.

Canada

British Columbia—Officials of the United Mine Workers of America are at Vancouver Island, organizing a new district of mine workers.

New Brunswick—On Jan. 11, Sir Thomas Tait took over control of the Frederick & Grand Lake Coal & Ry. Co. Extensive plans will be carried out for the development of the Grand Lake coal areas, including the building of a railway for 30 miles from Gibson to Unito for supplying the Canadian Pacific Ry. with 10,000 tons of coal annually. Construction work on the railroad will be started early in the spring.

Personals

E. L. Booth has been elected president of the Empire Coal Co., of Montreal, Canada. Mr. Booth was formerly second vice-president in charge of the Chicago offices.

Edward M. Mancourt, formerly manager for the Consolidation Coal Co., in Detroit, has been appointed general western manager for the company, with offices in Chicago.

O. H. Reinholt severed his connection with the U. S. Bureau of Mines, Jan. 14, at the expiration of leave of absence, and will resume private practice as a mining engineer with headquarters at San Diego, Calif.

Charles C. Renshaw, for a number of years manager of the Altoona Coal & Coke Co., has become identified with the firm of Tatnal, Lee & Co., Philadelphia, Penn., with offices in the Stephen Girard Building.

W. H. Loomis, lately with G. B. Markle & Co., at Jeddo, Penn., has become president and general manager of the Rock Hill Coal & Iron Co., following the separation of this company from the East Broad Top R.R. Co.

J. E. Leonard, of the Chehalis Coal Co. was in Spokane recently and exhibited samples of some exceptionally fine coal, taken from his Coal Creek mine. The coal is as nearly of a true bituminous quality as any yet found in western Washington.

Sam Dixon, president of the New River Coal Co. and of the White Oak Ry. Co., recently appeared before the Interstate Commerce Commission, at Washington, D. C., in connection with a complaint against the Chesapeake & Ohio R.R. in regard to the apportionment of rates.

Dr. M. J. Shields, of the American Red Cross Society, is now introducing first aid on the lines of New York Central, the New York, New Haven & Hartford and the Lackawanna railroads entering New York City. He is accompanied by Dr. Mackey, formerly of Scranton, Penn. On completion of this work, Dr. Shields intends to take his car to Washington, D. C., and will there attend the International Meet of the Red Cross Society.

Obituary

E. S. McKinley, Jr., general superintendent of the Oak Creek Mine, of the Yampa Valley Coal Co., was killed recently at the mine by falling on the tracks in front of a loaded car and being crushed beneath the wheels; he died while being rushed to Denver on a special train. Mr. McKinley was 28 years of age and a graduate of Cornell University in mechanical engineering. His death is deeply regretted in Denver, where he was widely known and greatly esteemed.

Construction News

Bridgeport, Ohio—The Lorain Coal & Dock Co. plans making extensive improvements at its Crescent mines, including the erection of a new steel tipple. Work will be started early in the spring.

Pittsburg, Penn.—The Pittsburg Coal Co. is taking bids for the sinking of two shafts: one, approximately 136 ft. deep, on the Jones Ray farm, and one, approximately 151 ft. deep, at the Yough Slope Mine. Plans and specifications are on file at the office of the chief engineer, Oliver Building, Pittsburg.

Bids are being taken on buildings and equipment for the new plant of the Cross Creek Coal Co., Nurgettstown, Penn., which includes: A new tipple; power house, 50x100; boilers of 1200 hp., coal picker, stokers, electric generators, fan and ventilating plant, pumps, motors; railway and mine trackage and electric mining machinery.

Fort Collins, Colo.—The Fort Collins Mining & Coal Co. has increased its capitalization from $50,000 to $150,000 and expects to sink a shaft and install complete mining equipment for operation within the year.

Castle Rock, Wash.—H. B. Davies and associates, of Tacoma, have leased the Huntington Coal property, two miles south of here, and will equip it with modern machinery for operation on a large scale.

E. N. Ouimette, of New York City, and associates, are reported to contemplate the erection of a $300,000 briquetting plant near Castle Rock.

Medford, Ore.—Pierce, Manley & Wallace, of Seattle, Wash., have purchased the Cascade Mine and will install new machinery.

Birmingham, Ala.—It is reported that the Tennessee Coal, Iron & R.R. Co. will build 50 miners' houses at Mine No. 2, near Ensley, and about 200 houses at Mine No. 12.

Columbus, Ohio—The Capitania Development Co., of Toledo, has been incorporated with $10,000 capital stock, which will be greatly increased in the near future. Men interested in the new company have bought 21,500 acres of coal land and the Ohio River & Western R.R. Co.'s 112 miles of narrow-gage track from Zanesville to Bellaire. Railroad will be made standard gage at once and two mines opened this spring. Plans contemplate the opening of two mines each year until property is fully developed. Thomas H. Tracy, Toledo, is president.

Victoria, B. C.—The Canadian Collieries (Dunsmuir), Ltd., will expend $750,000 during the next year for additions to its plant and machinery and for further development of its coal properties. This will be in addition to contracts which the company has recently awarded in connection with a hydro-electric power plant project.

Recent Incorporations

St. Louis, Mo.—The Sterling Coal & Mining Co.; capital, $60,000. Incorporators: S. A. Meddaugh, H. Brown and A. B. Rushton.

Toledo, Ohio—The Capitana Development Co., to own and operate coal mines in various parts of Ohio; capital, $10,000. Incorporators: George M. Jones, James J. Robinson and John Craig.

Austin, Tex.—The State Lumber & Coal Co., of Texas City; capital, $15,000. Incorporators: F. J. Marett, J. M. Proctor and J. Stanley Carothers.

Dover, Del.—The Clear Creek Coal Co., to operate coal mines in Kentucky and market coal; capital, $100,000.

Wheeling, W. Va.—The Spruce Bend Coal Co., of Bend, W. Va., to mine coal and manufacture lumber in Logan County; capital, $200,000, of which $10,000 has been subscribed and $1000 paid. Incorporators: P. M. Sharples, and others of West Chester, Penn.

The Arcadian Coal Co., to mine and develop coal and mineral lands and manufacture lumber in Braxton and Webster Counties, W. Va.; capital, $200,000. Incorporators: Thomas McCabe, Cleveland, Ohio; M. J. Sullivan, Latrobe, Penn., and others.

Wilmington, Del.—The Gordon Coal Co.; capital, $1,000,000. Incorporators: M. B. Hughes and J. G. Gray, of Philadelphia, Penn.

Columbus, Ohio—The Dean Coal & Coke Co., to mine and sell coal and coke; capital stock, $10,000. Incorporators, S. E. Dean, J. A. Stalter, J. R. Elder and others.

Montgomery, Ala.—The Nauvoo Consolidated Coal Co.; capital stock, $12,000. Incorporators, R. S. Shook, A. S. Tubb and E. M. Martin.

Foreign News

England—The final ballots of the English coal miners for or against a national strike, which will affect 900,000 men, were cast Jan. 12. The results will show a vote overwhelmingly in favor of a national stoppage. Reports indicate that fully 80 per cent. of the men have gone on record as favoring a strike. A full month, however, must elapse before the strike can become effective, as the miners are under agreement to give notice before stopping work.

Miners' Convention

Special Correspondence

Division of opinion as to the policy to be pursued by the bituminous and anthracite coal miners' unions of the country in attempting to enforce a demand for higher wages appeared among the leaders of the United Mine Workers of America when its annual convention opened in Indianapolis, Jan. 16. Some 1300 delegates representing 300,000 miners were present.

The question, which will be brought before the convention, is whether the individual districts of the miners' general union shall sign new wage contracts with mine owners, as they can be negotiated, or whether the miners as a national organization shall refuse to sign any contracts until the operators of all the districts have agreed to the miners' terms.

President White's Report

President John P. White in his annual report, said that the new wage contracts with the mine owners, to go into effect on Apr. 1, made it necessary for the United Mine Workers to put aside internal dissension and prepare to struggle for advancement.

"So far as I am concerned, and I think I voice the sentiments of the rank and file, it is my opinion that our policy should be such as to leave no doubt in the mind of anyone that there will be no reductions from existing wage contracts, and we should earnestly strive for such advancements as it is within the range of possibilities to secure. While we will never surrender the right to strike, we should not lose sight of the fact that some of the greatest successes our organization has ever achieved lay in the channels of peace."

Of the condition of the union in the anthracite field largely in Pennsylvania, in the present crisis, President White reported: "The problem of organizing the anthracite mine workers and building up a strong organization in that field has been a matter of serious concern to our movement for many years. The small membership reported in the anthracite field indicates that the miners are indifferent to their surroundings."

Interstate Agreement

The president reported that efforts were under way to bring about a joint conference between miners and operators of the bituminous fields of western Pennsylvania, West Virginia, Ohio, Indiana and Illinois, to discuss the terms of the new wage contract, at the close of the present miners' convention.

While he declined to commit himself in the matter, Vice-President Frank J. Hayes said that opposition to the policy of a national strike will come largely from officials of districts bordering on unorganized coal fields.

"It must be remembered that while the United Mine Workers have a membership of nearly 300,000, there are about 450,000 coal miners that are unorganized," said Mr. Hayes. "The question as to whether we should hold out for a national agreement, though in some districts the operators come to our terms, is a serious one."

Anthracite Miners and Operators

Special Correspondence

The demands of the anthracite miners, as formulated at the three-district convention in Pottsville last fall, are now in the hands of the operators. The miners' representatives have asked for a conference with representatives of the operators, to be held some time in February, and in all probability such a meeting will take place in New York or Philadelphia at the time indicated.

President William Truesdale, of the Lackawanna Coal Co., was in Scranton recently, and in the course of an interview, said: "I have no objections to meeting representatives of the miners' union," carefully indicating, however, that he spoke only for himself. Nevertheless, it may be accepted as a fact that the operators will offer no objections to negotiating with the men who are union officers, and there will thus be avoided the useless delay and uncertainty which prevailed three years ago, when the operators at first refused to deal with the officials of the miners' union, as representing the body of workmen.

As has been frequently stated, the miners have made a series of demands in which the principal items are as follows: (1) Recognition of the union with the introduction of the "check-off" system; (2) a 20 per cent. increase in wages; (3) a one-year agreement; (4) payment for coal by ton instead of by car, wherever practicable; (5) an eight-hour day. There are also a number of secondary demands, but these will hardly be taken into consideration during the course of negotiations.

It should be stated that the operators have permitted it to become definitely known that the majority of these demands are not likely to become the basis of a new agreement. The "check-off" system is particularly obnoxious to the operators, and it may also be stated that it is not desired by the great majority of anthracite miners.

On the other hand, it is understood that the operators are willing to make some substantial concessions to the miners on the basis of the existing agreement, and in all probability they will have their way in this, as the union is scarcely in a position to inaugurate and sustain a prolonged strike. It has exaggerated its demands, and it may be anticipated that the operators will at first exaggerate their determination to grant no concessions, but unless some unforeseen contingency arises, it now seems probable that a satisfactory compromise will be reached without involving a strike.

Institute Meetings

The Y. M. C. A. mining institutes of the Pennsylvania anthracite region now have an aggregate membership of over 5000 mining men. Meetings have recently been held in several important districts.

Wilkes-Barre—Two interesting papers were presented at the institute meeting held here on Saturday, Jan. 13, one on "Timbering," by John L. Picton, and one on "Who is a Miner?" by Richard Lewis. H. G. Davis, president of the Wilkes-Barre district, presided. The attendance was gratifyingly large, and the discussion most interesting.

Pittston—The third meeting of the Pittston district institute was held Monday evening, Jan. 15, and the subject for discussion was introduced by a paper on "Transportation," read by S. J. Jennings, general inspector for the Pennsylvania and Hillside companies. Questions of general interest were answered by Tudor Aston, foreman of Mt. Lookout colliery; John T. Brown, inside foreman for the Erie company, and Edward C. Weichel, general inside superintendent, Butler colliery.

Carbondale—On Saturday, Jan. 13, the Carbondale district mining institute held its annual banquet, at which 360 members were present. Two hundred members were added to the roll during a recent campaign. C. L. Fay, of Wilkes-Barre, was toastmaster, and other speakers were as follows: P. J. Moore, state mine inspector and president of the institute; Charles Enzian, U. S. Bureau of Mines; Dr. J. W. Grant, Carbondale, and Mr. Thomas, district superintendent for the Delaware & Hudson company, at Olyphant.

Nanticoke—At the meeting here, on Saturday, Jan. 6, papers were read before the Nanticoke district mining institute by William Norton, mining engineer of the Alden Coal Co., and P. F. Devers, district superintendent of the Lackawanna company. John E. Thomas, of the Susquehanna Coal Co. and president of the institute, presided.

Shamokin-Mt. Carmel—The institute of this district held a meeting on Thursday, Jan. 11, at Shamokin, at which J. R. Holland, general foreman of the Mineral R.R. & Mining Co. and president of the institute, presided. Papers by John Allen and J. W. Weir were followed by a general discussion and a musical program.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The continuation of low temperatures generally throughout the country has placed the coal business in the strongest position it has been in this season. The prolonged summer, with high temperatures prevailing well into the fall, resulted in a light buying movement and a consequent shortage in supplies. The cold weather of the past two weeks, together with the prospects of labor troubles, and some difficulties in transportation, have caused heavy inroads to be made on all available sources of supply, and these have been seriously depleted.

On the Atlantic Coast there has been considerable heavy weather, causing some losses at sea and making arrivals slow; the demand is strong, and with supplies low, it is probable this market will continue active the remainder of the season. In Pennsylvania and Ohio the trade is active and strong, especially in slack. The movement has been slow and some roads are reported as storing in anticipation of a strike; however with their privilege of confiscating any fuel in transit, it is not believed that they will consider it necessary to lay in heavy supplies. The West Virginia operators are viewing the situation with complacency, not only because of the possible labor troubles here but abroad as well; inquiries have been received for coaling the British navy and hopes are entertained of securing some of the English export trade in event of trouble there.

The market in the Middle West continues strong and active with prices advancing and stocks low. The prospects of a famine, as reported in some instances, do not seem probable, as warmer weather will permit the movement of heavy tonnages now standing on side tracks. Colder weather has caused renewed activity in the Western trade, but supplies are reported good and no famine is expected.

Boston, Mass.

The continued cold is having the usual effect on a market already short of supply. The two days, Jan. 13 and 14, were the coldest in this vicinity for five years.

Bituminous arrivals have been further interrupted, there have been some losses at sea, and conditions generally are materially worse than a week ago. Were it not that practically every consumer, small and large, is under contract, we would have a lively spot market. As it is, every shipper is looking for temporary supplies, and merchants are working together in spreading around what coal is available. Prices are unchanged, from around \$4 on cars, but chiefly for the reason that almost no free coal is to be had. Slow loading is reported from the Virginia terminals.

In anthracite there is no improvement. Dealers have tried to be forehanded, but are now hardly able to get more than hand-to-mouth shipments. With a strong retail demand there is little chance to accumulate stocks, as the prudent ones were hoping to do at this time, and an active request between now and Apr. 1 can be put down for certain. Stove and chestnut, as well as the supply of barges, are short, and the delays are getting more and more protracted. The Susquehanna Coal Co. lost the barge "Wayne" in Boston Harbor, on Jan. 13, and other transportation has suffered in the heavy weather.

The Boston retailers advanced broken and egg, Jan. 15, to \$7 and \$7.50, in each case 25c., making egg the same price as stove, and broken only 50c. less. Water freights are somewhat firmer, \$1@1.10 being asked for the larger craft, Hampton Roads to Boston, but with rather few inquiries for so short a market.

New York

The continued cold weather has made market conditions here considerably firmer. There has been an increase in the spot demand, particularly for the better-grade steam coals, for which there is a ready demand at a price of 10c. a ton higher than was offered last week, without finding a market.

All of the New York piers are having a great deal of difficulty in dumping coal with the result that boats are accumulating and the work of loading is some two or three days behind. There is now some demand for loaded cargoes at prices somewhat above the quotations at which f.o.b. coal can be had. When the cold wave started the market here was rather heavily supplied with coal at the piers so that the slowing up of transportation, caused by severe weather conditions, is only now beginning to show, in a shorter supply at the piers.

Spot prices for steam coals f.o.b. New York, range about as follows: West Virginias, \$2.50; ordinary Pennsylvanias, \$2.60@2.70; better grade Pennsylvanias, \$2.80; with the best grades of Pennsylvania \$2.90@3 f.o.b. The high-grade coals are unusually scarce and the market for these is quite firm. There are apparently no accumulations of demurrage coal of any grades at the piers.

Pittsburg

Bituminous—The severe cold snap has seriously disarranged the movement of coal, the temperature having been frequently below zero in the past few days. This has affected both mining and transportation. Mines have been short of cars, have been unable to mine their full quotas, and the coal has moved slowly after loading. For illustration, a case is mentioned of a coal train, such as would ordinarily be moved with one locomotive, which was stalled with four. A few mines are shut down entirely from lack of cars, while others are behind in deliveries and are having a great deal of difficulty in apportioning their output to apply on their different contracts.

Several coal companies on the main line of the Pennsylvania have received communications on behalf of the coal department of the British Navy, indicating that it may be in the market for coal against the possible suspension of mining in England, March 1; on account of the pending difficulty here, such inquiries do not elicit much interest.

Occasionally specially high prices are paid for small lots of coal, chiefly carloads, but in general the market is not quotably changed and we continue to quote: Nut, \$1.05@1.10; mine-run, \$1.10@1.15; ¾-in., \$1.20@1.25; 1¼-in., \$1.35@1.40; slack, 70@75c. per ton at mine, Pittsburg district.

Connellsville Coke—Spot furnace coke continues scarce, and no coke has been sold below \$1.80 in the past week, while higher prices have frequently been paid for small lots. Under normal conditions the shortage in production due to the holidays would be over by this time, but the cold weather has given production a fresh setback, and there is the great difficulty in moving coke besides. Nothing has been done on contract. We quote: Prompt furnace, \$1.80@1.90; contract furnace, \$1.85@1.90; prompt foundry, \$1.90@2; contract foundry, \$2.10@2.25.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Jan. 6, at 322,906 tons, an increase of 29,000 tons, and shipments at 3314 cars to Pittsburg, 4955 cars to points West and 826 cars

to points East, a total of 9095 cars, a gain of 700 cars.

Baltimore, Md.

Prevailing zero weather, with all of its discomforts, gave Baltimore operators the opportunity to have their inning during the past week. Prices of all grades of coal advanced from 10c. to 15c. per ton over those obtained for weeks past, and the demand for the product was unusually heavy.

The low grades of coal, which heretofore sold at from 70c. to 80c., advanced to from 90c. to $1 per ton, and were hard to procure at that figure. The best grades of small-vein coal advanced from $1.10 to $1.20 per ton and the supply was limited. The big-vein Georges Creek coal also jumped in price, the trade receiving $1.75 for all that it could deliver.

The movement of coal has not been all that could have been desired, on account of extreme weather conditions, and operators were careful not to book any more orders than they could reasonably care for. Ice conditions in the Patapsco River and Chesapeake Bay have been serious for days, and but few vessels have ventured out. At the coal piers of the Western Maryland Ry. Co., located at Port Covington, several hundred carloads of coal stood on the tracks untouched, and a considerable portion of it could not be loaded into vessels until it had gone through the steaming process. Shippers are hoping that the ice in the river and bay will disappear sufficiently to permit vessels to ply between destined ports.

Buffalo, N. Y.

There is a special complaint this month from the bituminous trade. There has been a great abundance of cold weather and the volume of business is large, yet the utmost effort on the part of operator or jobber, has failed to advance prices. The inference is that there is always someone willing to sell coal down to cost or the next thing to it. In fact a leading operator said the other day that he was obliged to sell his coal for less now than he received for it last summer. He had always been used to a low price in summer, counting on making his profit in the winter months, but he has so far been unable to get an advance and he finds that others are telling the same story.

There is a somewhat stronger feeling in slack and the increased strength of coke continues. If the improved tone of the pig-iron trade is kept up there ought to be a way before long for the bituminous trade to command a higher price. Quotations continue at $2.50 for Pittsburg three-quarter, $2.40 for mine-run and $2 for slack. Coke ranges from $4.25 for best Connellsville foundry to $3.50 for stock coke. The Allegheny Valley mines are running fairly strong, coal prices being about 25c. less than Pennsylvania.

The demand for anthracite is again away in advance of the supply, there being all of the early shortage of stove, which is already giving out in the Western market. The mining has been slow since the beginning of the holidays, so that the dealers are quite unable to supply their customers. All mining has been slow this month and in some instances the outside operations have been suspended on account of the weather.

Cleveland, Ohio

In the past week there has been a tremendous scramble for domestic coal, slack, and also railroad fuel. The railroads have been confiscating a great deal of coal for their own use which, in consequence, has hampered this market materially.

Slack has reached the $1 mark the past few days, with little in sight. The weather in the past week has been the severest for a number of years, and while there has not been any actual suffering for the want of coal in the city and vicinity, there was considerable uneasiness on account of so much coal being confiscated and the railroads slow in making deliveries.

The inquiries for coal have been greater in the past week than at any time during the year. Of course, this has been caused from the unusually severe weather. Prices have been firm, but no material advance, excepting in slack, has taken place.

Columbus, Ohio

With the thermometer hovering around the zero point and often reaching 10 deg. below, and with an improvement noted in many lines of manufacturing, the coal trade in Ohio is now in better condition than at any time in the past six months. Activity prevails in every branch of the trade and operators and jobbers are having difficulty in filling orders promptly because of the lack of motive power on the railroads and a growing scarcity of cars.

The domestic trade is the chief feature in the market at this time. Dealers went into the cold spell with fairly large stocks, but the demand was so strong that they were soon exhausted and orders were placed with the operators and jobbers. Soon immediate delivery was asked and in some instances stocks were difficult to obtain.

Railroads have been unable to move coal shipments promptly because of the heavy snow and extreme cold. As a result there is considerable confusion at the mines and the output in the various Ohio fields has not been as large as might have been the case. Prices are strong and an advance to the usual winter level has been announced by a number of the dealers. Prices prevailing in Ohio are as follows:

Domestic lump in the Hocking Valley	$1.50
Domestic lump in Pomeroy Bend district	$1.65@1.75
Three-quarter inch	1.35
Nut	1.15
Mine-run in the Hocking Valley	1.10@1.15
Mine-run in eastern Ohio	1.00@1.10
Nut, pea and slack	0.70@0.85
Coarse slack	0.65@0.75

Cincinnati, Ohio

Extremely cold weather has given this market the stiffest conditions that have been in evidence here for many months; this applies to practically all sizes and grades. Almost anything that can be classed as lump, or nut and slack, will bring a good price, and in almost every case at a considerable advance over what was possible even three weeks ago. Nut and slack is selling at $1 at the mines for the grade that sold a few weeks ago for 80c., and then was piled up at the mines and on cars in the railroad yards for lack of demand.

The weather has been the coldest recorded here this year, and possibly for 10 years.

The demand for nut and slack is even more pressing than for lump coal. The factories are adding their requisitions to the already unusual demand from steam-heating plants. There is hardly a pound of free coal of that character and at least one concern is delivering mine-run to fill its contracts which call for nut and slack, but which is not to be had except the company buy it on the open market.

The river coal men together appropriated a fund of $2500 with which to keep steamers moving in the Ohio River to prevent the freezing of the harbor and its approaches. There is an immense quantity of coal in barges in the harbor together with about 100 empty barges, which might result in serious loss should an ice jam, such as is threatened, form. The river coal is important to the Cincinnati trade, as it is a large element in fixing the price of domestic fuel in the immediate retail market here.

Thurmond, W. Va.

The cold wave and the probability of a more or less prolonged cessation of work in the anthracite and some of the bituminous fields have all combined to make the New River operators feel more cheerful over the coming prospects.

There has already resulted a rise in screened coal prices, and a steadiness in tidewater, the latter helped by the likelihood of a strike in the entire British coal fields, involving over one million men. It is probable that this strike would result in the loss to the British coals of a considerable amount of export business, more especially in Italy and South America, much of which should go to the high-grade coals of West Virginia. As it is, two or three of the sales agencies in this

field have already made large contracts for export coals, deliveries on which are badly hampered by the extremely high steamship rates now prevailing.

The Chesapeake & Ohio Ry. is making determined efforts to get a large tonnage from that portion of the New River field now served by the Virginian Ry. along the Winding Gulf; the total shipments from the New River field over the Chesapeake & Ohio showing a falling off of 12% in 1911, as compared with 1910. Loading of coal in this field has been fairly good since Jan. 1, notwithstanding the cold weather and heavy snow. Great difficulty, however, has been experienced in getting coal moved, especially to the West, mainly owing to the number of locomotives put out of the service by the unusually low temperatures.

Charleston, W. Va.

The cold weather has cut down the output in the state and sent up the price of coal except that held down by contract. It has been many years since a cold spell has lasted as long as the present one. The heavy snows and extreme cold, ranging from 5 to 25 deg. below zero, have not only prevented the handling of cars but has otherwise interfered with the mining of coal. Lump and egg has taken a jump, also run-of-mine. Kanawha lump is bringing from $150 to $1.70 at the mine, with run-of-mine at about 95c. New River run-of-mine ranges from $1.20 to $1.45, and New River egg at from $1.60 to $1.70. Indications just before the first of the year were that the output for January would exceed that of last year, but the extreme cold may be the means of cutting it down below a year ago. The jump in prices, however, has been the one really satisfactory movement in the situation during the past 10 days; continued cold weather will probably cause a still further advance.

Louisville, Ky.

Activity such as had not been seen in many years was evident in the local market during the past week, due to the unprecedented cold spell. That which was true of the Louisville market was true of practically every city and town in Kentucky.

While the dealers were busy day and night in filling orders, the charity stations and the relief desk at the office of the mayor were also overwhelmed with applications. For the first time in many years few questions were asked when an applicant who even looked the part made his or her appearance. So widespread was the suffering that few of the poor were able to provide from their own incomes sufficient fuel to supply their wants.

The average prices which prevailed were as follows: Pittsburg, $3.75; Jellico, $3.60; Winifrede, $3.60; Taylor, $3.25. Pocahontas smokeless brought $4.75, and New River Smokeless, $4.50. Kentucky lump continued to sell as low as $3 for a 2000-lb. ton, and Banner lump, $3.25. Straight Creek lump brought $3.75; nut and slack, $2.25, and Gem selling at $3.

A shortage in steam coal which promises to be serious, is also causing much concern. The manufacturers here have been warned that the inactivity at the mines around the Christmas holidays, and the delay in shipments following the heavy snow fall, are elements to be considered. The local dealers have been forced to rely upon their reserve supplies for coal for manufacturing purposes. How long they will be able to meet the demands from this source seems to be questionable.

Memphis, Tenn.

Memphis is in the middle of the best coal selling weather that we have experienced for 12 years. We are having severe weather with the temperature low and a strong wind blowing from the north, laden with snow and sleet. The retail yards in Memphis have drawn heavily on their stocks and the smaller dealers have practically exhausted what they had in storage.

While there has been no advance in price, it has given the mines about all they wanted at prevailing prices, which are as follows:

Kentucky No. 1 lump	$1.50
Kentucky No. 2 lump	1.25
Kentucky No. 1 nut	1.10
Alabama No. 1 lump	2.00@2.50
Jellico lump	2.00@2.25
Jellico block	2.25@2.50
Round coal	1.65@1.90
Cahaba coals	2.50@3.00

These maximum prices are being secured in isolated places. Screenings are scarce, and it is impossible to secure sufficient to take care of the steam business for this section.

Nashville, Tenn.

Nashville and vicinity are in the midst of the blizzard which is taking in the entire country, and just as was predicted several weeks ago, the unprecedented cold spell has caught all the dealers short of coal.

The usual trouble around the mines with freezing weather and snow, retarded considerably the loading of coal. This together with the shortage of cars on the one week when every mine in the field could have run, full capacity, added much to the demoralized condition.

There is still a big demand for screenings at the top market price. Outside of this there has been no relative change in this field over recent quotations. Some few people, as an extra inducement to have a little spot coal shipped immediately, have seen fit to offer a slight advance on the regular prices, but this condition has not prevailed to any extent.

Indianapolis

Continued cold weather has caused all coal mines in the state to work full time, with large forces, to supply the demand. Previously, the mines had been worked on an average of about half time. Many Indiana cities, depending on natural gas for fuel, have sent rush orders for coal, the gas supply being insufficient.

The indications are that the demand will continue, since big consumers have begun to store in anticipation of the miners' strike after Apr. 1. The operators are, however, somewhat pessimistic, believing the cold weather will not last and that the strength of the market will vanish. It is too late for retail dealers to stock up heavily since they have been turning their surplus into cash.

Chicago

Wholesale prices in the Chicago coal market are on a higher average level than they have been in the last six years. Severely cold weather, with the mercury below the zero mark most of the time, gave a sky rocket turn to the price situation that caused a stir in every direction.

On steam coals the rise has been far more rapid than on those of the domestic variety. Smokeless mine-run has risen from 80c. to $1.10 on shipments direct from the mines, with a strong tendency toward another jump to $1.15. Lump and egg sell wholesale at $2.15 to $2.25. Splint coal, which sold a short time ago for $1.10 to $1.25, moves freely at $1.55 to $1.60. Low grade screenings have risen almost 100% and a boost of 50% in other sizes has not been unusual.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62
Egg	2.62
Steam lump	2.25
Screenings	1.87
Springfield:	
Domestic lump	$2.57
Steam lump	2.32
Mine-run	2.27
Screenings	1.82
Clinton:	
Domestic lump	$2.52
Steam lump	2.25
Mine-run	2.15
Screenings	1.77
Pocahontas and New River:	
Mine-run	$3.15@3.30
Lump and egg	4.20@4.30

Coke—Prices asked for coke are: Connellsville, and Wise County, $4.50@4.65; byproduct, egg and stove, $4.85; byproduct, nut, $4.55@4.65; gas house, $4.85.

Minneapolis—St. Paul

The local coal market has shown great activity during the past week. The weather has continued cold, stocks have been diminishing at a rapid rate and some dealers are looking for a coal famine. This is not probable, however, as a

day or two of milder weather would allow the railroads to bring in hundreds of cars of coal which is now stalled on side-tracks on all the roads.

This stretch of 20 deg. below zero weather has played havoc with the railroad service. The Great Northern reported Friday that they had 1400 loaded cars of coal at their yards in Duluth, but were unable to move them. A frozen car, they claim, pulls twice as hard as under normal conditions, and a frozen engine uses up one-half its energy in moving its own weight. Retailers' stocks are low on all grades of coal, but especially on anthracite. A canvass along the H. & D. division, which supplies the large resident district of Minneapolis, shows there is a shortage on all grades of anthracite, and only one car of stove size was found at any of the twelve yards.

St. Louis, Mo.

The coal market in St. Louis is in an extraordinary condition, which has obtained since the middle of last week, when the weather went down to 10° below zero and was followed by snow. The snow held up the railroads and ice blocked the ferries on the river to such an extent that the yards in East St. Louis were congested and it was impossible to get coal across.

Carterville coal is worth in the neighborhood of $1.50 for the larger sizes, and there is an unlimited market for the smaller sizes at almost any price the shipper demands. This same condition applies to the Franklin County coal, but this product is moving almost exclusively into the Northwest.

The local demand for anthracite has been exceedingly good, but shipments are hard to get. The same condition applies to smokeless lump and egg; gas-house and byproduct coke are in good demand, but it is almost impossible to get shipments. There is no coal coming in from the Saline or Springfield districts, as these coals are in demand in the Northern market, where they are bringing a better figure than St. Louis could stand. A small tonnage of Arkansas anthracite is moving in, but not enough to relieve the market any.

Portland, Ore.

Portland had a touch of real winter weather during the week. It was in the nature of a silver thaw, which means that telegraph and telephone wires, trees and fences became coated with ice to a thickness of an inch or more and with disastrous results because of the crushing weight.

The coal and fuel dealers in general were buried under orders that poured in at an amazing rate and which were difficult to fill promptly. One fuel dealer stated that business increased about 300% during the first days of the cold snap.

Train service was tied up in eastern Oregon during the storm, but not sufficiently to cause any disturbance.

Spokane, Wash.

Coal has been in a great demand in the territory known as the Inland Empire during the last week, but the prices have remained stable. The cold weather is drawing upon the stocks to a considerable extent, but the mines are furnishing their share, and the demand is easily met. Indications are that the cold weather will continue for a few more days, and in the meantime the coal dealers are doing their best. Prices are as follows:

Kind	Wholesale	Retail
Rock Springs	$7.20	$9.00
Owl Creek	7.20	9.00
Kirby	7.20	9.00
Carney	6.70	8.50
Bearcreek	6.35	8.25
Roslyn steam	5.25	6.25
Canadian steam	5.25	6.25

Foreign Markets

Great Britain

The tonnage position is satisfactory, and there is a good tone to the market. Prices, however, are about unaltered and are as follows:

Best Welsh steam coal	$4.14@4.20
Seconds	4.02@4.08
Thirds	3.78
Best dry coals	4.02
Best Monmouthshire	3.78
Seconds	3.60
Best Cardiff small coals	2.16
Seconds	1.92

The above prices for Cardiff coals are all f.o.b., Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days less 2½ per cent.

Production and Transportation Statistics

Norfolk & Western Ry.

Statement of commercial and company coal from mines on the Norfolk & Western Ry. for the month of December, 1911, is as follows in net tons:

From	Commercial	Company
Pocahontas field	1,112,126	97,748
Tug River field	147,107	44,100
Thacker field	167,232	63,831
Kenova field	68,885	9,357
Clinch Valley field	91,032	7,194
Total	1,586,382	222,230

The following are shipments from the different fields in West Virginia:

	Transfer Coal	Tipple Coal	Total Coal
Pocahontas	1,142,793	22,358	1,165,151
Tug River	188,506	2,701	191,207
Thacker	226,431	4,632	231,063
Kenova	70,586	7,656	78,242
Total	1,628,316	37,347	1,665,663

Total coke shipments, originating entirely in the Pocahontas field, were 96,609 tons.

The Car Situation

On Jan. 3 there were 135,938 more cars on the lines of the members of the American Railway Association than the demand called for. This was a big increase from the statement of the previous fortnight, when the surplus amounted to 76,814. That in turn compared with a surplus of 36,143 as of Dec. 6. Most of the increase in the latest report resulted from a falling off in the movement of coal.

In the two weeks ended Jan. 3 the surplus of coal cars increased from 35,409 to 64,719, and the surplus of box cars increased from 23,485 to 36,145. Miscellaneous and flat-car surpluses followed the general trend with considerable increases.

On the corresponding day last year the net surplus of idle cars was 106,924. Two years ago it was only 38,416; in 1909, 332,513, and in 1908, 341,100.

Financial Notes

The Northern Securities Co. reports the earnings of the Crow's Nest Coal Co. for the year ending Dec. 31, 1911, at $27,552. Earnings were curtailed because of the strike.

Monongahela River Coal & Coke Co. has declared a dividend of $2 a share on the preferred stock out of earnings for fiscal year ended Oct. 31; payable Jan. 25 to stock of record Jan. 22.

Consolidation Coal Co. has declared the regular quarterly dividend of 1½% on the capital stock and a dividend of 1½% on the subscription receipts for stock carrying dividends declared after Jan. 31, 1911, both payable Jan. 31 to stock of record Jan. 26.

Virginian Ry. proposes to increase its stock from $36,000,000 to $65,000,000 through issuance of $29,000,000, 5% cumulative preferred. Matter comes before stockholders at annual meeting here Jan. 27, but Rogers estate is believed to own all the road's common stock save $500,000. Belief is that extension to the Great Lakes through acquisition of other railroads or through building is contemplated.

The board of directors of the Lehigh Valley R.R. Co. has authorized the distribution of $6,060,800, or 10% on the total outstanding stock, payable Feb. 26, 1912. Coincident with this the Lehigh Valley Coal Co. has authorized the organization of the Lehigh Valley Coal Sales Co., with a capital stock of $10,000,000, consisting of 200,000 shares of the par value of $50 each, of which 121,216 shares of the par value of $6,060,800 will be immediately issued. The readjustment is made necessary by the decision of the supreme court rendered in May, 1909, by which it was held that a railroad company cannot lawfully transport coal owned by it.

The preferred and common stock of the New River Co., owned largely by Boston and Pennsylvania people, has just been listed on the Boston Curb Exchange. The bonds of this company are already listed on the Boston Stock Exchange. This stock was widely distributed in 1906 through a number of local interests and the company sells much of its product through Maine, Massachusetts and Rhode Island. The preferred stock paid dividends through 1907 and 1908, but has not paid since then. The listing on the Boston Curb has been at the application of large shareholding interests who desire to see a broad, natural market in the stock.

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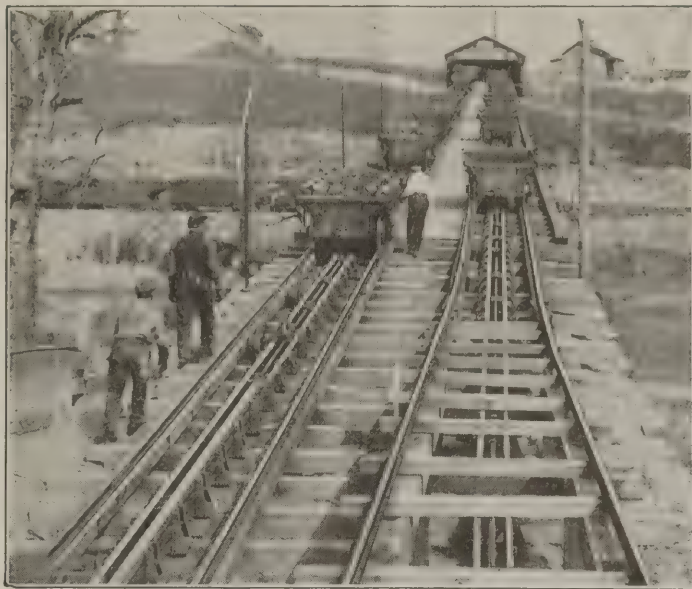

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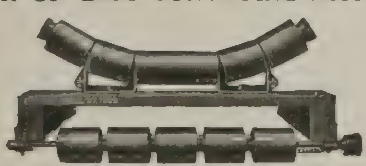

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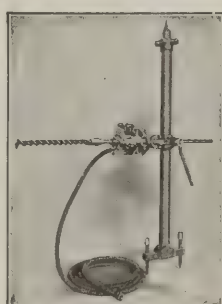

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The annual meeting of the stockholders of the Hill Publishing Company, for the election of directors for the ensuing year and for the transaction of such other business as may properly come before the meeting, will be held at the office of the company, in the Hallenbeck building, 497-505 Pearl Street, Borough of Manhattan, New York City, N. Y., on Tuesday, January 30, 1912, at 12 o'clock noon. Dated, New York City, December 19, 1911. ROBERT McKEAN, Secretary.

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Wanted—Contract work (mine, mill, etc.), or assistant, by married physician; one year hospital experience; also private practice in Pennsylvania. Address Box 5, care Coal Age. Jan. 27.

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1. No. 16.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, JANUARY 27, 1912

Ten Cents per Copy.
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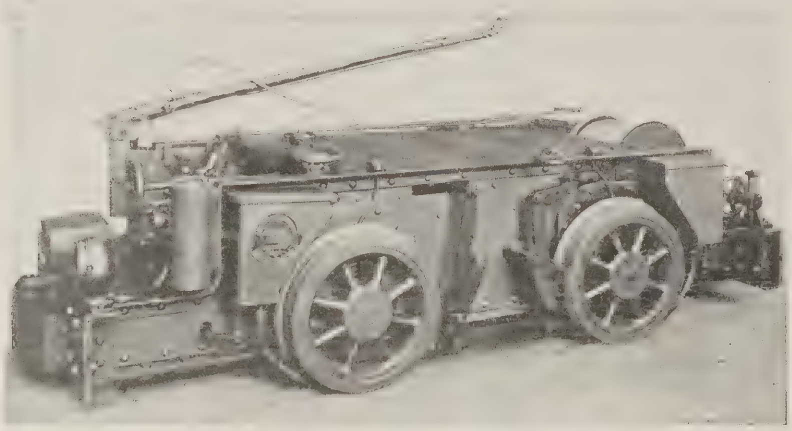

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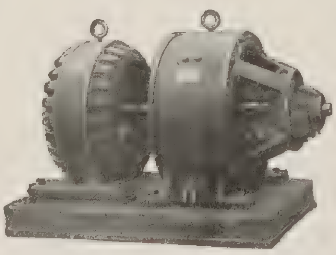

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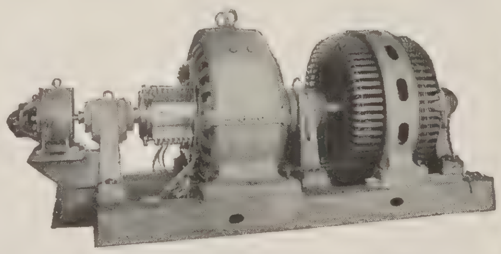

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COAL AGE

Vol. 1 NEW YORK, JANUARY 27, 1912 No. 16

THE decision of the U. S. Supreme Court, approving the Employers' Liability Law, marks an epoch in labor legislation. Its sole interest and importance to coal men is in the shadow it casts before. No recent act so clearly betokens the trend of thought pertaining to our social problems, as does this ruling of our highest national court.

True! this law was designed principally to deal with our great railroads, and affects interstate labor only; however, to quote the Supreme Court decision: "The laws of the States, in so far as they cover the same field, are superseded, for necessarily that which is not supreme must yield to that which is."

Legislators in every state now have a definite and accepted ruling laid before them. Therefore, with this decision to guide them, is it not likely that lawmakers will create measures in behalf of intrastate labor, exactly paralleling the approved Federal Act governing interstate employment unless indeed those vitally interested show due concern for the passage of more equitable legislation?

The law as approved by our highest tribunal makes employers of interstate labor liable for accidents to employees whether the mishap is due to negligence on the part of the victim, or is caused by a coemployee. Such a liability law enacted and enforced in a coal state, would mean bankruptcy to three out of every four companies, should a disastrous explosion or fire occur at any one of their mines. Under such a liability law, there would be no reasonable limit to the burden which could be assessed by a jury on the defendant

Coal operators can no longer afford to evade the issue. The problem of a proper accident provision for industrial workers cannot be ignored. The question is, Can we not secure fair and uniform compensation laws that will provide for a miner and his family in case of accident or death, and yet permit the stricken company to recover and continue in business?

The blackest stain on the coal industry has come from the deceit and perjuries accompanying accident investigations. It is nearly always the same old story—a coroner's jury composed of farmers, doctors or some other class of men who never saw the inside of a coal mine, and then the usual verdict, "caused by a blown-out shot." This deplorable condition is an outgrowth of unjust laws. The operator chooses the only course that will avoid financial disaster, and strives by fair or foul to avoid conviction.

That present laws are ineffective is proved by the reports from employers' liabilities companies, which show that of all the accidents reported to them, only one in eight led to a settlement. Under the law's technicalities, any effort on the part of the coal company to settle, is sure to be presented to a jury as evidence of guilt Last but not least, the relations of operator and miner under the present act are constantly embittered, and this lack of harmony is not calculated to restrict the number of accidents.

The United States is practically the only country that retains the principle of an employers' liability law. Other nations have adopted some form of compensation act, based on the idea that injuries to men, like accidents to machinery and buildings, should be imposed on the employer. One is as much an expense of production as the other.

When this principle is adopted, the mining company can shift the risks of compensation to an insurance company, which, for a reasonable premium, will carry this hazard for them. The insurance company, to operate with success, would have to vary its premium on each mine in accordance with a fixed standard of safety. The charges to operators of mines having many natural dangers would be greater than to companies operating in comparatively safe seams.

In this way, a just tax would be placed on each coal company; present uncertainties would be removed through the operator's knowing beforehand what definite compensation charge he must add to his cost of mining; insurance companies could form a more precise idea of the charges they might be compelled to pay, and thus place their business on a scientific basis; and lastly, the injured workman and his family would receive all the compensation paid over by the employer and the insurance company, instead of having 47 per cent. of the money go to enrich a class of lawyers properly dubbed "ambulance chasers." In a later issue, we will discuss the plan of voluntary compensation as adopted by the H. C. Frick Coke Company.

European Wash House Practice

Special Correspondence

The first of a series of articles to be published on this subject. The question is discussed here along general lines, while the succeeding papers will deal with the problem in greater detail.

It has long been a recognized fact that the occupation of mining, both in metalliferous and coal mines, must be ranked as one of the callings involving a considerable amount of physical discomfort and uncleanliness. And further, there is no doubt that in the past a great proportion of the sickness and loss of time among operatives is traceable to the fact that the miners on leaving work were not provided with adequate means for bathing and washing. No suitable arrangements were provided whereby they could change their wet and dirty clothes for garments more suitable for exposure to the outside air.

Many of these miners have to travel considerable distances to their homes and in the case of married men, the size of the house and the presence of other inhabitants interferes with the bathing arrangements, with the result that the percentage of mortality must have been materially increased. Cases of phthisis and similar complaints are at the present day far too common, and although mining companies are frequently most generous in the provision of medical attendance, it is obvious that the root of the trouble lies deeper and that the true remedy of the problem is in preventive, rather than curative means.

For this reason, in Europe, and especially in France, Germany and Belgium, the question of providing adequate washing, bathing and clothes drying appliances is receiving considerable attention and some remarkable installations have been made to which attention may here be drawn.

Referring to the types of appliances available for such purposes, one may first of all consider the question of proper change of apparel. The miner, on coming up from the warm and usually damp workings of the mine, finds, unless he is properly protected, a blast of cold bleak air meeting him, often accompanied with rain or snow, and these conditions are aggravated by the fact that he has either to walk or ride some distance before he reaches his home. For this reason some form of dressing accommodation is urgently necessary.

Clothes Suspension Method

Two types of such plant exist in Europe. The first of these consists of a large hall with benches on which the workmen sit while changing clothes, the hall being given considerable elevation and suitably warmed. In the upper part of the hall is suspended a rack arrangement furnished with a number of pulleys corresponding to the total number of employees in the mine. Over these pulleys work metallic cords carrying at one end a hook or other form of gripping appliance to which the wet garments can be attached. At the other end is a counter weight and locking device whereby the clothes can be hauled up into the roof and locked in position, the key of the lock being retained in the possession of the workman owning the clothes.

Fig. 1. Dressing Room and Clothes Hoist at the Poirier Mines

A current of warm air circulating through the building, dries the clothes and thoroughly aerates them, removing contaminating influences; the pulleys are spaced a sufficient distance apart to provide free room round each set of clothes for the circulation of air. The workman, on coming to work, after passing the time

check office, comes into the dressing hall, brings down his dry working clothes, changes, hangs on the hook his ordinary garments and hauls them up locking them in their position in the roof.

On return from the mine, he enters the dressing hall, often by means of a covered way from the pit mouth, so as to prevent the access of cold air to the heated body. After washing in the appliances to be described shortly, he brings down his dry clothes, changes, hangs up the wet mine clothing, which will then be dry and ready for the next time he comes to work. In some establishments this arrangement is supplemented by a clothes-washing and drying plant whereby at suitable intervals the dirty mine clothes are washed and dried rendering them fit for further use. This type of plant is in extensive use particularly in Germany and Belgium.

Closets and Lockers

An alternative to this equipment which is to be found in some mines, is to use clothes chests or lockers. These are generally made of light steelwork frames, cased in with expanded metal, so as to permit at all times a free supply of air to circulate through the clothes. They are usually ranged round the sides of the dressing hall and each locker is furnished with a lock and key, the latter being in possession of the workman.

The usual dimensions of these lockers is 1.75 m. in height, 0.3 m. in depth, the same in width, and they are usually elevated from the floor by means of struts to a height of about 0.15 m. to 0.3 m. Sometimes they are divided into two compartments, the top one being reserved for hats, coats, etc., while the lower one is used for underwear and boots.

The dressing room and clothes hoists in use at the Marcinelle-Nord Colliery in Friesland belonging to the Fiestaux Pit of that company is shown on the front cover of this issue. It will be seen that the apartment is well lighted and warmed and that in all its arrangements it is capable of rapid and easy cleaning. The illustration Fig. 2 shows a section of the type of expanded metal lockers used in the alternative arrangement for this purpose. The possibility of adequate supervision and of proper hygiene is apparent. In Fig. 1 is shown a similar installation to that on the front cover, being a dressing room and clothes hoist at the St. Charles pit of the Poirier mines, installed by Goehmann & Co., of Brussels. This firm has installed about 80% of the dressing and bathing installations existing in Belgium, France, Germany, Russia, Spain and Austria in connection with mining equipments.

Bathing Arrangements

An equally important and perhaps even more important branch of the subject is the question of baths and wash-houses. The average miner's home is not well equipped for the complete bathing necessary after the arduous toil to which the operator is subjected, and the methods adopted on the Continent are therefore of interest in this connection.

A considerable amount of thought is of course necessary in order to provide adequate accommodation for a large number of men at one time without running up the expense of the installation to an unreasonable figure, and therefore simplicity combined with efficiency is the keynote for such work. At the same time, it is astonishing to what a degree of comfort it has been found possible to bring the bathing accommodation both for men and women employed in the collieries of Europe. Hot and cold water is usually available, and in some cases, especially for the engineers and senior officials employed in the mine, full baths are provided. Where these are not available, however, shower baths are used and washing operations can be conducted in privacy by means of brickwork cells closed with curtains or screens.

Through the courtesy of Messrs. Goehmann & Co., we are able to show several illustrations of such equipments. In Fig. 4 for example, is a view of the exterior of the building devoted to the spray baths and dressing room at pit No. 17 of the Monceau-Fontaine Colliery in Belgium. The interior fittings of such installations may be judged by Figs. 5 and 6 showing respectively the spray baths and lockers at the Fiestaux pit, and the spray baths for the miners at the St. Charles pit of the Marcinelle-Nord and Porier collieries.

The cells are usually constructed in glazed white tiles which are of great hygenic advantage, do not discolor, resist the influence of weather and frost, and are simple and practical to use. They are plastered on to the structural work by means of cement mortar, and in order to give the free standing walls a special resisting power, a lining of bands of iron running horizontally are usually placed in each layer or in every third or fourth layer. If shaped tiles are used at the ends of the walls, the ends are propped up with vertical iron bars or gas piping bedded into the ground at their lower end. The crevices of the walls are filled in with white marble, cement or cement mortar.

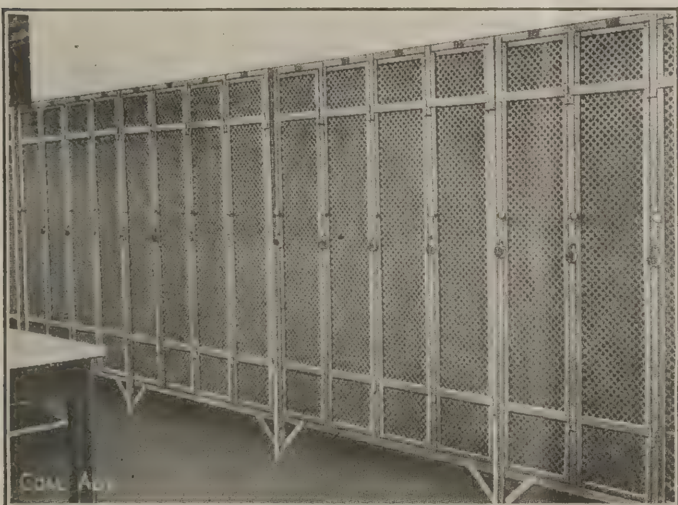

Fig. 2. Expanded Metal Lockers

Fig. 3. Wash House with Basins

Comparison of Method

An alternative method is to use enamelled brick and in order to show the relative extent to which the various methods enumerated above are adopted, Table 1, is attached giving a few of the principal collieries which have adopted dressing rooms and wash-houses.

The first column gives the number of workers provided for in the clothes hanging appartus in the roof of the dressing

halls and the second gives the number of workers for which lockers are provided. The third column gives the shower baths built of enamelled brick, and the fourth the shower baths built of tile in the manner above described.

TABLE I

	Dressing Hall		Wash Houses	
Colliery	Hangers	Lockers	Enameled brick	Tile
Ougree-Marihaye..	650			40
Kessales ...	1100			57
Concorde ...	400	10	31	
Gosson	1472	24	79	
Patience ...	600		53	
La' Haye....	1100			65
Bois d'Avroy	1157	40		86
Bonne-Fin ..	470	208		58
Abhooz	1084	77		76
Petite Bacnure		280		52
Cockeril ...	1000		63	
Est de Liege	400			42
Hasard	550	30	7	
Minerie	105			14
Bonnier ...		20	10	
Oignies Aiseau	300	30		36
Roton	1000	40	72	
Bois Communal ...	324		27	
Poirier	550	24	53	
L'Epine	250		25	
Marcinelle-Nord	600		72	
Monceau Fountain..	2578	808	479	
Fontaine-Leveque..	1100	24	102	
Anderlues ..	825		119	
Mariemont .			91	
Bois-du-Luc	800		80	
Levant Flenu			5	
Produits ...	30		14	
Levant-Produits ..			6	
Siege d'exp. Frameries.			7	
Fief		20	3	5
Nord du Rieu due Cœur.				3
Gr. Hornu..				29
Strepy-Bracquegnies..		416	52	

The illustration Fig. 7 shows an alternative method of securing privacy in the various shower bath cells by the use of enamelled sheet doors. Where expense is cut down to the finest point, wash basins provided with hot and cold water are used, as shown in the illustration Fig. 3. For heating the water four steam and two hot water boilers are used.

As a general rule the dressing hall and washing equipment are complementary to one another and are contained in the same building, inasmuch as one operation without the other is hardly satisfactory. As a typical example of the way in which such installations are arranged may be taken the equipment provided at St. Etienne mines of the Loire.

Equipment at the St. Etienne Mines

Four doorways are provided into the building, two leading to the subsidiary departments such as the store and lamp room, and two opening directly on to the dressing hall. The main hall has dressing accomodation for 500 workers. The miners in changing clothes divest themselves as completely as possible of their working outfit and then proceed to the shower baths immediately adjacent to the hall. The officials of the mine change and bathe in separate compartments, clothes lockers being provided for them. Urinals and water closets are provided, as are also the necessary boilers and apparatus for the heating system of the building and the hot water required for the baths.

At the other end of the building are subsidiary offices including naphtha stores, the lamp filling room, the lamp cleaning department, stores, and the lamp repairing room. In this way the miner is able to obtain and return his lamp in the same building as is provided for his dressing and washing accommo-

Fig. 4. Exterior of the Monceau-Fontaine Bath House

Fig. 5. Spray Baths at the Marcinelle-Nord Colliery

dation. Immediately over the lamp departments is another story, in which are two rooms devoted to the engineers' baths and dressing accommodation. In order to provide a free circulation of air extensive ventilation is provided on the Louvre system in the roof of the building, and in addition there are ventilating windows in the side of the structure.

In an article of this description it would be impossible to give a complete idea of the way in which bathing and dressing accommodation have been adopted on the Continent. It may, however, be said that almost without exception the facilities provided have been greatly appreciated by the workers who have availed themselves to a large extent of the equipment provided.

Whether such installations should be made compulsory and the use of them by the miners should be part of the obligatory routine of the mine is a matter of opinion. There is, however, no doubt that the provision of such accommodation in connection with collieries and mines is a step in the right direction, not only from the point of view of the worker, but also that of the employer, inasmuch as it leads not only to an increase of contentment with the conditions of employment on the part of the worker, but has a reflex action on the general health and efficiency of the operators. This has been found by experience to be a great asset to the working of such mines as have adopted the systems above described.

Fig. 6. Lockers at the Poirier Colliery

Fig. 7. Baths with Enamelled Sheet Doors

Mine Cave Commission

Special Correspondence

The mine-cave commissioners who were recently appointed by Governor John K. Tener, of Pennsylvania, have made some progress in their investigation into mine subsidences in the anthracite region, and the damage resulting therefrom.

Recently the commissioners requested the director of the department of public works in the city of Scranton to inform them of the number of cubic yards of ashes and rubbish collected in Scranton during the year 1911. The bureau of engineering of the department of public works estimates that 108,016 cu.yd. of any given material will fill a 5-ft. bed extending over 13½ acres. That quantity of ashes and rubbish was collected and wasted during 1911 in Scranton.

These ashes will serve for the upper beds, but as the lower beds are much thicker than the upper a large amount of rubbish will be needed to replace them. Though this be conceded, it has been pointed out that most of the damage that results from mine caves is directly attributable to the subsidences in the beds near the surface.

List of Commissioners

The following is a list of the commissioners: W. J. Richards, president, Pottsville; W. L. Connell, Scranton; E. J. Lynett, Scranton; W. A. Lathrop, Wilkes-Barre; George W. Davis, secretary, Lansford; Charles Enzian, Wilkes-Barre; W. L. Lewis, Pottsville; J. Benjamin Dimmick, Scranton; Reese A. Phillips, Scranton; Charles Stevens, clerk, Scranton.

The commission has decided to investigate the leases to ascertain what provisions are embodied in them in reference to surface rights. In some leases already examined by the commissioners, entire tracts of land are protected to the extent that, in the event of a mine cave, the property damaged must be placed in the same condition as it was previous to the disaster brought about by the cave that affected it.

It is the intention of the commissioners to do their work thoroughly. They regard the situation as serious, but not irremediable. Within a few hours of the commission convening, the children in school No. 23 of this city had to be dismissed; while on a previous occasion, when the mine commission was assembled here, a house in Ross Ave. was engulfed from roof to cellar.

Pathogenic Mine Atmospheres—III

By Edwin M. Chance*

Here are discussed the active pathogenic gases, as carbon monoxide, nitrogen peroxide, hydrogen sulphide and sulphur dioxide. The possibility of a skin inhalation of carbon monoxide is considered.

The presence of carbon monoxide in mine air may be traced to several sources. As it is a product of the incomplete combustion of carbonaceous substances, it is formed by explosions of coal dust or firedamp, by underground fires, and by the detonation of most explosives. It is well known that carbon monoxide is produced when air at ordinary temperature acts upon bituminous coal. It has remained, however, for Mahler and Denet to prove the presence of this gas in mine air from such a source. These writers have found as much as 0.004 per cent. of carbon monoxide in the air of well ventilated mines. The statement may be found in the literature that this gas is also produced by the decomposition of organic matter other than coal in the mine. As the presence of carbon monoxide has been considered indicative of mine fires, its presence from other causes must be given due weight before forming a definite opinion as to the existence of a fire.

Its principal claim on our attention, however, lies in its physiological action. As this gas is odorless and nonirritant, it may be breathed in considerable quantity without the subject being aware of the fact, the first warning being given by grave functional derangement. Briefly, the mechanics of its action may be thus described: Carbon monoxide, having an affinity for hemoglobin about 200 times greater than that of oxygen, readily replaces the latter in the blood when breathed. As the blood becomes saturated with carbon monoxide its oxygen capacity becomes correspondingly diminished, until it can no longer supply sufficient oxygen to fulfill the requirements of the organism. In addition to this, the gas is said to cause degeneration of the cells of the organism, and thus serious nervous disorders are brought about. Haldane and Douglass state that physical disablement is produced in man when about 50 per cent. of the blood is saturated with carbon monoxide, death occurring when this figure increases to 80 per cent.

Effect of Carbon Monoxide

Owing to its great affinity for carbon monoxide, the blood may become saturated to a dangerous extent when this gas is present even in minute quantities. It is difficult to give fixed points at which an atmosphere containing carbon monoxide will produce given effects. It has been stated, however, that quantities under 0.02 per cent. have no appreciable action on man, while the lethal percentage has been fixed at 0.5 per cent. Herman has tabulated the action of carbon monoxide as follows:

THE ACTION OF CARBON MONOXIDE

Percentage in air	Effects on man
0.05	After half an hour or more, giddiness on exertion.
0.1	After half an hour or more, inability to walk.
0.2	After half an hour or more, loss of consciousness and perhaps final death.
1.0	After a few minutes, loss of consciousness and final death.

When any given percentage of carbon monoxide is breathed, the blood tends to reach a degree of saturation at which the carbon monoxide and oxygen in the air are in equilibrium with the carbon monoxide in the blood. If we apply the law of mass action to this phenomenon, it will be readily seen that a change in the proportion of oxygen present will have an effect upon the system, carbon monoxide-oxygen-carbon monoxide hemoglobin, opposite in direction to that produced by a change in the proportion of the carbon monoxide. Now the data on which the statements as to its toxicity have been based have all been gathered when carbon monoxide was breathed mixed with air containing 21 per cent. of oxygen. Unfortunately, however, when carbon monoxide is met with in dangerous quantities in the mines, the oxygen percentage is, as a rule, far below the normal. It seems to the writer, therefore, that under such conditions far lower proportions of carbon monoxide than those noted would produce serious results. It is regrettable that we have but little real data bearing on this point. A case has been reported, however, in which several men lost their lives on entering an atmosphere containing 0.0023 per cent. of carbon monoxide and 4.874 per cent. of carbon dioxide. The oxygen percentage was not stated. As has been mentioned before, when considering the toxicity of an atmosphere, the action of no one of its constituents can be taken alone, but all must be considered together.

Animal Test for Carbon Monoxide

As carbon monoxide is poisonous to warm-blooded animals generally, its effect upon birds and mice has been taken advantage of to give warning of its presence. Haldane, who has been instrumental in bringing this test to the notice of mining engineers, uses these words in describing it:

"The principle of the test is as follows: In small warm-blooded animals the rate at which chemical changes occur in a given body weight is enormously greater than in large animals. Thus a mouse weighing about half an ounce consumes about fifteen times as much oxygen as half an ounce of the human body would consume in the same time. A reason for this difference is evident enough with bodies of the same shape and composition, but of different sizes; the surface increases as the square of any corresponding diameter, but the mass as the cube. The bigger an animal is, therefore, the less surface will it have for a given mass, and the less rapidly will a given mass of it lose heat to the environment; or the less heat, and consequently the less oxygen, will a given mass of it require in order to maintain the normal body temperature. Not only are the chemical changes in the small animal far more rapid, but the rate of respiration, circulation, etc., are correspondingly increased. It is difficult to count by the eye the rate of breathing in a mouse, and quite impossible to count its pulse rate. By a photographic method of recording the electrical changes which accompany the heart beat, Miss F. Buchanan, of Oxford, has recently shown that the pulse rate in mice and small birds is from 700 to 1000 per minute.

"It follows that the small animal will absorb any poisonous gas far more quickly than a man will, and will, therefore, show symptoms of poisoning far sooner. It can, in fact, be employed to show what will ultimately happen to a man if he remains in the poisonous air. This, and this alone, is the principle of the test. The small animal is not, in the long run, more sensitive than a man to a given percentage of carbon monoxide; indeed, the opposite is almost certainly the case."

Symptoms of Monoxide Poisoning

The symptoms of poisoning by this gas are varied. When small quantities are breathed there may be drumming in the ears, with more or less frontal headache and nausea. As the poisoning proceeds, giddiness and lassitude will set in, followed by progressive loss of power in the lower extremities, merging into paralysis, which eventually invades

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the rest of the body. Synchronously with loss of muscular power the mental processes become deranged. Should the subject, however, inhale an atmosphere containing much carbon monoxide, almost instant insensibility will be the result. After recovery from exposure to this gas, severe pains in the head and extremities have been frequently noted; though a more serious after-effect is pneumonia.

The post-mortem appearances are characteristic. As carbon monoxide hemoglobin possesses a deep violet to cherry-red color, the face and lips have a remarkably fresh and lifelike appearance, very different from the bluish or livid pallor produced by a deficiency in oxygen.

Effect of Nitrogen Derivatives

Nitrogen peroxide is one of the products of the combustion of certain explosives. It is extremely poisonous when breathed. Peterson and Haines state: "Habitually breathed in small quantities and great dilution, it produces severe chronic diseases. In acute poisoning, immediate dyspnea, tightness of chest, coughing, fainting, cyanosis, diarrhœa and collapse. Death within 40 hours, though symptoms of slight poisoning are delayed, in which case the first symptoms are headache, desire for fresh air, thirst, and then suddenly symptoms of aggravated character—distress of breathing, anxiety depicted on face, cold perspiration, protruding eyeballs, and spasmodic coughing, followed by vomiting."

Effect of Sulphur Compounds

The presence of hydrogen sulphide in mine air may be brought about by the bacterial decomposition of organic matter, by the heating of coal by a mine fire, or by the action of organic matter on sulphates in solution. It is slightly heavier than air and possesses a strong odor, 0.01 per cent. being readily detected by the olfactory organ. This gas is even more toxic than carbon monoxide; it is stated that as little as 0.02 per cent. may have a toxic effect. Birds are especially sensitive to it, being killed by 0.05 per cent. "Breathed in its pure state, this gas is immediately fatal. It acts upon all animals through all tissues, especially the lungs. If somewhat diluted, it produces nausea, giddiness, cold skin, labored breathing, irregular action of the heart, pains in the stomach, and death by coma or in violent convulsions, with tetanus and even delirium. In greater dilution sleepiness will be produced, the continued respiration of the gas proving fatal, sensibility not being restored. In exceedingly dilute condition it sometimes occasions febrile symptoms somewhat resembling typhoid. Air containing 0.05 per cent. was the limit that men could breathe (Lehmann). Sometimes symptoms appear after a considerable lapse of time after breathing the gas, and they may continue for some days."

COMPARISON OF THE PHYSIOLOGICAL ACTIONS OF AIR CONTAINING VARIOUS POISONS (LEHMANN).

Gas	Quantity causing rapid death	In ½ to 1 hour caused illness and danger to life	No serious effect in ½ to 1 hour	Slight symptoms after several hours
Sulphurous acid.....	....	0.04—0.05%	0.005%	0.002—0.003%
Carbon dioxide......	30%	about 6.0—8.0%	4.0—6.0%	2.0—3.0%
Hydrogen sulphide..	0.1—0.2%	0.05—0.07%	0.02—0.03%	0.01—0.015%
Carbon monoxide....	....	0.2—0.3%	0.05—0.1%	0.02%

The presence of sulphur dioxide is probably one of the surest indications we have of the presence of a mine fire. Fortunately the gas is so suffocating that ample warning is given of its presence. Though notably toxic in its action, workmen exposed to the gas may establish considerable tolerance toward it.

A Suggested Danger in Helmet Work

While a great volume of material has been written on the subject of the requirements of a man equipped with breathing apparatus, it has occurred to the author that a most important phase of the matter has been neglected, namely, the insensible respiration. In addition to the oxygen absorbed through the lungs, the blood is continually being supplied with oxygen through the skin. Gerlach[1] states that the ratio of oxygen supplied by the skin to that supplied by the lungs is as 1 is to 137, while Regnault[2] and Reiset set the ratio at 1 to 180. Should the wearer of a breathing apparatus enter an atmosphere low in oxygen, the inconvenience caused by the curtailment of the supply of this gas through the skin would probably be negligible. Should, however, the atmosphere contain much carbon monoxide, there might be considerable cause for apprehension, when we consider that carbon monoxide has over 200 times greater affinity for hemoglobin than oxygen, and practically the same diffusibility through animal membrane. Of course, this danger would only become pressing after long exposure to such an atmosphere. It is for the foregoing reasons that I cannot too strongly urge those who may have direction of rescue parties to expose their men no longer than necesary to lethal atmospheres.

[1] "Die Physiologie der Haut," Roehig, Berlin, 1876.

[2] "Human Physiology," Landois and Sterling, London, 2d ed., p. 886.

Colliery Steam Piping Suggestions

By H. H. Lawrence

Steam pipes that are well covered and well drained save money by prevention of accidents and the reduction of waste and repairs.

The installation of a steam power plant in the coal-mining field should call for no less careful consideration and design than in other industrial fields. Unfortunately, however, it often receives but scant attention, with resulting serious loss to the operator.

Some points to be considered in designing a system of steam piping are: (1) That as soon as the steam leaves the boilers it begins to condense, and since condensation cannot be absolutely prevented the design should provide for its removal. (2) Expansion in the steam line should always be provided for. (3) Valves should be located, if possible so as to allow one portion of the steam-piping system to operate while the other may be shut down for repairs. (4) Although there is no perfect heat insulator, the loss of heat from steam pipes by radiation may be reduced to a minimum by the employment of a proper covering.

It has been found experimentally that each square foot of uncovered iron pipe surface will radiate about three British thermal units per hour for each degree Fahrenheit difference between the temperature of the atmosphere and that of the steam. The exact amount of radiation depends on the humidity of the air and somewhat on the velocity with which the steam flows in the pipes. Assuming this figure to be 3 B.t.u. per hour per square foot of radiating surface, the economic loss in any particular case may be calculated from the following formula.

$$L = \frac{3\,A\,(T - T_1)\,H\,V}{965.7 \times 2000 \times E}$$

In which L is the loss in dollars per annum due to steam condensation. A equals area in square feet of the pipe surface exposed to the air. T equals temperature of the steam in degrees Fahrenheit. T_1 equals mean temperature of the surrounding air in degrees Fahrenheit. H equals the total number of hours steam is conveyed through pipes per annum. E

equals the evaporation of water in pounds from and at 212 deg. F. per pound of coal; V equals value of fuel per short ton including handling and disposition of ashes, etc., and 965.7 equals the latent heat of steam at 212 deg. F. If A equals 1000, T equals 315 deg., T_1 equals 60 deg., H equals 3000, E equals 10 and V equals \$3. Then L equals \$356.47. The 1000 sq.ft. of pipe surface is equivalent to 577 lineal ft. of 6-in. pipe or 443 ft. of 8-in. pipe.

By using a proper covering as much as 90 per cent. of this loss may be saved. There are many makes of covering on the market and the best way to secure a good article is to purchase it from a firm having an established requtation. Pipe covering is usually made in two forms; one, known as sectional, which consists of molded segments held in place by metal straps and is easily applied; the other, a plastic cement which is more particularly adapted to the insulation of pipe fittings, etc.

If a steam line is constructed so that there are sags, low points or pockets, the condensed water will gradually accumulate and reduce the sectional area of the pipe until forced out in more or less large quantities by the steam. This is especially apt to occur if the demand for steam is intermittent and it is from this source that there arises the well-known water hammer caused by the steam carrying a quantity of water along at a high velocity and delivering it against some elbow or valve with considerable impact. The effect of such a rush of water into the cylinders of a reciprocating engine is too well known to require further comment.

All low points in steam lines should, therefore, be properly drained, either by specially designed apparatus for eliminating the water or by "bleeders" as shown in Fig. 1.

Removing the Water of Condensation

The sketches, Figs. 2, 3 and 4, show methods by which the water of condensation is removed. In the several sketches B represents the boiler and E the engine. Fig. 2 shows the simplest method used in piping. The water of condensation flows into the engine with the steam, unless separators V are provided to remove it. In case all of the engines are stopped, as at night, water will accumulate in the pipe and cause trouble when starting the engines, unless the water is drained off by "bleeders." In Fig. 2 the piping to the engine is made from the top of the main, so that the water of condensation will run to the dead end; the small amount of water that is carried over to the engine may be removed by the separator V. The water thus accumulated at the end of the main should be continuously removed by a pump or trap.

In Fig. 3 the pump or trap at S is replaced by a drain pipe, which is connected below the elevation of the boiler water and will drain automatically, provided the drop in pressure in the main is not so great as to maintain a level of water in the drain higher than the point S. If the level maintained is lower than the separators V, then they may be connected to the drain pipe, and in case it is necessary to make a dip in the main, such as at L, the lowest point of this should also be connected to the drain. The entire system will then maintain its circulation; there will be no strains set up in the pipe by alternate heating and cooling, and the whole will be self-draining, whether working or not. When installing such a drainage system, all connections with the drain should be provided with check valves, such as are shown in Fig. 1.

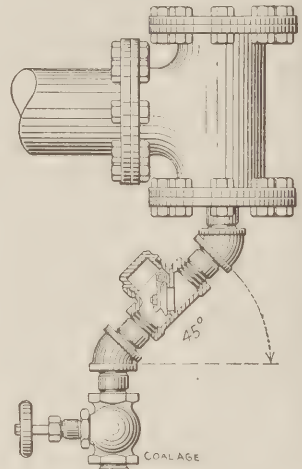
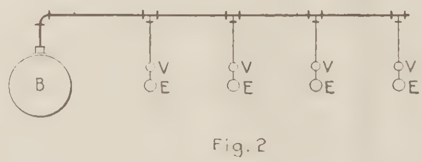
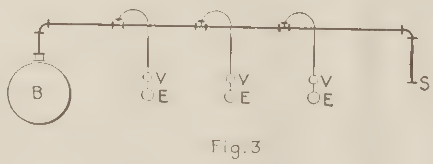
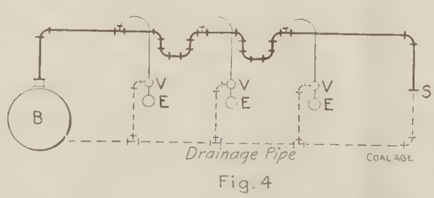


Fig. 1. Check Valve on Drain Pipe







Methods of Installing Steam Lines

Where the elevation of the boilers is sufficiently below that of the engines, as in some of the anthracite collieries in Pennsylvania, the gravity return system of steam piping is feasible, and the results thus obtained are entirely satisfactory in every respect. In a majority of cases, however, the required difference of elevation cannot be obtained and in such instances it is common practice to lead the condensed water back to the feed pumps, which return it to the boiler at a high temperature (about 212 deg. F.). As many drain pipes as possible should be brought together in this way.

Constructing a Branch From the Mains

In leading off a branch from the mains, the connection should always be made at the top of the main, and a horizontal partition at the center of the tee will improve the action of the branch still further, since in case of a quick demand for steam at the engine, the flowing water at the bottom of the main cannot be lifted into the outlet pipe.

It has been the experience of mechanical engineers that the pitch of all the pipe lines should be in the direction of the flow of steam. If a rise is to be placed in the main, a drain should be located at the lowest point just before the rise. In terminating the mains and all important branches, such as at S, in Fig. 4, the ends should be provided with a drop-leg or some other form of low point in the system, and these should be piped to the drainage pump.

A like connection should be made at all fittings which are of such form that the water may collect in them. A method that gives good results in draining mains is to lay a small drainage pipe about 1½ in. in diameter at a suitable distance below the mains and connect it with all the low spots in the piping, and also with the drainage pump.

In order to prevent water entering the mains, from which the steam may have been shut off, a swinging check valve should be used at each connection between the drainage pipe and the main. Such a valve should be placed at an angle of 45 deg., as shown in Fig. 1, so that the valve disk takes a position nearly vertical. In this position it requires practically no head of water to force it open when in action.

Some of the advantages to be gained by a drainage system such as outlined above are the recovery of the otherwise waste heat in the water of condensation, the elimination of strains due to cooling of the pipes when not in use, together with the consequent reduction in the number of pipe leaks, and the delivery of drier steam to the engines, which insures cylinder lubrication with a minimum amount of oil. However, whether or not such an installation will pay at a plant of the usual size in the coalfields, where fuel is cheap, is a matter which will be determined almost entirely by local conditions.

Coal at normal temperature absorbs oxygen, some coals doing so more rapidly than others. Certain unsaturated compounds in the coal combine with the oxygen without producing any great amount of carbon dioxide.

Self Contained Breathing Apparatus

Special Correspondence*

An account of an expert test of self-contained breathing apparatus, grading them according to their availability and recommending certain modifications.

The experimental committee, appointed to investigate certain self-contained breathing apparatus with the object of recommending a suitable appliance for use in the mines of the South Midland coal fields, has issued a report of considerable interest. The members of the committee were well known mining engineers in the Midlands, and the practical investigations were of a somewhat protracted nature, the proceedings being directed by Dr. John Cadman, professor of mining at the Birmingham University, who occupied the position of chairman of committee.

The appointment of the committee was largely the outcome of the Homestead colliery disaster, when the local organization was proved to be so inadequate and the absence of suitable appliances so pronounced that an urgent appeal to the Yorkshire rescue stations for help was rendered imperative. There is abundant evidence in the report now made public that the committee conducted the experiments in the experimental mine of the university with the sole object of securing the most practical information possible relating to rescue apparatus. In the result they may not have given universal satisfaction, for that is scarcely possible where it is necessary to condemn as well as to praise; but that the members of the committee in the prosecution of their labors have sought to give the apparatus a fair trial and to arrive at an honest conclusion regarding the merits of the prospective types examined, will be generally conceded.

Those who have an opportunity to study the report in detail will do so with both pleasure and profit, for it contains some interesting and informing data. Six types of apparatus were examined, and it appears the committee endeavored to reproduce the actual conditions which occur in a mine after an underground fire, and they further undertook such forms of exertion as are then necessary. During each test and each group of tests they collected the following data: The favorable and unfavorable points observed by each wearer during each experiment, the details and nature of the work accomplished, the time the apparatus was worn, the body temperature, pulse and weight of each man before and after the test, the increased weight in the CO_2 absorbent, together with details of the conditions under which each test was conducted.

In parenthesis it may be noted that the youngest member of the committee was 26 years of age and the oldest 50; height ranged from 5 ft. 7 in. to 6 ft. 6 in., and weight from 116 to 195 pounds.

During the progress of the investigation the makers of the apparatus occasionally renewed or refitted defective or badly designed parts. The inquiry was extended considerably, because improvements were made in the apparatus from time to time—improvements which were largely the outcome of the committee's experiments. In this way the task set at the commencement became difficult and seemed almost endless.

For the purpose of the report, the apparatus were considered in two distinct groups, depending upon: (a) The attachment to the face; (b) the gas supply.

Helmets, Masks and Mouthpieces Compared

Under (a) are considered: (1) Helmets or masks covering the whole face; (2) half-masks covering the nose and mouth only; (3) mouthpieces. At the commencement of the tests the committee were all disposed to imagine that the helmet was the most comfortable attachment, but gaining more experience they ultimately came to the unanimous opinion that the helmet is entirely unsuited for use in mines. As explained, helmets as at present constructed, do not permit of a sufficient field of vision, and this renders traveling very difficult, particularly when crawling or looking in an upward direction. The half-mask permits of comfortable breathing, does not restrict the vision, but is very difficult to apply to the face, and the entire muzzling of the nose and mouth and the pressure on the face and chin become depressing and uncomfortable after some time, particularly when the wearer is perspiring.

The mouthpiece, consisting of an india-rubber tube with a flange of suitable size and shape to insert between the teeth and the lips, has much in its favor for use underground, and as far as the experience of the committee goes, is the only suitable attachment. Its favorable features are: The range of vision is not limited; it can be readily inserted in the mouth; it is comfortable and efficient; conversation is possible by slightly distending or raising the mouthpiece, which, even in the most deadly atmosphere, may be momentarily released for expectoration.

Respirable Air Supply Compared

Reverting to classification (b), depending upon gas supply, the Aerolith apparatus depends for its oxygen supply upon the evaporation of liquid air rich in oxygen. The report says: "The supply of oxygen is intermittent, and does not respond to excessive exertion and the expiratory tube occasionally becomes blocked with ice." At the same time it is stated that the apparatus, as improved by Mr. Blackett, seems to overcome this difficulty, and the experiments, so far as they went, were very satisfactory. For reasons given, however, the committee do not seem to favor "this form of apparatus as an efficient type for use in mines."

In the compressed-oxygen type, those giving constant supply (Draeger, Fleuss, Meco) have the oxygen stored in cylinders capable of carrying 260 to 290 liters at 120 atmospheres. The oxygen is supplied for breathing purposes by means of a reducing valve, which may be adjusted, but cannot then be altered while the apparatus is being worn.

In the Draeger and Meco, the reduction in pressure is utilized by means of an injector for circulating the gas continuously through the breathing bag and regenerators; in the Fleuss the oxygen reduced in pressure simply passes direct to the breathing and regenerating bag. The automatic oxygen supply apparatus is represented by the Weg, which theoretically is most efficient, and is of excellent design in many respects; but the committee say "the automatic valve has not reached a state of perfection sufficient to warrant us in recommending it as suitable."

After describing in some detail the tests and experiments, the committee say all the apparatus examined can be used to some extent in mine rescue work, although the experiments revealed defects in construction and principle which are more pronounced in some types than others. To illustrate the various conclusions arrived at they have prepared the table printed on the next page.

Three of the types of apparatus were eliminated by the committee as being the least efficient by comparison, and the Draeger, Meco and Fleuss reserved for the final test as to their suitability, the opinion expressed being that all "are capable of much improvement, and should be modified before being adopted."

Decision of Committee

The claims of the selected appliances are discussed as follows:

"For work under normal conditions,

*The report of a committee of the South Midland coalowners upon an investigation conducted in the mining department of the University of Birmingham into self-contained breathing apparatus for rescue and recovery work in mines after underground fires and explosions. Birmingham (England). Cornish Brothers, Ltd., publishers to the University, 37, New street. Price of report, 5s. net.

and as the apparatus now stand, we are of opinion that the Fleuss is superior to any which we have examined, the order of preference for such work being: 1, Fleuss. 2, Draeger. 3, Meco (Westfalia).

"Under conditions where the temperature of the atmosphere is high, and under long spells of excessive exertion, the Fleuss apparatus shows defects in that the inspiring air attains a high temperature which renders the apparatus uncomfortable and defective. The absolute comfort in distribution of the weight and the flexibility of the tubes has led us to prefer this type under conditions of reasonable atmospheric temperatures and work, but the defect referred to is so serious in an apparatus of such merit that unless remedied, we cannot recommend the Fleuss as suitable under the conditions likely to obtain in rescue work in your district.

"On the other hand, in the more severe tests made in atmospheres with high temperatures, the Meco (Westfalia) and Draeger showed superiority to the Fleuss, the order of preference in these tests being: 1, Meco. 2, Draeger. 3, Fleuss.

"The bad distribution of the weight in both the Meco and the Draeger, and the stiffness of tubes connecting the mouthpiece to the apparatus, render these apparatus clumsy and uncomfortable.

"It will be seen that we favor the Fleuss type on account of its general comfort and adaptability under normal conditions of temperature, and the Meco (Westfalia) and Draeger types in excessively warm and moist atmospheres."

The report contains a specification of apparatus. Appendix I gives details of apparatus with observations. Appendix II examples of instructions for tests. Appendix III proposed scheme for organization of brigades. Appendix IV photographs of apparatus examined.

RESULTING TESTS OF BREATHING APPARATUS

Apparatus	Mechanical Construction	Body Comfort	General Adaptability for Work	Helmet	Mask	Mouthpiece	Efficiency of Oxygen Supply	Efficiency of Absorbent	Temperature of Air Supply after Period of Exertion
Aerolith....	bad	v'ry good	bad	bad	....	....	irregular	....	good
Draeger....	good	fair	good	bad	....	bad	v'ry good	v'ry good	good
Fleuss......	v'ry good	v'ry good	v'ry good	good*	....	v'ry good	good	fair	bad
Hall-Rees...	good	bad	bad	bad	....	....	bad	....	bad
Meco.......	good	good	fair	bad	bad	bad	v'ry good	v'ry good	good
Weg.......	good	good	fair	....	fair	....	irregular	v'ry good	good

*Detachable helmet.

Pillar Drawing in Contiguous Seams

By Frank Lynde

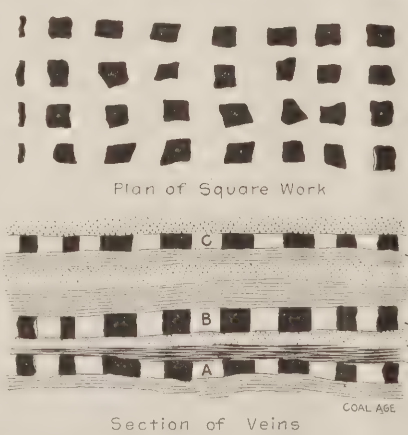
Pillar drawing, even under normal conditions, is a delicate and difficult operation, but when complicated, as here described, the problem is indeed a serious one. The correct solution will be arrived at only by experimenting and a number of methods for robbing are suggested.

An interesting problem in pillar robbing has arisen in the anthracite field, where three closely contiguous seams are being worked. These seams have been practically worked out and the operators are now facing the problem of drawing the pillars.

The accompanying sketch shows the relative position of the seams which are designated at *A*, *B*, *C*, beginning at the bottom. In the case under consideration, these seams have from 100 to 125 ft. of hard sandstone cover and 50 to 90 ft. of wash material. *A* and *C* are about 6 ft. thick, and *B* somewhat thicker. The stratum between *A* and *B* varies from 3 to 10 ft., the material changing from bone to soft sandstone. The stratum between *B* and *C* is from 10 to 25 ft. thick and of a somewhat harder sandstone.

B seam, being the thickest, was the first one to be worked, the mining being done by the room-and-pillar system, with rooms 42 ft. centers and 24 ft. wide. The *A* seam was next worked by the same system as used in *B* seam, and the rooms so driven as to have all pillars directly under those in the *A* seam. The *C* seam was next opened and worked in the same manner as *A* and *B*, so that all pillars in the seams *A*, *B* and *C* formed practically continuous vertical columns, one directly above the other.

The particular workings under consideration are about 50 ft. higher than the shaft bottom, making it difficult to flush with culm. Also the elevation of the high-water mark in this section is about 50 ft. below the top of the hard sandstone above *C* seam.



Working Contiguous Seams

Pillar drawing in contiguous seams having this comparatively thin and irregular parting presents many difficult problems. The case may be considered under the following heads: *A*, Culm Flushing; *B*, Sand and Dirt Flushing; *C*, Flushed with Mine Refuse, and *D*, Square System.

FLUSHING

Under ordinary conditions it would seem the proper method would be to flush the workings of *A* and *B* seams with culm. Then draw the pillars in *C* seam and permit the roof to settle on *A* and *B* seams. Where the stratum between *A* and *B* seams is of considerable thickness, say 7 ft. or over, *B* seam should be robbed next. Where this parting is less than 7 ft. thick, both *A* and *B* seams may be worked together.

An objection to this method would be the necessity of putting down a drill hole or drill holes for flushing, since the bottom of the shaft is below the workings, and it would be difficult to utilize it for this purpose. Care should be taken to have the hole so located as to be readily accessible to all parts to be flushed.

B, Sand and Dirt Flushing—If there are no improvements on the surface, the wash material may be hydraulicked into *A* and *B* seams through a series of drill holes. But it must be remembered that flushing of this kind requires considerable fall in order to be an economical operation. Sand and dirt are not so readily handled by this system as culm, and if the seams pitch less than 6 deg., such heavy material cannot be readily flushed. The supporting power of sand and dirt is greater than that of culm, but the cost is more as more holes are required and more water per unit volume of flushed material, to say nothing of increased labor cost.

C, Flushed with Mine Refuse—If the culm and sand are impracticable, rock and slate may be used, which have been thrown out from the breakers.

The material will, of course, have to be broken up, to accomplish which a crusher with a speed of between 800 and 1200 r.p.m. and driven with 50- or 60-h.p. engine should be used, and in case electrical energy is available the street-car motor type of drive gives good results. Under normal conditions this crusher will handle from 40 to 50 tons of material per hour. In event of material being harder than slate, one of the low-speed crushers should be used. The amount of water required for such operations varies from 4000 to 6000 gallons per ton of material and the installation of such a plant costs from $2500 to $3500.

CRIBS

C, Cribs—Should flushing operations of any kind not be practicable, cribs may be built in *A* and *B* seams, one above the other in every second or third room, or about 100 ft. apart. Such cribs should be from 8 to 10 ft. square and well ballasted with rock. *C* seam can then be robbed, and when *A* and *B* seams take the pressure, the cribs will have a tendency to prevent the pillars from chipping.

D, Square System—If all these systems prove impracticable and in addition it should prove necessary to protect the surface, probably the only remaining method is the square system as illustrated in the accompanying sketch. In this system of mining, the pillars are all cut up into squares sufficiently strong to support the roof pressure. In some instances 50 to 60 per cent. of pillar coal can be recovered by this method. All the pillars should be left one above the other.

In any event, an undertaking of this kind should be so systematized as to divide robbing into a number of sections. One section should be worked at a time as the removal of the pillar coal is extremely difficult and the result uncertain. If a given method fails in one section, employ another method in the next section.

New River Coal Field

SPECIAL CORRESPONDENCE

The past year has been, in many respects, an abnormal one in the New River fields; hardly any new mines have been opened, and, while the output of coal has been good, prices have been uniformly low, in many cases below cost of production. For the first three months of the year prices were fairly well maintained and the operators worked together, but after Apr. 1, everything went to pieces and the coal-mining industry has been in that condition ever since, until the last two months, when the operators, realizing that they could not mine coal profitably under such conditions, began to pull together again. Such a state of affairs has militated against any new developments and the year has been a quiet one in that respect.

The principal development has been along transportation lines, involving the diversion of some 70,000 tons per month from shipment over the Chesapeake & Ohio Ry. to the Virginian. This was brought about by the construction of a line from the Loup Creek district to the Virginian by the McKell interest, the largest individual owner and producer of New River coals.

Another important change of ownership has lately taken place, the Loup Creek Collieries Co., with an acreage of 25,000 and shipments of 400,000 tons per annum, has passed into complete ownership of the H. H. Rogers estate.

Along technical lines there has been little of interest to chronicle. A new mining machine now being experimented with at one of the large mines, will, it is confidently expected, lower mining costs and put out coal in better condition.

The Eccles mines of the New River Collieries Co., which have been under development for the past three or four years, are now beginning to load heavy tonnages. They are now loading about 25 cars daily and, when fully developed, expect to have an output of 5000 tons.

Strenuous efforts have been made during the past year to develop new markets for the New River-Pocahontas coals, the operators realizing that they can no longer depend on New England to take all surplus coal and to cover the output of all future developments. These efforts have met with considerable success and it is believed that 1912 will show a much needed increase in shipments to Mediterranean ports and South America.

Additional Montana Coal Statistics

BY J. B. MCDERMOTT*

As already noted in COAL AGE, No. 13, p. 408, the total production of coal in Montana for the year ending Oct. 31, 1911, was 2,913,397 tons, having a value of $4,903,620.73. The total production for the same period in the previous year was 2,970,246 tons, having a value of $5,405,847.72.

The total number of men employed underground during 1911 was 3132, and the number employed above ground 644, making the total number of coal miners employed in the state during the year of 1911, 3776. The total production per man per day was 3.3 tons. The total amount of black powder used was 1,808,745 lb., and the total amount of dynamite used was 35,220 pounds.

There was one accident for every 76 men employed, and 58,268 tons were produced per accident. There was one life lost for every 224,107 tons produced, or one for every 290 men employed; 3.44 men were killed per thousand employed.

*State coal-mine inspector, Helena, Mont.

Azoturia

This disease, common in mules, is an affection of the liver and blood-forming functions, the prominent symptoms being loss of control of the hnid limbs and the passage of ropy and dark-colored urine. These suggest that the urinary organs are affected but this is not the case. There is an excess of azotous or nitrogenous constituents in the blood and it is from this fact that the name "azoturia" is derived. The disease does not exhibit itself when the mule is kept at pasture, but when it is living on highly nitrogenous food such as oats and is kept long in idleness. A mule thus overfed and underworked is not affected while in the stable; exercise seems to permit the working of the secreted poisons. The quicker breathing of the animal, while laboring, seems to cause a transference of the poison from the overcharged liver and the portal veins of the abdomen.

The following notice relating to azoturia is displayed in the mule and horse barns of the Consolidation Coal Company, in West Virginia.

"It is a disease of too frequent occurrence during the winter months. Stablemen, remember that there is no excuse for the occurrence of azoturia. This disease is caused by feeding working rations to idle horses. Remember that azoturia can be prevented. It takes but 48 hours for this disease to develop.

"All horses idle from any cause whatever must have their grain rations cut down until they return to work. Symptoms of azoturia are plain and should be recognized by stable attendants. The animal is brought out of the stable after having been well fed and rested. He comes out in high spirits, full of life, travels a short distance or works a short time when he becomes lazy, sweats freely, knuckles over at fetlocks and may lie or fall down, perhaps being unable to rise. The muscles of the haunch become swollen and hard. The urine becomes coffee color. Muscular spasms, uremic convulsions and death may be expected.

"Should azoturia occur in your stable, the first thing to do is to call your veterinary surgeon, stating what you believe to be the trouble so that the surgeon may bring proper remedies with him. The second thing to do is to get the horse into a box stall or on the barn floor. Bed him down with plenty of straw or hay, offer him water to drink, turn him from side to side every four hours; blanket him if possible; do not dose a case of azoturia with colic remedy, large doses of spirits of niter or anything else that you have on hand. Call the veterinary surgeon, await his arrival and in the meantime make the animal as comfortable as possible.

Coal Mine Ventilating Equipment

By W. M. Weigel*

The construction and operation of the disk fan are described and formulas derived for its pressure and capacity. The distinguishing characteristics of the Guibal centrifugal fan are also set forth. This is the third of a series of articles on mechanical ventiiators.

*Associate professor of mining, Pennsylvania State College, State College, Penn.

Disk fans have vanes or blades set obliquely to the plane of rotation, as in wind mills or screw propellers for boats. They are usually mounted on a horizontal shaft and are placed directly in the line of the current of air that they move. The difference in pressure on the two sides of the wheel is due to the change in velocity of the air.

The blades are constructed of sheet steel, the inner ends being fastened to a hub on the shaft. The outer ends may or may not be connected by wrought-iron distance pieces but in any case the back of each blade is braced near the top to an extension cf the main hub, or to an extra hub. This is necessary to prevent deflection of the light blades by the air pressure. A cast-iron or sheet-steel casing encircles the wheel with just sufficient clearance to prevent touching. The width of this casing is a little greater than the axial thickness of the wheel.

Fig. 1 shows the general construction of a motor-driven ventilator of this type as made by S. B. Stine, before being placed in position. When installed, the airway or mine opening is built up close to the surrounding ring with either brickwork or tongued and grooved lumber. In the smaller sizes the motor may be direct-connected to the fan shaft. For the larger sizes instead of using a direct or geared motor drive, the fan may be driven by belting to a steam engine, motor or line shaft. This latter method has the advantage of offering less obstruction to the air current.

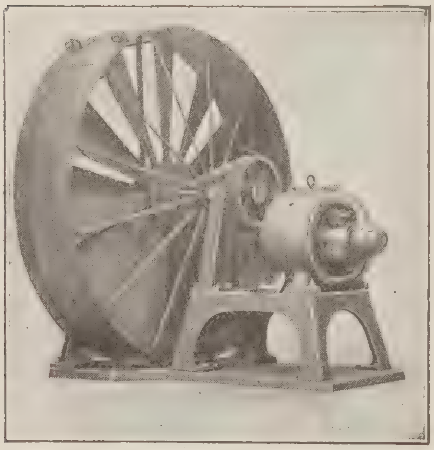


Fig. 1. Stine Disk Fan

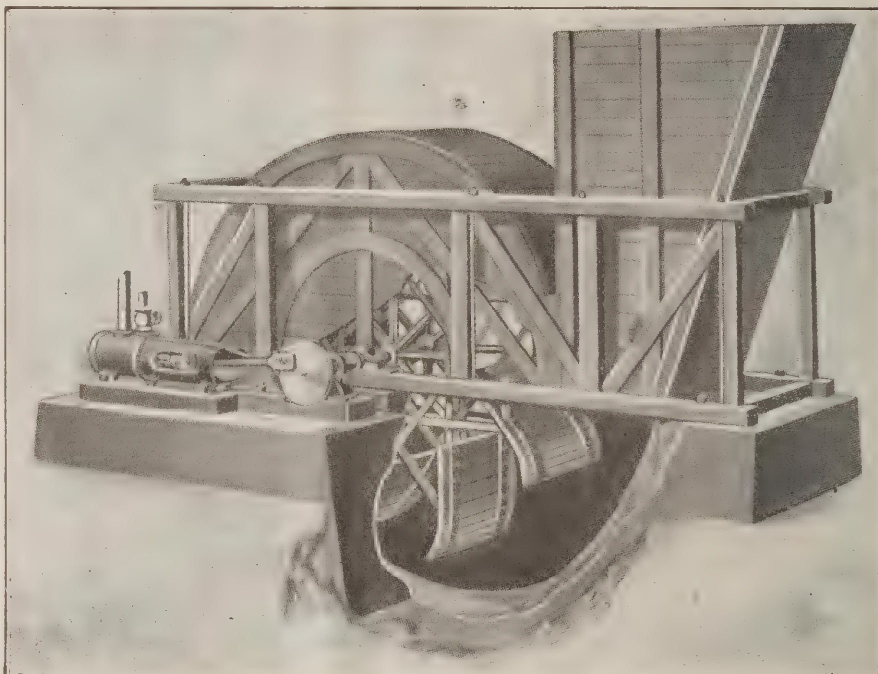


Fig. 2. Guibal Fan with Wooden Blades and Casing

The number of vanes in disk fans varies from 4 to 12. Increasing the number of vanes increases the frictional resistances, but strengthens the action of the fan. It is usually necessary to make the central disk or boss quite large, ¼ to ⅓ the diameter of the wheel, in order to prevent the air from rushing back through the fan at this point, where the pressure developed is the least.

The advantages of this type of fan lie in its low first cost and low cost of installation, no heavy foundations being required; its adaptability to emergency use because of the ease and quickness with which it may be installed; and its fairly high efficiency when working with low pressures. It is not suited to air pressures much above 1-in. water gage or to quantities of air exceeding 80,000 to 90,000 cu.ft. per minute. These fans are made, however, in sizes up to 12 ft. in diameter with capacities of 100,000 cu.ft. of air per minute. As mentioned before they are usually set directly in the airway and are thus liable to destruction from an explosion.

Pressure and Capacity of Disk Fans

The blades of disk fans may be considered as sectors of a helix, and in fact they follow the lines of a helix to a certain extent, the angle which the blade makes with the plane of rotation increasing as the center is approached.

Let

α = Angle made by the blade with the plane of rotation, at any distance from the center.

r = Radius at this point.

then $2\pi r \tan. \alpha =$ the pitch of the blade, and disregarding the friction of the air on the blade, a particle of air would be moved forward a distance equal to the pitch in one revolution of the wheel, if the blade was a continuous helical surface; that is, it would be moved forward a distance $2\pi r \tan. \alpha$ normal to the plane of rotation. Letting $n =$ number of revolutions per second and $v =$ the velocity of the air leaving the face of the wheel in feet per second, then

$$v = 2\pi r n \tan. \alpha. \qquad (1)$$

The velocity v is equivalent to a total pressure of $\sqrt{2gh}$ where h equals the head in feet of a column of air necessary to produce the velocity v. In order to make uniform comparisons, the weight of a cubic foot of dry air at 32 deg. F., at the sea level should be taken as a basis. Under these conditions a cubic foot of air weighs 0.0807 lb. and the pressure equivalent to a velocity v is $p = 0.0807\ h$, where

$p =$ Pressure in lb. per sq.ft.
and

$\frac{p}{5.2} =$ Pressure in in. of water, also let

$i =$ Water-gage in inches,
then

$p = 5.2i$,
and

$$h = \frac{5.2\ i}{0.0807} = \frac{v^2}{2\ g},$$

from which

$$i = \frac{v^2}{128.86\ g}, \text{ or } v^2 = 128.86\ gi.$$

Theoretical and Actual Pressure and Capacity

Substituting the value of v^2 in equation (1)

$$i = \frac{(2\ \pi r n\ tan.\ \alpha)^2}{128.86\ g}. \qquad (2)$$

This is, of course, the total theoretical pressure attainable, that is, velocity pressure + static pressure, and if the fan is operated against a resistance, all the energy expended will not be converted into velocity alone. The pressure developed will be less than (2) because of the friction of the air on the blades, and the "slip" of the fan. The actual pressure will vary with the design of the fan, and the conditions under which it operates, and will be from 60 per cent. to 75 per cent. of that found from equation (2) where i does not greatly exceed one inch.

In order that the pressure or velocity of the air may be the same over the entire face of the wheel, the value $2\pi r\ tan\ \alpha$ must equal a constant, but this condition requires too great an angle of the blade near the center of the wheel. To overcome this difficulty the large central disk or boss previously mentioned; is employed and at the same time the ends of the blades fastened to this are not given the full pitch. The pressure actually developed is probably that due to the conditions existing at the mean of the inner and outer radii.

The pressure increases as the square of the tangent of the angle of the blades but a point is soon reached on increasing this angle, beyond which the shock of the air on entering the blades and the consequent churning and eddying has an even greater effect on reducing the pressure and decreasing the efficiency.

The theoretical capacity of the fan is the product of the velocity by the area of the annular space between the inner and outer circumferences.
Let

$r_1 =$ Radius of the central boss or hub;
$r_2 =$ Radius of the tips of the vanes;
$Q =$ Capacity in cubic feet per second;
then

$$Q = \pi v\ (r_2^2 - r_1^2) \qquad (3)$$

Since the velocity varies with the ratio of the velocity pressure to total pressure (that is, velocity pressure + static pressure) the volume discharged will approach nearest the theoretical when both sides of the fan are open to the atmosphere, and will be zero when the fan is discharging into or exhausting from a closed space.

The angle of the blades with the axis of rotation varies from 20 deg. to 35 deg. in the different makes of fans, and to some extent depends on the work the fan is to do.

Guibal Fans

Many forms of centrifugal fans are used at American mines, almost as many forms as there are different manufacturers of fans, but each has certain characteristics by which it may be classified as belonging to one of the following groups:

a. Guibal fans.
b. Capell fans.
c. Modern steel-plate fans.
d. High-speed or multivane fans.

The Guibal fan was one of the first forms used and is distinguished by its large diameter and its comparatively few blades, which are plane surfaces or surfaces curved only slightly. Fig. 3 shows the outlines of a typical Guibal fan, 35 ft. in diameter, and 11 ft. 8 in. wide, with inlet on one side only. As seen in the illustration the blades terminate at the circumference of the inlet, and slope backward about 30 deg. from a radial position. The light double lines extending across the inlet show the arms and bracing of the blades. These are bolted to cast-iron spiders keyed to the fan shaft as illustrated in Fig. 2, which shows a Guibal fan with part of the casing removed.

Referring again to Fig. 3, it is seen that the inlet is approximately one-half the diameter of the fan wheel, and that the spiral casing follows the circumference of the fan after leaving the point of cutoff, and then gradually enlarges, the expansion or discharge area at the cutoff being small in comparison with the diameter of the fan. This is another distinctive feature of the Guibal fan.

There are no cheek plates or annular disks connecting the sides of the blades, the side casing fitting to them as closely as possible without actually touching. In Fig. 3 it is seen that the blades curve forward at their tips to a radial position, while in Fig. 2 they curve backward; there is no recognized standard in respect to this.

Formerly the blades, casing and chimney were made of wood, and many fans of this construction are still in use and giving excellent service. All-steel construction is better, however, because it is more durable, has less leakage and is fireproof, a most important consideration. These fans may have an inlet on each side, but more often are provided with a single inlet. They are built as small as 10 ft. in diameter.

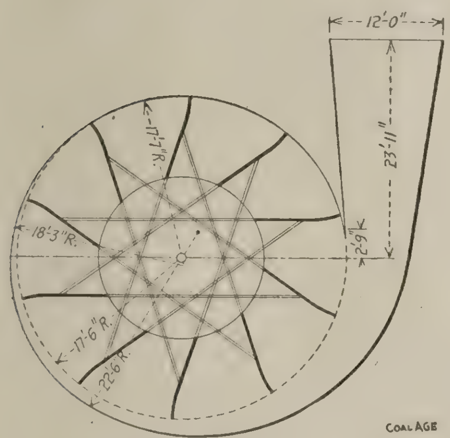


Fig. 3. Guibal Centrifugal Type

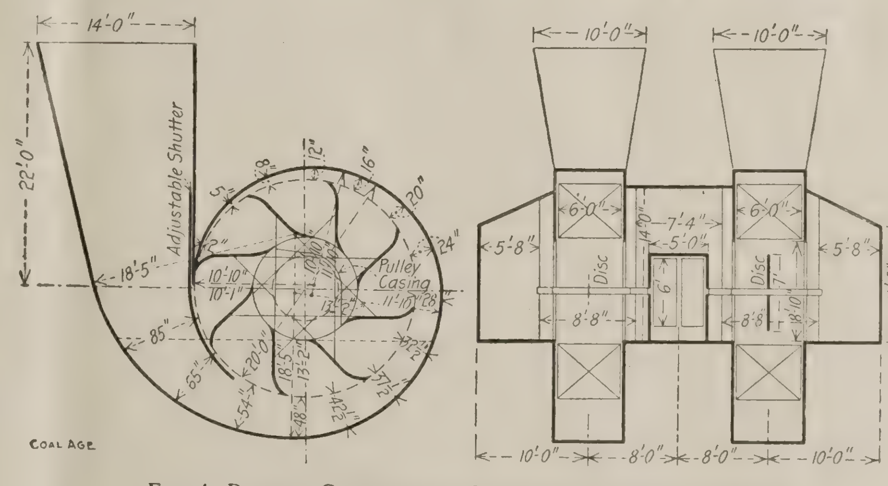


Fig. 4. Double Centrifugal Fan with Cutoff Shutter

The Cutoff Shutter

When air is being discharged into the spiral casing from between two blades, the pressure is on the front of the blade. Now as the tip of the blade passes the point of cutoff the discharge of air is suddenly stopped, causing more or less shock, and a sudden removal of the pressure from the front of the blade. This condition tends to cause vibrations injur-

ious to the fan, and pulsations in the air. To overcome it what is known as the Walker Anti-Vibrations Shutter was introduced.

This device consists of a flexible slide introduced at the point of cutoff, and supported between guides on the inside of the casing, which are curved to a circle of such size that the blade tips will just clear the shutter. By raising or lowering this sliding shutter the point of cut-off is changed and the discharge area is varied to suit the work the fan is doing. The lower edge of the shutter is notched in the form of an inverted *V*, the notch starting from each lower corner. Thus a blade on reaching the lower end of the shutter has the area of this notch through which to discharge the air in front of it, and the area gradually reducing as the blade advances, the air is discharged gradually and shock prevented.

The location of the shutter is shown in Fig. 4, illustrating the outlines of a Guibal fan in which the tips of the vanes bend backward and the inner ends forward, so that the air may enter from the inlet with less shock. This installation at the Susquehanna Coal Company's colliery, Nanticoke, Penn.,* consists of two fans, as indicated in the illustration, drawing air from one mine. They are mounted on separate shafts, but are driven by one duplex engine.

*"Centrifugal Ventilators," by R. V. Norris, *Trans.* A. I. M. E., Oct., 1891.

From the dimensions given in Figs. 3 and 4, it is seen that the spiral casing is not a true mathematical spiral, which would be difficult to lay out in practice, but consists of arcs of circles with increasing radii. The diameter of the inlet is approximately one-half of the diameter of the fan wheel, and the width of the blades for single-inlet fans one-third or less of the diameter.

Guibal fans have good efficiencies, and are suitable for large volumes of air at medium water gages, that is, 2 in. to 5 in. On account of their large diameter and slow rotative speeds they are especially adaptable to direct engine drive. They have found their largest application in the anthracite district of Pennsylvania.

United Mine Workers' Convention

Special Correspondence

The convention at Indianapolis will determine the stand that will be taken by miners with regard to making new wage contracts April 1, in bituminous and anthracite coalfields throughout the country. Daily reports of the proceedings by our own representative.

Opening Sessions on Tuesday

Fourteen hundred delegates, representing 314,000 organized coal miners, gathered in Tomlinson Hall, Indianapolis, Jan. 16, for one of the most important conventions and conferences in the history of the coal industry of the United States and Canada, the 23rd annual convention of the United Mine Workers of America. One of the chief purposes of the convention will be to formulate the demands that will be made by the miners when their representatives meet the mine operators to negotiate and establish new wage contracts for both the bituminous and anthracite fields.

President John P. White called the convention to order and the opening session was given up to addresses of welcome by representatives of civic and labor associations. Former Mayor Charles A. Bookwalter spoke for the Central Labor Union of Indianapolis. He said the miners were confronted by a question of great importance to the common good and their action would have a large influence in the industrial world. Other speeches of welcome were made by Rabbi M. M. Feuerlicht, representing Mayor Shank and Gov. Marshall. President White expressed the appreciation of the entire membership for the cordial welcome extended by the City of Indianapolis.

At the afternoon session the committee on rules and organization made a report providing that sessions should be held from 9 to 12 a.m. and from 1:20 to 5 p.m. Speeches were limited to five minutes and a rule made that no member be allowed to speak more than once on any question until all who wished to be heard had spoken; disorderly conduct to be punished with a reprimand and expulsion from the hall. Cushing's manual was adopted as a parliamentary guide.

President White read his annual report and Vice-President Hayes and Secretary-Treasurer Perry followed with their reports. President White said, among other things, that the miners will most certainly not consider any reduction in their present wage scales, but will strive for such advances in pay as seem possible to achieve; adding: "Probably no convention of the United Mine Workers in recent years has assumed a greater obligation than will this one if it fully discharges its duties to those who compose our membership."

Mr. White also said that now, practically on the eve of the expiration of the wage contracts, the attention of the whole Union membership and of the entire country will be centered on the deliberations of this convention and, "It will remain for the convention to outline a policy that will best meet the needs of the people and adopt a plan that will redound to the benefit of our membership everywhere. Our scale committee will do well to consider the responsibilities that devolve upon it."

The president then described the condition of the organization at the time when he took charge and spoke of conditions now, pointing out the growth and improvements made during the past year. The causes of the numerous strikes were discussed and while refusing to surrender the right to strike, he advocated a more reasonable course. His report showed that the United Mine Workers have a paid-up membership of 266,256, which is an increase of 24,864 over the previous year.

In conclusion, President White recommended that the organization renew its affiliation with the World's Mining Congress, which connection was discontinued in 1909.

Socialism Introduced

After going on record as favoring government ownership of industries, the socialists among the delegates introduced a resolution indorsing their party as "the political party of the working class," but the motion met with resistance and was defeated. Stormy debate occupied the whole of two sessions of the convention. Action was deferred on a resolution providing that the United Mine Workers should withdraw from the American Federation of Labor, condemning the National Civic Federation as an agent of capitalists and sharply criticizing the officials and leaders of the Federation of Labor for coöperation with the Civic Federation.

Because the organization had stipulated that it would be nonpolitical, the resolutions committee reported that it had refused to concur in the resolution committing the organization to the Socialist party, and offered as a substitute one declaring that "it would be well if workers would unite in the political as well as the industrial field." This brought about another discussion that lasted the remainder of the day.

John Walker, president of the Illinois miners, speaking for the socialists, intimated that if necessary an effort would be made to amend the constitution so that the national union could indorse the Socialist party. In a fiery speech he declared: "If you will not listen to our pleadings you will pay the cost." The "capitalistro parties," he said, possess the

power to enforce injunction, and to kill if necessary, and he urged the working class to seek political power "so that if it is necessary to use the injunction and the bayonet they will be used in defense of your firesides."

President Mooney, of the Missouri organization, protesting against the campaign of the socialists in the convention, declared the delegates could not pledge the Mine Workers of America to any political party. He said the constitution provides that religious or political subjects shall not enter into the deliberations of the convention.

Consolidation Possible

Consolidation of the Western Federation of Miners and the United Mine Workers is a strong possibility and was prophesied by John A. McKinnon, of British Columbia, and Edwin Young, of Montana, who addressed the convention. Both speakers represented the Western Miners as fraternal delegates to the convention. "All that is necessary," they declared, "is to refer the matter to the Westerners and surrender the charter of the American Federation of Labor, thus clearing the way for consolidation." The proposed amalgamation would result in the most powerful individual labor union in the world, with half a million members or more. The delegates cheered the prophecy.

In the report of Vice-president Hayes it was shown that while the United Mine Workers have a membership of 300,000 there are about 450,000 coal miners that are unorganized; hence, it is a serious question whether they should hold out for a general national agreement, when in some districts smaller bodies of operators are willing to come to terms. The scale committee, appointed Jan. 18, went into session Friday and is expected to report on or before Jan. 25.

Factional Dispute

The report of the credentials committee afforded an opportunity for airing the factional troubles which have nearly disrupted the organization of District No. 5, western Pennsylvania, during the past four or five years. Fiery oratory was fanned to a white heat when the committee reported that the Gibbons delegates were not entitled to seats in the convention on the ground that the three men selected were not members of the organization, and recommended the seating of the Feehan delegates. Robert Gibbons, Abe Kephart and James Sabin, the three deposed delegates, fought every inch of the way until the vote was reported in favor of seating their opponents.

Unusual interest was shown in these debates, because the Feehan-Gibbons fight is said to have been the most serious factional controversy that has arisen on the convention floor in many years. Conservative labor leaders expressed regret at the evident display of unharmonious spirit in the labor movement, and predicted defeat of the organization's plans if factional fights continue.

Interstate Wage Conference

Although the Feehan-Gibbons debate occupied approximately all Saturday's session, President White reported that his plans for the revival of the old interstate joint wage-scale movement have proved successful. He said the operators have promised to attend the meeting of the joint wage-scale committee to be held here Thursday, Jan. 25. He also said that miners of the anthracite field have demanded an eight-hour working day, a one-year contract, and a 20-per cent. increase in wages. His announcement that the interstate joint movement will be revived brought forth much applause as many of the delegates have feared that the operators would refuse to enter into a joint conference.

The miners indorsed a resolution to the effect that the organization should strive to have enacted compensation laws in the various states where mining is conducted. A proposition to start an international sick and accident fund was voted down, and several resolutions in regard to membership in the National Civic Federation of Labor were carried over until Monday. It cannot be said that a great deal was accomplished by the convention during the first week.

Scale Committee Appointed

The delegates to the miners' convention took up the matter of amending their constitution, Monday morning. Just before noon adjournment, President White appointed a joint wage-scale committee to go into conference with the operators, Thursday, Jan. 25. If the work of the convention is completed before a report is made by the members of the scale committee, the delegates will remain until a report is secured so as to ratify or reject the work of the conference.

The convention is greatly elated over the fact that the operators agreed to come to Indianapolis for a joint conference. The miners' prospects are declared to be brighter than they have been for years. There is an abiding hope that a joint wage scale will be speedily agreed upon.

Constitutional Amendment

An effort was made, Tuesday, by the socialist element, to frame the new constitution so as to shear the international officials of much of their power and place it with the rank and file to be expressed by the referendum vote. In some instances the effort was successful, but in the more important matters the authority was left with the international president and other officials.

After the next annual elections international officers will be chosen every two years instead of annually. A report of the constitution committee to this effect was embodied in the new constitution after a long debate in which an effort was made to keep the clause out of the constitution until it had received the endorsement of the membership through a referendum vote.

Almost the entire day was devoted to the constitution committee's report. It is thought that at least two days more will be required to pass or reject the proposed constitution.

The Year 1911 in Indiana

Special Correspondence

With five important strikes affecting some 2850 miners, in addition to numerous minor difficulties between the operators and the men, the year of 1911 in Indiana was one of the hardest in a long period for both miners and operators.

There are 18,000 miners in Indiana qualified to mine coal. Beginning with last May, the largest strike period in the year occurred when seven mines, the properties of three separate companies, were idle, 1500 men being ordered on strike. These were the Little Mining Co., of Green County, the Jackson Hill Co.'s mines, near Clinton, and the Coal Bluff Coal Co.'s mines, at West Terre Haute. This was a long fight and many joint meetings were held, but failed to bring a settlement, and the final decision of President Taylor, of the Illinois Operators, and President White, of the United Mine Workers, left the real issue involved in the strike unsettled. There were at the close of the year 550 men on strike in the Bicknel field in southwestern Indiana.

A far greater loss to the miners resulted from the shutdown, due to a lack of demand for steam coal. In many of the mines of the state for six months or longer, the average work was but two or three days per week, while only a small proportion of the mines worked with anything approaching regularity until the last few weeks of the year.

Taking as a basis that 9000 of the 18,000 miners of the state were out of employment through this cause, and we have as a conservative estimate that 2,700,000 days' work was lost by the Indiana miners during 1911. This is based on the estimate at the time of the worst condition that 50% of the miners were out of employment from all causes. Conditions the last few weeks of the year were much improved, although there were a number of mines running on slack time.

Two mine conventions were held during the year at Terre Haute, the first special convention in the history of the state being convened in May. The government rescue car made three visits to Terre Haute during the year and was

busy throughout the districts. First-aid teams were organized in the Terre Haute field.

The output of coal for the first half of the year was estimated at not more than 25% of the capacity of the 18,000 miners in the state. A part of the congested conditions in the Indiana coal fields is due to the presence of 2500 miners who came from other fields in 1910, during the prolonged Illinois strike, and remained in the state during 1911. The total production of coal in Indiana for 1910 was 18,389,815 tons, with a spot value of $20,813,659. The figures for 1911 are not available, but it is estimated that the total production will fall short of the 1910 output by several million tons.

World's Consumption of Bunker Coal

The suggestion that the opening of the Panama Canal may render feasible the establishment of a great American station for supplying coal from the mines of the United States to vessels of the world lends interest to an estimate prepared by the Bureau of Statistics, Department of Commerce and Labor, of the coal consumption on the oceans of the world. The statement estimates the coal consumed on the oceans of the world at approximately 75 milion tons per annum, valued at over 250 million dollars.

An exact statement of the quantity of coal consumed by the merchant marine and navies of the world cannot be made, owing to the fact that comparatively few countries state in separate terms the quantity of coal supplied to vessels for their own use, or for "bunkering" purposes.

The United States statistics show about 9 million long tons supplied to vessels at ocean ports to be placed in their bunkers for their own use, and the British reports show about 20 million long tons supplied to vessels in the foreign trade and 2½ million tons to vessels in the coastwise trade. This would make for the two great coal-producing countries of the world—the United States and the United Kindom—a total of over 30 million tons supplied directly to vessels for "bunkering" purposes.

In addition to this, however, a considerable percentage of the coal sent out of Great Britain as "exports" passes to ports and stations in various parts of the world from which it is finally supplied to ocean vessels for fuel purposes. A paper presented before the Royal Statistical Society of England by D. A. Thomas, M. P., stated that:

> The great bulk of our export of coal is for the use of steamships, and it is within the mark to say that over half of our exports are for navigation purposes. . . . Cardiff alone ships over a million tons annually to Port Said, over a half million to Malta and Gibralter, about the same quantity to Cape Verde and the Canaries, over 300,000 to Colombo, and large quantities to Aden, practically the whole of which goes to bunker steam vessels calling to coal at those depots.

As the British exports of coal, aside from that recorded as supplied to vessels for fueling purposes, amounted in 1910 to over 62 million long tons, the above quoted estimate would seem to justify adding to the 30 million tons recorded as bunker coal by the United Kingdom and the United States another 30 million as the share of British exports which finally becomes bunker coal.

While the Bureau of Statistics is unable to state the share of American coal exports which become vessel supplies (aside from that actually reported as bunker coal and not included in the export statement) it is quite probable that a considerable percentage of the coal from the United States which passes to the West Indian Islands and the coast of Mexico is used for vessel fueling. Add to this the more than 2 million tons supplied by the Japanese mines to vessels engaged in the foreign trade, the more than 1 million tons supplied from Australia, the nearly 1 million tons supplied from India, plus the estimated consumption of about 3 million tons by the navies of the world, and the Bureau of Statistics estimate of an average of 75 million tons consumed on the oceans of the world seems a conservative one. As the valuation of the coal exported for steaming purposes averages about $3.50 per ton, the further estimate of the value of the coal used on the oceans of the world—over 250 million dollars per annum—seems also a conservative one.

The Wyoming Mine Explosion

Reported by Telegraph

On Ja 20, at 4:10 p.m., a small local explosio occurred at the No. 4 mine of the Ker erer Coal Co., located at Susie, Wyo. Over 100 men were in the mine at the time of the explosion, of whom five were killed and 18 slightly injured.

Location and Geology

The town of Susie is located about eight miles north of Kemmerer, Wyo., on a branch of the Oregon Short Line R.R., in the extreme southwestern part of the state. It is about 270 miles, by rail, north of Salt Lake City, and 440 south of Butte, Montana.

According to the U. S. Geological Survey map "Coalfields of the United States," this field is described as the Hams Fork Region of the Rocky Mountain Province. The coal occurs in the Fork Benton division of the Colorado formation, belonging to the Upper Cretaceous series. The measures have a strong westerly dip varying from 15 to 35 deg.

The coal is a high-grade bituminous and ranks as one of the best fuels in the West. It is described by the U. S. Geological Survey as "an excellent fuel for all purposes, quite hard, breaks with a bright fracture and stands storage and long transportation with but little loss."

Mining Methods

There are three principal operating companies in this field; the Union Pacific Coal Co., a subsidiary of the Union Pacific R.R. Co., operating in the southern part; the Diamond Coal & Coke Co., a subsidiary of the Amalgamated Copper Co., operating in the central part; and the Kemmerer Coal Co. (at one of whose mines the explosion occurred) operating in the northern part.

Mining is done entirely by means of slopes sunk approximately on the dip and having water-level entries turned every 350 to 450 ft. From these entries rooms are driven to the rise generally on 60-ft. centers, with 35-ft. rooms and 25-ft. pillars, with barrier pillars at intervals of from 2 to 6 rooms, depending on the roof conditions. Horses are used for haulage on these entries and the ordinary engine-plane system is used on the slopes. Small quantities of firedamp are occasionally found which burns in a peculiarly sluggish manner when ignited. The coal is shot off the solid almost without exception.

The Explosion

This district has been particularly free from any extensive explosions, having been the scene of only one other serious disaster, that at Diamondville, Dec. 1, 1905, which cost the lives of 18 men. The quantities of gas encountered were not considered excessive, and the mines are, without exception, under competent management and carefully handled.

The No. 4 mine of the Kemmerer Coal Co., the scene of the present disaster, is a comparatively new one, having been under development only some two or three years. The mine was opened on the usual slope system and worked by the room-and-pillar method. It is well equipped with modern appliances throughout.

The explosion is supposed to have been the result of a blown-out shot in the second north entry, and occurred just as the day shift were going off. An unusual feature of the disaster is the fact that the fatalities appear to have been confined entirely to Americans.

The mine rescue car No. 4 was on the scene of the accident within an hour, and together with assistance from the neighboring mines, rendered valuable aid in the rescue work. The mine was only slightly injured by the explosion, and all the bodies have been recovered.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Labor Unrest

Time, with no leaden heel, seems hastening the approach of a general stagnation of the coal business consequent on a strike in which the two largest coal-producing nations, and one that ranks sixth in the list, may well be involved. The United States, Great Britain and Belgium produce together 65 per cent. of the production of the world.

The miners of Great Britain, on Jan. 10, by an overwhelming vote of 445,801 to 115,921, decided to cease work on March 1. They hope to get the mine owners to consent to a minimum wage, but this the operators are not likely to concede without a bitter struggle. They do not feel able to make any large concessions, because the national competitor, Germany, has for years been displacing English coal, the output of that country having risen 200 per cent. while England's production has only advanced 68 per cent.

The profits have recently been reduced by the operation of the eight hours' act, and the English operators feel that they cannot bear any further burdens. In view of the fact that the production of the English mine worker is less than half as much as is produced in our anthracite regions per inside man employed, and almost exactly one-third of the average output per man inside in the bituminous regions of this country, it might be suggested that speeding up would be a possible solution of the miners' difficulties and not a minimum wage.

The later reports appear to indicate a feeling of anxiety on the part of the miners, as if they had somewhat exhausted their spleen by the vote cast, and are beginning already to look with apprehension toward the titanic struggle. Moreover, questions of patriotism also intervene. A naval war depends on steam, and, furthermore, taxation could not well meet the demands of a war if business were at the same time stagnated by internal strife. This complication always results in the mine owners and mine workers being alike compelled by public opinion to suppress their variances on behalf of the preservation of the empire. Realizing the gravity of the situation, the British government has sought to place contracts in America, without much avail, owing to the difficulties in our own labor situation.

The Belgian strike has not yet involved the whole kingdom, and all differences may be adjusted before April 1, when our own strike is anticipated. There is also a strong feeling of unrest in Germany, though it is not so manifest as in Great Britain and Belgium.

Home troubles may yet end in peace. The miners in those states where higher wages are paid and the unions are strong, will think twice before they decide to strike and thus aid the operators of those districts where the men will not strike and where lower wages prevail. It is not likely that the miners of West Virginia will lay down their tools when those of Pennsylvania, Ohio, Indiana and Illinois come out on strike. Hence, the end of a long struggle would inevitably show West Virginia more strongly entrenched than ever in the Northern trade. That state could well increase her output 50 per cent., and it is a safe prediction that those concerns which can forecast their coal demands will prefer to place their contracts in West Virginia, because there alone, is to be found a certainty of a steady fulfilment of contracts placed.

At times it seemed to be a safe prediction that the miners in the unionized fields would have either to accept a reduced wage at home or migrate to West Virginia and receive a reduced wage there. Nevertheless wages have risen steadily in the union fields, the operators have struggled along, in many cases increasing their indebtedness year by year. Whether the miner has gained by the increased wage is, of course, a question. He has undoubtedly suffered by working less steadily than he would, had his wage been less. But such a statement is hard to prove, and the miners so far have not realized it, finding that the days worked at mines where the unions are

strong are not materially less in number than in mines of the unorganized fields.

The action of the miners in raising wages in the northern coal fields, while leaving the state of West Virginia to its own devices, has brought the West Virginia coal field rapidly to the front as a producer. This artificial stimulus of a section of the whole industry of the nation has caused the section so stimulated to overrun all markets, with the result that in face of glut and fierce competition the northern operators are kept from raising their rates of pay. Had the unions been less prodigal of their power, their potency to increase wages would have been more marked today.

Old Hednesford Disaster

The disaster in the Old Hednesford mine of the Cannock Chase Co., Ltd., of England, Dec. 14, 1910, shows how much carelessness even today is to be found around some coal workings. The Cannock Chase Co. kept a house in the Bass seam, where the boys were in the habit of going to fill their lamps. Each boy filled his own. The bucket, that caught the waste from the filling tank, caught fire and the blaze rapidly spread. The boys had been in the habit of throwing oil-soaked wicks on the ground, when they removed them from their lamps, and consequently the condition of the floor of the heading was favorable to the spread of the conflagration. Some thirty cars stood on the track, and the man who attempted to extinguish the blaze could not move them. Consequently, when the fire spread beneath them it could not be stamped out. In a short while the cars themselves caught fire.

The separation doors between the shafts were opened by order of J. Collier, the foreman of the Bass seam, in order that the smoke and carbon dioxide would not pass through the workings, but later, at least 45 min. after the fire started, the under-manager came down, and ordered these doors shut. At the inquest he stated that he did not realize that this action would force the products of combustion into the mine and on the escaping men. Five men were asphyxiated. The jury returned a verdict recommending that a man be placed in charge of the lamp house, and that sand be stored for use in subduing such a blaze should it again occur.

It does seem that the financial interests of the coal company, even if there were no more potent reasons, should favor a more complete remedy, to wit, the removal of the lamp house altogether. But there is a valuable suggestion here, that where oil is apt to be spilled by leaking cars or other causes, a small body of sand and a shovel should be kept ready for smothering any incipient blaze. Furthermore, it would be well to strew sand over all oil droppings, later removing the oil-soaked sand at frequent intervals.

Natural Schistification

The recent explosions at Adrian and Briceville call forcibly to one's attention the fact that the latent powers of coal-dust are rarely exhibited to the full in these catastrophes owing to conditions not favoring perfect combustion. When one regards the violence at Bruceton, Monongah and Harwick, one realizes that those explosions were of an entirely different order from those which have recently occurred.

In order to make plain the severity of one of these, that at the Bruceton experimental station, it might perhaps be well to preface further remarks by stating that, to all appearance, the voids above the concrete which lined the galleries at that mine were not large enough to explain such a lift in the concrete arching as undoubtedly took place. The buckling of the reinforcement has automatically registered the fact that in one place the arch was raised twelve inches. How could this be, unless the whole overlying earth were likewise raised, and this is the explanation now finding favor.

It must be conceded that the conditions at the Bruceton mine were highly favorable for a spectacular exhibit of the explosive power of coal dust. It is true the headings were short and the force of the explosion was thus somewhat reduced, but had more dust per lineal foot been present the disruptive energies within the mine could not have been greater, though an increase of violence would have been shown, had all the headings been charged.

In the main return gallery the charge, if spread over the floor, would have covered it with a layer only 0.021 in. thick, or if the sides had aided the floor to hold the same charge, they would have been covered with an equal coating of 0.008 in. of dust. The equivalent floor charge in the oblique gallery where the dust was only distributed in half-pounds per running foot, would be 0.013 in. deep while the floor and rib charge would be less than 0.005 in. thick.

These are apparently extremely light charges. An off-hand judgment would not view them as constituting a large amount of dust. But every ounce was of such fineness and was placed in such manner as to be immediately available.

Moreover, the fuel was in such quantity that the oxygen present was insufficient to permit the carbon and hydrogen of the coal to burn completely to carbon dioxide and water. Much fuel remained unburned when the blast belched from the mouth of the mine.

Other exploded mines have had as much dust of like nature and fineness, as Bruceton; to have had more would not have increased the violence. Probably this dust was not so ingeniously distributed. But, in any event, the dust was there and its failure to do more damage must be ascribed to some form of natural schistification or dampening.

Where motors are used, the heading soon contains a large amount of sand which has been ground to fine caliber and deposited near the rails.

For example, at one mine in central Pennsylvania, with a rolling, uneven floor, no less than three gondola cars of sand are ground to powder beneath the wheels of the electric motors every month. And it was noticeable that the deep dust in the Adrian mine consisted largely of such sand dust and natural sand. In other mines with a shale roof, the constant dropping of top-rock serves, especially when it tends to slake, to schistify the floor of the mines. This found exemplification in a marked degree at Vivian, W. Va.

Schistification may be a cure for explosions, but with the leaky cars at present in general use, it would seem to be only an insufficient palliative.

There seems every probability, in the view of the British chief inspector of mines, that had electric hand lamps been in use at the Whitehaven and Hulton collieries, in England, the terrible disasters which took place there in 1910, would not have occurred. In the case of both accidents, there is little doubt but that the igniting cause of the explosion was the gauze safety lamp.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions of Indiana Examinations Held at Terre Haute, January 12, 13, 1912

Mine-boss Examination

Ques.—Does coal dust, when suspended in air, give to the air explosive properites?

Ans.—The finely divided dust of many bituminous coals is highly inflammable. When this dust is floating in air and exposed to a flame of sufficient volume and intensity, there are present all the conditions necessary to burn the dust with explosive rapidity. The finer and more inflammable the dust, the more rapid the combustion and the more violent the explosion, other conditions being the same. This condition is spoken of as an explosive condition of the mine air.

Ques.—(a) When is shaft timbering required and when is it not required? (b) What are buntons and what is their use?

Ans.—(a) Shaft timbering is generally required at the surface in all shaft sinking while passing through the drift overlying the harder strata. Timbering is also required, as the sinking proceeds, wherever the strata are not self-supporting under the conditions existing in the shaft. In other cases, only such curbing and buntons are required as are necessary to make the shaft safe and to support the guides, column pipes, signal wires, electric cables and other shaft equipment.

(b) Buntons are the heavy cross-timbers put in a shaft to support any part of the shaft or its equipment, or to support a temporary scaffold or staging.

Ques.—There being 43,560 sq.ft. in an acre and 27 cu.ft. to a ton, how many tons of coal may be gotten from a tract of five acres, the coal seam being 6 ft. thick and allowing 20 per cent. for loss?

Ans.—The cubic contents of this five-acre tract and 6-ft. seam is 5 × 43,560 × 6 = 1,306,800 cu.ft. Then, taking the average weight of Indiana coal as 1 ton per cu.yd. (27 cu.ft.), and allowing for a loss of 20 per cent. or ⅕ of the contents of the seam, the net weight of coal taken out of the mine would be

$$\frac{4}{5}\left(\frac{1,306,800}{27}\right) = 38,720 \textit{ tons}$$

Ques.—What are the conditions that should determine the widths of rooms and headings and the size of pillars, in mine workings?

Ans.—The width of a heading is determined (1) by the requirements and use of the heading, size of mine cars and kind of haulage employed, or quantity of air to be circulated in airway; (2) by the nature of the roof and floor, the roof pressure, and the length of time the entry must be kept open. The width of rooms is determined by the depth, thickness and inclination of the seam; the character of the roof, floor and coal; the system of mining adopted and length of time the rooms must be kept open. The size of entry and room pillars, alike, is determined by the data last mentioned and the width of the openings they protect.

Ques.—(a) An airway 16.7 ft. wide, 8.9 ft. high, is passing 65,000 cu.ft. of air per min.; what is the velocity of the air current?

(b) If powder smoke requires 2 min. and 17 sec. to travel 149 yd. in an airway 10x12 ft., what quantity of air is passing in the airway?

(c) In an airway 6x7 ft. the anemometer registers 75 ft. per min.; what quantity of air is passing in the airway? Show each step in the calculation of these three questions.

Ans.—(a) The sectional area of the airway is 16.7 × 8.9 = 148.63 sq.ft. The average velocity of the air current in this airway is then

$$v = \frac{q}{a} = \frac{65,000}{148.63} = 437.3 \textit{ ft. per min.}$$

(b) The powder smoke is observed to travel 149 × 3 = 447 ft. in (2 × 60) + 17 = 137 sec., or $\frac{447}{137} \times 60 = 195.75$ ft. per min. The average velocity of the air current, however, is less than the observed velocity of the smoke, and may be assumed, with fairly close approximation, to be 0.8 of this velocity. Or, in this case, the average velocity of the air is 195.75 × 0.8 = 156.6 ft. per min., the area of the airway 10 × 12 = 120 sq.ft., and the quantity of air passing is then

$$q = av = 120 \times 156.6$$
$$= \text{say } 18,800 \textit{ cu.ft. per min.}$$

(c) The sectional area of this airway is 6 × 7 = 42 sq.ft. Assuming that the reading of the instrument represents more or less accurately the average velocity of the air current,, the quantity of air passing in this airway is

$$q = av = 42 \times 75$$
$$= 3150 \textit{ cu.ft. per min.}$$

Fireboss Examination

Ques.—If an explosion should occur in a safety lamp in use, what should be done?

Ans.—Assuming that the explosion within the lamp chimney or combustion chamber was light and did not force the flame through the gauze, the lamp should be lowered slowly and carefully withdrawn from the gas. This is a most critical moment and requires the utmost self-possession on the part of the one holding the lamp.

Explosion of gas in a safety lamp usually occurs as a series of small explosions following each other in quick succession. Often little balloons of flame appear and explode with a light pop. The phenomenon indicates a danerous approach to a highly explosive atmosphere. It may be that a more violent explosion in the lamp is only prevented by the extinctive gases (burnt air) confined in the top of the lamp and more or less permeating the air in the combustion chamber. In withdrawing a lamp from a body of sharp gas, the fresh air entering the lamp will often produce a highly explosive mixture within and greatly increase the danger. Under these conditions extreme caution is required to avoid trouble.

Ques.—What are the causes of sudden outbursts of gas in coal mines; and what, in your opinion, should be done to prevent accidents resulting from the same?

Ans.—Sudden outbursts of gas are the result of the gradual weakening of the strata in which the gases are confined under pressure, owing to the extraction of the coal. The roof action in mines, following the extraction of large areas of coal, often results in the formation of vacuous spaces or voids in the strata, and these become filled with gas under great pressure. The gas works forward toward the openings as the strata are disturbed, often producing ominous noises, "bumps" and "poundings." In many cases these noises are followed, after a time, by the bursting out of immense volumes of gas into the mine workings; and frequently the openings are choked with hundreds of tons of coal and slate thrown down by the force of the escaping gas.

In mines where such occurrences are common, every effort should be made to drain the gas from the strata in advance of the workings, by boreholes sunk from the surface or driven in advance of headings; or by driving narrow headings a

distance into the virgin coal and allowing time for the gas to drain off sufficiently to relieve the pressure. All openings should be driven up narrow with wide pillars between them, the principal work depending on drawing back the pillars. The face and ribs of all new work should be well protected by timbering.

Ques.—Are you in favor of mixed lights in mines where explosive gas is generated? Give reasons in full.

Ans.—Mixed lights should never be used. If safeties are required to be used at all in a mine or any portion of a mine, no open lights should be allowed at the same time, in such mine or section. The practice of permitting the use of torches or open lights on entries or gangways, while safety lamps only are to be used at the face, is dangerous; because, at any moment, an accumulation of gas in the waste, or in an idle room, or void place where it has escaped notice may be forced out onto the entry by a fall of roof, or a heavy shot, or by some derangement of the circulation and be ignited by the open lamps.

Ques.—Should a fireboss be under the supervision of the mine boss or superintendent, or should he have complete control over that part of the work that pertains to firebossing?

Ans.—The Indiana mine law, Section 22, makes it "unlawful for any person to serve in the capacity of mine boss, fireboss or hoisting engineer, at any mine, without having . . . . . a certificate of service or competency." It is the evident meaning and intention of the law to place the work of firebossing, in the mine, in charge of a man whose competency to perform that service has been ascertained by a satisfactory examination and is certified by a duly authorized certificate. It would not be logical or in keeping with the spirit of the law to limit the authority of the fireboss in respect to the particular work placed in his charge. In the eyes of the law he is the *competent* person to look after and control whatever pertains to firebossing.

Ques.—Do you approve of the practice of brushing gas from a place with a coat or canvas? State why.

Ans.—The custom of brushing gas is unsafe as a practice, because it can never be known with certainty how much gas may be distributed and thrown into the air. The person brushing out the gas may become enveloped in a dangerous atmosphere, from which he would find it difficult to escape. We may, of course, assume that he has taken the precaution to place his safety lamp where he believes it will cause no trouble, or to extinguish the open light if he has one. Any accumulation of gas in a mine should be handled with caution, and its removal effected by means of temporary brattices, so arranged as to cause the air current to sweep away the gas.

Mine Haulage Question

Mine-haulage Systems Compared

Ques.—Give a brief description of the different systems of haulage used in coal mines; and state the particular advantage or disadvantage of each system.

Ans.—Mine haulage may be divided into two general classes; namely, animal or mule haulage and mechanical haulage, which is again divided into rope and motor haulage. There are three kinds of rope haulage; namely, inclined-plane haulage (which includes both gravity-plane and engine-plane haulage), tail-rope haulage and endless-rope haulage. Motor haulage includes steam, compressed-air and electric motor haulage.

Mule haulage is simple and needs no description. It is best adapted to small mines, not sufficiently developed to install a mechanical system of haulage; and to gathering hauls in larger mines, where the coal is gathered from the different working places and brought by mules to a central station, where trips are made up to be hauled by mechanical means to the shaft or slope bottom.

In gravity-plane haulage, the loaded cars descending the incline by gravity pull the empty cars up the plane by means of a rope that passes over a head-sheave at the top of the plane. The two ends of the rope are attached to the two trips, respectively. Gravity haulage has the advantage that no motive power is required to move the cars.

In engine-plane haulage, a winding engine, located at the top or at the bottom of the plane, hauls the loads up the incline and lowers the empties, by means of a rope attached, in turn, to each trip. Engine-plane haulage is adapted to the haulage of loaded cars up grades that are too steep for mule or motor haulage.

In tail-rope haulage, the loaded cars are hauled in trips, from an inside parting to the shaft or slope bottom, by means of a rope that extends from the winding drum of an engine on the surface, into the mine, and is attached to the front end of the trip. This is the main rope. The tail rope is twice the length of the main rope, and extends from the winding drum of the same haulage engine to the inby end of the parting, where it passes over a tail-sheave and is attached to the rear end of the trip. The tail rope hauls the empty cars into the mine, the cars pulling in the main rope after them. This system is adapted to haulage from several districts and short variable grades that make an endless-rope system impracticable.

The endless-rope system consists of one endless rope running from the double drum or sheaves of the winding engine to the large sheave at the inby end of the parting in the mine and back again to the engine. The rope both here and in the tail-rope system is supported on rollers and small sheaves the entire length of the entry. In this system the cars are attached to the rope at regular intervals by means of a grip or a special automatic clip, the loads being hauled out on one side of the rope and the empties pulled in on the other side continuously. The endless-rope system is well adapted to a long haul on easy grades, a large output and steady producton of coal with little delay.

Motor haulage requires little explanation. Motor cars specially designed for mine work are used instead of mules. Their use is limited to light grades, this limit of gradient being determined practically by the slipping of the motor wheels on the iron rails. In motor-haulage practice, grades exceeding 2.5 per cent. are avoided wherever possible, except for short distances only. It is possible for a motor alone to climb a grade of 8 or even 10 per cent. by sanding the rails; but whenever the grade exceeds, say, 2 or 2.5 per cent., there is too large a proportion of the power of the motor absorbed in its own propulsion, and too little power is effective for hauling the trip.

On level roads a mine motor will generally give a draw-bar pull equal to about $\frac{1}{5}$ of its own weight. Under general conditions in mines, the weight of the loaded trip a motor will pull on a level road is 40 or 50 times the draw-bar pull; or, say 8 or 10 times the weight of the motor car. Grades and curves in the track very much reduce the weight of loaded trip a given motor will haul. The draw-bar pull is reduced 1% for each per cent. of grade, and the live load or weight of loaded trip hauled decreases much more rapidly, being about 50% only, on a 2 per cent. grade.

The speed of hauling in mine-motor practice is commonly estimated, in miles per hour, as about $\frac{1}{5}$ of the diameter of the drive-wheels, in inches, for the full hauling capacity of the motor. For example, a six-ton motor car, with 30-in. drive wheels, may be estimated as capable of hauling, say, 24 loaded mine cars weighing two tons each, at a speed of about 6 miles per hour, under ordinary conditions in mines, on a level road.

Steam locomotives are but little used in mines, because of the gases given off by the furnace in generating the steam. Compressed-air motors have the advantage of greatly assisting the ventilation of the entries by the exhaust air of the engines. This system of haulage requires the installation of a pipe line for conducting the compressed air into the mine, and charging stations and reheaters for heating the air, on long haulages. The pipes are easily broken by roof falls, and the system is not as flexible as electric haulage.

Electric haulage, while introducing the dangers of electricity in the mine, has the advantage of giving a flexible system of haulage capable of reaching all parts of the workings.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

[This department of Coal Age *next week will be devoted entirely to a statement of the views of readers on the subject of sealing off mine fires. A number of letters dealing with the problem, and inspired by our foreword last week, have already been received. We earnestly request every reader who has not yet expressed an opinion to send us a brief statement of his ideas in the matter.* —Ed.]

Gas Locomotives for Mines

The following are some of the results obtained with the "Otto" Internal Combustion mine locomotive, which was referred to in issue No. 7, page 217, of Coal Age, as working at the Barton mines in Nottingham, England.

The length of line inside the mine is about 700 yd. and on the surface about 1½ miles. With the previous horse traction one round trip on the surface line occupied over two hours, including shunting at the wharf, hauling a train of 10 loaded wagons of about 20 tons total gross load. The locomotive makes one trip with the same number of wagons in ¾ of an hour regularly, and in some cases in 35 min. The line is for the greater part level but partly in favor of the loads. The heaviest grades are 0.77% against loads and 4% against empties.

The petrol consumption during 27 workings days was 38 gal. which equals 1.4 gal. per day from 7 a.m., to 5 p.m. During this time 1274 net tons of stone were hauled. This shows that with one gallon of petrol, 33½ net tons were covered; at a tare of 10 cwt. per wagon this represents a total gross load of 47.6 tons, this being over a line of 1½ miles, so that 71.4 ton-miles were covered with one gallon of petrol. The locomotive is fitted with two speed-gears in either direction, i.e., for 3¾ and 7½ miles per hour.

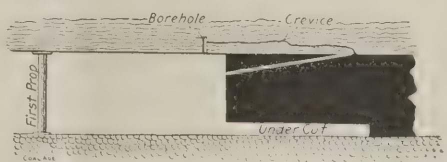
This locomotive has replaced six horses which cost $14.40 per week in fodder alone, while also requiring four boys. The locomotive only requires one driver and one boy for shutting the gates, when crossing the roads. The petrol consumption per week of about 8½ gal. at 16c. exclusive of rebate, amounts to about $1.34 per week.

Thus the great economy of petrol locomotives over horse-haulage is shown by these figures. The driving is extremely simple, one of the miners being appointed to do this. The starting of the locomotive is a matter of minutes, so that during long intervals the engine can be stopped to save petrol.

English Engineer.
Liverpool, England.

Preservation of Draw-Slate

It has occurred to me that as the draw-slate is often loosened by the gases resulting from coal shots, it might be well to drill a few small holes along the face as near the coal as possible, so that the gas might have an opportunity to escape before the center of the open space between the first post and the coal face is reached.



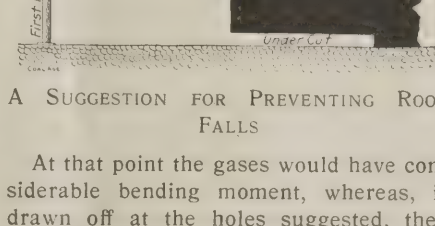
A Suggestion for Preventing Roof Falls

At that point the gases would have considerable bending moment, whereas, if drawn off at the holes suggested, they would have no opportunity to spring the roof. I understand that in some places this scheme is adopted to prevent the fire-damp in the slate from breaking it down.

Chicago, Ill. D. Orson.

Powder in Mines

The accompanying sketch illustrates the working faces of a pair of entries where two miners are at work. *A* and *B* are two crosscuts. *B* is open for ventilation, while *A* is closed with a brattice; two tool boxes are located on both sides of the brattice. Does the law allow each



Location of Tool Boxes

miner to have a keg of powder in the mine? Article XII, rule 26, of the mining laws, relating to the quantity of powder that each miner is allowed to have, says: "Gunpowder or any other explosive shall not be stored in a mine, and a workman shall not have at any one time in any one place more than one keg or box containing 25 lb., unless more is necessary for a person to accomplish one day's work."

According to the law each miner is allowed to store 25 lb. of explosive, and if two miners are permitted to arrange their storing boxes as shown on the sketch, then there would be two kegs or boxes of explosives in one place, while, according to law, there should be only one box or keg in any one place. Each miner should be allowed to store only a half of a keg, or 12½ lb. each.

Now, supposing that a new room is to be started along the gangway, as at *Y*, shown by the dotted lines, there is a possibility of adding another tool box to the crosscut *A*, which already contains two; the new location is to be at *X*. Since each miner is permitted to store 25 lb. of powder, the maximum quantity of 75 lb. of explosive may be stored in one crosscut. In the same way the number of tool boxes can be increased until there are many more in the croscut. Does the law intend to allow each miner to have 25 lb. of explosive stored irrespective of the proximity of other miners' store boxes, or is one crosscut to be occupied by only one miner? At any rate the law is ambiguous, for, judged by common-sense rules, there should be only one tool box in any one crosscut.

Pittston, Penn.

To Avoid Gas Explosions in Mines

I have had 38 years' practical experience in coal mining, doing every kind of work in and about the mines, and I have been watching closely for some time past the mater of gas explosions. It seems to me that with proper care and due regard to the removal of gas, such explosions can be prevented. I have never yet seen the mine that was properly equipped for taking care of the gas the mine produces. If explosions are to be prevented, the mine must be prepared to take care of the gas that is generated just as it is prepared to take care of the coal mined. I will say in regard to the system of ventilation, whether the air is split or not, this alone will not overcome the gas and prevent dangerous accumulations at the working face.

New Philadelphia, Ohio. J. F. H.

[Our correspondent might have suggested just what measures and precautions he considers are essential in the operation of a coal mine, in order that explosions of gas may be avoided.—Editor.]

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Co-operation in Coal Mining Communities

By Charles L. Fay*

In the average large coal-mining community, there are three factors which operate as determining forces in its economic problems.

First. That part of society composed of citizens related to business and professional enterprises outside the coal company interests.

Second. The miners.

Third. The coal company (which is personified in the men holding positions from superintendent to president.)

The selfish attitude of each factor and the consequent lack of vital coöperation prevents the development of a society unit and results in antagonisms. These ill-advised and self-constituted groups make pretensions occasionally, of recognizing a common community interest, but continue, however, to be unduly critical and make of every circumstance a bone of contention about which to quarrel. In all this, a pettiness is oftentimes manifested that is ridiculous, particularly when the largeness of each of the three factors is considered.

The Officious Public

To illustrate my point: the business community decides to promote a welfare movement. It is pointed out that the movement will not only benefit the business community, but the employees of the coal company as well. To qualify the position, it is stated that the movement will benefit the employees by providing a medium and means of self-help that will aid in personal advancement and contribute to their social well-being; also that as the employees are "lifted" in moral standard and vocational efficiency, the company will secure more competent and thrifty workmen, which is of business value to the company.

Consequently factor No. 1 argues with enthusiasm that factor No. 2 should contribute each year the equivalent of at least a day's wages as a nominal share of the necessary support, and that factor No. 3, being the great industrial and financial enterprise of the community and the largest single reaper of benefits, should be the largest single benefactor; but as the movement was originated by factor No. 1 and as factor No. 1 is well fitted to direct its activities, etc., why, of course, while each factor must be represented in the management, factor No. 1 will (with due show of patronage) control the work in hand. The basis of the virtuous proposition presented by factor No. 1, is selfishness, which expresses itself through a generous impulse made negative by a spirit of patronage and condescension.

The Captain of Industry

Reverse the order. Factor No. 3 conceives, from some source of inspiration, an idea that if put in force in the community should operate upon the employees in a manner to benefit the company by tending to regulate the habits of the workmen, and present an opportunity for self help that naturally would lead to more efficient service. Factor No. 3, cognizant of the prejudices of factors Nos. 1 and 2 attempts to so initiate the movement as to throw responsibility upon factor No. 2, but retain the dominating power in the hands of factor No. 3. If factor No. 1 is brought into the matter at all, it is in a nominal way for which factor No. 1 must pay the price, both in substantial support and good will, selfishness being the motive, veneered by virtuous utterance, with the inevitable result that the social unbalance is further developed.

The Suspicious Working Man

Factor No. 2 in the community life is between the "Devil and the deep sea"—needing the constructive and unselfish coöperation of both factors 1 and 3 and yet segregated by both—finally becomes stubborn, suspicious and somewhat hopeless. Factor No. 2 accepts selfishness as the basis of its own struggle for self-preservation and considers coöperation outside its own class as mockery and a sop.

Now, at the dividing lines between the three social factors, and on each side of the lines, are those who possess the neighborly instinct, have some consciousness of brotherhood, a more or less unselfish conception of their own needs and the needs of others. They are glad to help and be helped. It is this advanced group that makes possible some semblance, at least, of a society balance and prevents absolute anarchy.

The Triangle of Forces

The personality of a mining community, such as indicated, must necessarily be negative. What possibilities for genuine, unselfish coöperation in such communities! How ludicrous and wasteful the selfish pull-hauling methods that exist. Yet of the existence of such a discordance, the community may be sublimely unconscious. The loss through lack of sane coöperation is manifested not only in the matter of the social unbalance of the mining communities, but between employer and employees in the much advertised "fight" between capital and labor.

For labor to organize to better the lives and living conditions of working men and to aid each other in becoming more efficient workmen and more capable and intelligent citizens is commendable. Such organization is productive of good and is respected; but to organize primarily to "fight" presumes the objective to be war not peace—destruction not construction—segregation not coöperation. Such organization produces a Napoleonic army in which the leaders are, too often, autocratic officers dominated by biased conviction or overwhelming ambition for leadership and preferment. They sacrifice the rank and file of the workmen to an organization servitude in order to hold intact their autocratic society of professional office holders. The leader with larger vision and nobler purpose is whipped into line or thrown in the "gob."

Finding Only What Is Sought

On the other hand, for capital to organize—well, that is illegal! Nevertheless, for capital to attempt to correlate its forces so as to conserve the best interests of the community the employees and capital, is both desirable and laudable, but when capital employs its superior sagacity in a careful effort to entrench itself for a constant and increasing warfare of absorption and control, setting up the principle of "subdue" or "fight," it then is presuming strife and antagonism and not coöperation.

There are radicals on both sides who cannot comprehend, will not comprehend or for personal venom or advantages do not care to comprehend the loss sustained by society and industry as a direct result of ignoring fair and reasonable coöperation. Just as the citizens not related to the companies and outside the ranks of the employees are a factor in the local community, so is the general public a factor when in a larger sense capital and labor are under con-

*Mining secretary, Pennsylvania State Y. M. C. A., Wilkes-Barre, Penn.

sideration; and while the general public or "third party" suffers from the results of lack of coöperation between capital and labor the "public" is too often, "counted out" as far as rights are concerned.

THE PUBLIC'S EVER-READY REPROACHES

Then again, in times of open strife the public, too often, becomes obsessed by a sentimental bias to one side or the other and feeds the fires of prejudice, further hindering the spirit of coöperation even though by this means the contending forces may be brought, for the time being, to rest on their arms.

Now, there are many on both sides of the ever present capital and labor problem who are doing all in their power to better conditions, to develop the spirit of coöperation and to recognize in due measure the rights of persons and the rights of property. The efforts of such leaders are the sunlight flashes of the dawn of a better day. The sun of coöperation is appearing. Selfishness will be displaced by the spirit of unselfishness. There will be "a new heaven and a new earth."

The battle, however, continues. The basis still is selfishness and the presumption is war. Only as the possibilities in coöperation penetrate the consciousness of the rank and file, will destructive leadership be supplanted, and the day of a better peace actually dawn. What an age of privilege in which to live!

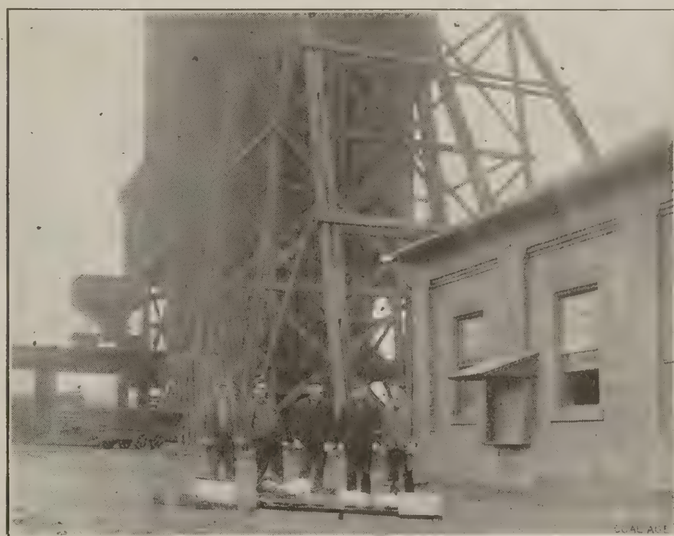
Every thinking man of courage, common sense and character may have a part in developing that consciousness in the minds of the "rank and file" that will make for better conditions and better society. But the road leads not along the way tabbed "political socialism."

First Aid at Frick Plants

BY M. J. SHIELDS*

As the field representative of the first-aid department of the American Red Cross, I undertook the organization and training of first aid corps for the H. C. Frick Coke Co., on Sept. 25, 1911, on which date a meeting was held with all the superintendents present and General Manager Clingerman presiding, at which conference the different coke plants and mines were grouped in five divisions, namely; Baggaley, Mount Pleasant, Connellsville, Uniontown and Brownsville. The superintendents were instructed to select one man out of about every fifty employees to take the training. The selection was made from mine foremen, fire- rib- and coke-bosses, electricians, motormen, hoisting engineers, miners and some outside employees. The company had a number of trained helmet and rescue men, and also quite a number of employees who had received first aid training, and they were afterwards added. So the number of men who actually attended the meetings comprised one in every thirty employees, or a total of nearly eight hundred men. A course of seven lectures was given weekly, with an intermission of two weeks, thus extending over a period of two months. The meetings were held in halls, centrally located, and all during the day time and on idle days, except in the Baggaley division. All the men instructed were supplied with the American Red Cross abridged first-aid textbook, the foreigners receiving Polish, Slavish and Italian editions, and the course of instruction pursued is the one found on page 164 in that book, namely: (1) Structure and mechanism of the body and the materials for first aid; (2) general directions for rendering first aid, study of fractures, dislocations, strains, bruises and shocks; (3) wounds, burns, scalds, and electric burns; (4) unconscious conditions, the handling and carrying of the injured; (5) special and mine injuries; (6) sanitary matters and the prevention of diseases; (7) a general review in the form of first aid contests. These lectures lasted about half an hour and then the men were given triangles, roller bandages, splints, and other first aid materials, and a practice drill took place which lasted from an hour to an hour and a half. This drill was superintended by the Company physicians and myself, and the finished work examined and criticised, and the meetings closed by free discussion of the subjects gone over in the lecture. The lecture, drill and discussion together made the total time devoted to each meeting two hours. The course ended on Nov. 25, by a series of contests in each division and the following are the names of the winners in the team obtaining first place, and the percentages scored by all the teams.

DAVIDSON MINE SQUAD



FIRST-AID AND HELMET MEN

Brownsville Division.—Edenborn mine 100%—James Curry (captain), Cyrus Flesher, John Mullen (subject), Thomas Daugherty, Austin Kane, Thomas Laughran. Leckrone mine 99.%. Lambert mine 99.5%.

Uniontown Division. — Continental No. 2 mine 100%—John Tupper (captain), George Haines (subject), Wm. Cosgrove, Gideon Pike, Huston Doyle, John Bloom. Phillips mine 99.2%. Yorkrun mine 97.5%.

Mt. Pleasant Division. — Marguerite mine 100%.—A. S. Snyder (captain), Michael Kavanshansky (subject), Thos. McDermott, A. M. Weaver, Steve Susa, Harry Hudson. Standard mine 98.3%. United mine 98%.

Connellsville Division.—Davidson mine

*First Lieutenant, Medical Relief Corps, U. S. Army, Scranton, Penn.

99.1%—Max Reidman (captain), Frank Bell, John J. Malloy, Joseph Morgan, James Yocum, George Rushnock (subject). Leisenring No. 3 mine 98.3%. Everson car shops 97.5%.

Baggaley Division—Baggaley mine 94%. John McKenna (captain), Frank Bolton, George Hoke, R. H. Barry, Harry Blystone (subject), Christ Hoke. Whitney mine 93%. Dorothy mine 91%.

The first aid department of the American Red Cross Society gave bronze medals as first prizes and certificates of merit for the second and third prizes. As contests are the next best proof to real accidents of first aid efficiency, these competitions showed some remarkable results. They proved that the men had taken a deep interest in the work and demonstrated a capacity to deal with any and all kinds of accidents in an intelligent way and I might add that contests are not only educational, but school the first aid man to be cool and calm in a real accident and remember what he knows. These contests were judged by two physicians and one practical mining man.

A table of specific discounts was prepared by the judges and read out prior to the beginning of the contest. It was as follows:

DISCOUNT FOR FIRST AID CONTESTS

	%
For loose or granny knot	5
For a loose bandage	5
For a loose splint	5
For faulty artificial respiration	5
For not stopping bleeding	10
For not taking care of shock	10
For not doing the most important thing first	5
For slowness in work	5
For captain's failure to command men properly	5
For awkward handling of patient or stretcher	5
For failure to be aseptic	5
For failure to entirely cover the wound	5
For lack of neatness	5

SAFETY THE FIRST CONSIDERATION

Each team consisted of six men, captain, subject and four assistants, and the squads were started out with a credit of one hundred per cent. and discounted from the above table. There were fifty-four teams entered and the halls where the contests were held were crowded with spectators. In this work I received the hearty co-operation of Mr. Clingerman, the general manager, and the other officials, specially C. L. Albright, secretary of the Beneficial Association. The organization and training of this splendid body of first aid men rounds out the motto and policy that President Thomas J. Lynch has adopted and carried out: "Safety the first consideration," a motto which he has striven to embody, not alone in first aid, but also in manifold schemes for accident prevention.

DAVIDSON MINE OF THE H. C. FRICK COKE COMPANY

First Aid Hints

All large mines should be equipped with four rescue corps, two inside and two outside. Each crew should consist of no less than six men, trained, not only in the use of apparatus, but also to implicit obedience to the commands of their leader. Such crews should receive instructions and training once a week.

When working in unbreathable gas see that all members of a rescue party keep close together and that every precaution is taken for their safety. Establish a relief station and a relief crew at the end of the breathable air. Patrol all doors and brattices leading to this station as a protection to the waiting relief crew. When working in thick smoke see that each rescue party retains the end of a rope that is stretched to fresh air.

When an accident has occurred remove the patient to a quiet place, taking him to the hospital room at once if his condition permits. Never carry a seriously injured patient to the engine room, as the jar of the engines is often the cause of intense agony to his shattered nerves and bones. The noise of the moving machinery also causes acute mental distress to a suffering man. Handle the patient calmly, gently, and without the appearance of nervous haste. If the head is injured it should be elevated above the body, otherwise keep the whole body on a level unless the patient is faint, in which case raise the feet or lower the head. Injured legs or arms may be benefited by being raised slightly from the level of the body. A gentle pulling of the leg of the patient not only aids, but gives him a marked sense of relief. The leg muscles tend to contract and draw a broken limb further out of line. This is corrected by gentle traction.

The most comfortable position is usually on the back with the limbs stretched out. Loosen all tight bands, cut all clothing covering the wound, but remove only just enough to allow of a thorough inspection and dressing of the wound. Dress the wound as quickly as possible to prevent infection. Do not permit your hands to come in contact with the wound unless they are aseptic. All severe bleeding should be stopped before the final dressing takes place. If the patient is unconscious, watch him with the utmost attention; if he shows signs of vomiting, place him upon his side, with the head lowered, so that the vomit may not pass into the lungs. In case of burns the wetting of the clothing with a solution of luke-warm water and baking soda will tend to relieve the pain. After the wound is dressed, let the patient rest quietly a short time before he is removed.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Coal and the Money Trust

An interesting feature in connection with the demand for a money trust inquiry is found in the fact that Mr. Lindbergh, of Minnesota, who is demanding the investigation, is apparently disposed to charge that what he terms the "money trust" is operating in connection with the coal industry. Mr. Lindbergh has submitted to the Committee on Rules, which is considering this matter, together with other data, the following statement:

"These subsidiary railway corporations, outside of the value of the express companies as stock-holding concerns, are small affairs. Their total capitalization is not over $259,000,000, with a market value of under $350,000,000. The anthracite-coal monopoly created by Morgan and Baker through the railroads is of more consequence.

"About $160,000,000 worth of anthracite coal is produced annually in the United States. All this comes from a small area of Pennsylvania. The railroads have been for 40 years buying control of these anthracite-coal lands. The first important work of Morgan as a maker of monopoly was the eliminating of competition by buying control of a competing railroad line for the New York Central. The second was an attempt to create an anthracite-coal monopoly through railroad combination. He worked at this for 20 years, and George F. Baker nearly as long, and 10 years ago the monopoly was formed. The roads that hold it are now all in the control of the seven men. These roads now own lands containing about 95 per cent. of the anthracite coal in the United States. They produce only 82 per cent. It is their policy to let the independent operators work out their deposits. This will give them in the future a still greater control of this mineral.

"It has been difficult to create any monopoly of the bituminous coal of the country; it covers so great an area. But this, like anthracite, is naturally controlled by the railroads which take it to the consumer; and there are many effective local monopolies. Morgan has been active in creating these in connection with Eastern roads. West of the Mississippi a great share of the usable coal is controlled either by the Union Pacific, the Gould system, or the Hill Lines."

This is one of the grounds upon which Mr. Lindbergh demands that investigation shall be undertaken by the committee; it being a fundamental feature of his ideas that there exists an improper relation of some kind between the banks, which, he alleges, control the money of the country, and the persons who are engaged in the production of various staple articles of which coal is one. It has not yet been decided whether to undertake the investigation or not, but the chances still favor the probability that the investigation will be begun on this or some other basis.

Progress in Pittsburg-Lake Freight-Rate Case

The Interstate Commerce Commission has resumed work on the so called Boileau case which involves the question of the relative rates between the Pittsburg district and the lake ports on the one hand and the West Virginia mines and the lake ports on the other. The discussion has now largely degenerated into a battle between accountants who are endeavoring to show what proportion of the revenues of the various roads are actually derived from coal and what proportion of the outlay is caused by the transportation of coal, this for the purpose of determining a "reasonable rate."

The Works, Coal-Mines Bill

A bill to provide for the inspection and regulation of coal mines has been introduced by Senator Works, of California. This authorizes the Secretary of the Interior to make and enforce such rules and regulations as may be necessary for the control of coal mines operating in the territories or producing coal in any state for transportation to any other state, thus taking up the old idea that the Federal government may supervise the conditions under which commodities entering into interstate trade are produced.

Section 3 of the bill provides for coöperation with state mining bureaus or commissions, and Section 4 authorizes the Secretary to go into any mine that he may wish for the purpose of ascertaining what changes of management are needed. The section continues as follows:

"That when the said Secretary shall make any order respecting the management or operation of any mine or the use or disuse of any device, apparatus, or appliance in the operation thereof, the owner or lessee of such mine shall comply with such order within a time to be fixed by said Secretary. If such owner or lessee of any such mine, or any officer or agent of such owner or lessee, shall fail or refuse to comply with any such order he shall be guilty of a misdemeanor and be fined not less than one hundred dollars nor more than five thousand dollars, to which may be added imprisonment for not exceeding six months, and each day that he shall so fail or refuse shall be a separate offense, and the said Secretary may, in his discretion, require that such mine be closed and not operated until such order is complied with, and may enforce such requirement by proper legal proceeding if not complied with."

Alabama

Birmingham—Fire, Jan. 7, at the Carbon Hill mines of the Galloway Coal & Coke Co., in Walker County, destroyed the engine house and damaged a large amount of machinery. It was with difficulty prevented from spreading to other buildings on the property. The loss is estimated at $50,000.

The Tennessee Coal, Iron & R.R. Co. has started work on the construction of 150 miner's houses at its No. 12 mines, Ensley, Ala. A new town is also being built at Edgewater near the No. 13 mines.

Colorado

Fort Lupton—Following the arrest of five union miners at the Alpha coal mines, Jan. 7, charged with riot and unlawful assemblage, all troubles ceased at the mine, and a small force of non-union miners began work the next day.

Trinidad—The Wootton Land & Fuel Co., controlled by J. P. Morgan, B. F. Cheney and a syndicate of Boston capitalists, is now operating two mines on the historic Wootton estate. The new tipple has just been completed and more than $100,000 has recently been spent in development work. Colonel J. A. Owenby, formerly of Boulder, is in charge of the properties.

Illinois

Harrisburg—The O'Gara Coal Co., which at present has a group of 17 coal mines in this vicinity, is preparing to sink two new shafts east of Harrisburg, where the company has held options for some time on the coal under 3000 acres of land. The coal is practically the same as found in other sections of this and surrounding counties.

Springfield—The Tuxhorn Coal Co. has resumed work at its mine which

has been closed down since Oct. 1, owing to a lack of orders. The mine has opened with the full force of 175 men and the prospects are good for a large business.

Canton—Owing to the falling of doors that govern the passage of air from the fan at the mine of the National Coal Co., near Middle Grove, between 15 and 20 miners were affected by lack of air, one morning recently, and operations were suspended for the remainder of the day. A similar accident took place at the No. 2 Blackhawk mine, Farmington, where 40 men were taken out from the workings before being seriously affected.

Streator—The local mine of the Harrison Coal Co. was closed down recently for a time on account of water which had seeped in from the abandoned workings at No. 4 shaft about a mile distant.

Chicago—At a meeting of representatives of the coal operators of Illinois, Indiana, Michigan, Wyoming, Montana, Iowa, Kansas, Missouri and Oklahoma, an organization known as the American Federation of Coal Operators was effected, Jan. 16, for the purpose of bringing about a peaceful solution of labor disputes. H. N. Taylor was chosen president, C. S. Keith vice-president, and Charles L. Scroggs secretary and treasurer.

During the recent cold weather the coal supply in Chicago became seriously depleted, on account of the difficulty in moving freight and operating the mines. Severe coal famines were also reported from many points in central Illinois.

Belleville—The Illinois mine-rescue car, after being stationed at Collinsville for several weeks, came here, Jan. 14, for a five or six weeks' stay.

Indiana

Indianapolis—Practically every loaded car of coal has been sent forward from the Indiana mines and empty cars sent in. Probably every mine in the state was in operation Monday, Jan. 22, for the first time in two years. Thanks are due to the good work of the railroad commission, the members of which went into the coal-distributing yards and ordered the companies to move the coal. If the mild weather continues there will be a rush to store coal by large consumers in preparation for a suspension or strike after Apr. 1. The belief persists that there will be trouble between the miners and operators.

Clinton—The Oak Hill Coal & Mining Co. has been sold to J. K. Dering, and the property transferred. Five mines in the Clinton field and about 3600 acres of coal lands are included in the deal which is said to involve $1,000,000, although the sum was not made public. The local management will not be changed except for Edward Shirkie's retirement, and the mines will continue active.

Sullivan—The last of the $100,000 which was the price paid by the Jackson Hill Coal Mining & Transport Co. for 2000 acres of coal land in Haddon township near Paxton, was paid over recently, thus closing what up to that time was the biggest coal deal ever put through in Sullivan County. Since the deal was closed last July, a large number of surveys have been made in the vicinity of Paxton, and it is said steps will be taken in the near future to sink mines.

John P. White, of Oskaloosa, Iowa, was reëlected president of the United Mine Workers by a majority of 45,424 over his oponent, Thomas L. Lewis, of Bridgeport, Ohio, according to the report of the tellers made to the convention, Jan. 18.

The wage-scale committee of the United Mine Workers of America organized Jan. 18 with J. H. Walker, of the Illinois district, as chairman. The scale committee will demand an increase in the mining rate for both bituminous and anthracite fields. Some of the members say they favor an increase of 10c. a ton, while others have indicated a preference for a 5c. advance, with a run-of-mine basis.

Iowa

Des Moines—Serious coal shortage was recently reported from practically all parts of the state; in some places it amounted to a famine. The local Commercial Club was inclined to blame the Rock Island R.R. Co. for much of the suffering in Des Moines.

Kentucky

Central City—Five men were killed as a result of an explosion in a mine of the Central City Coal & Iron Co. about 5 o'clock in the morning of Jan. 17. Four bodies have been removed. The cause is unknown. The mine is not badly damaged. Two hundred men usually are at work in the mine, but the explosion came soon after the day shift had come out and before the night men had gone down.

Louisville—The mine owners of Kentucky, carrying out a plan which had been under consideration for some time, have organized the Mine Owners' Association of Kentucky, the announced object being to promote the interests of the mining industry. The association was formed at a meeting held at Louisville. Officers were chosen and authorized to take immediate steps toward affiliating the body with the American Mining Congress.

Whitesburg—The new city of Jenkins in the Elkhorn coal field has been incorporated.

The Louisville & Eastern is to be extended from Torrent to Jackson, by way of Devil's Creek. In order to hasten this extension, owners of property along the proposed route are offering every encouragement possible in the way of reasonable charges for rights of way.

Middlesboro—The Gibson-Carr company, of Middlesboro, will be ready to ship coal by the first of February from its new mine, opened on Tye Fork of Brush Creek, Knox County. The Sneed & Meguire Coal Co., of Louisville, recently leased 10,000 acres on Colver Creek, and the Louisville & Nashville is building a branch from the terminus of the Black Mountain & Wasioto road, 20 miles north of Harlan, to the Sneed & Meguire property.

Minnesota

Albert Lea—Specimens of lignite coal, found in a trench in Mansfield, have been received here. The coal seems to be a good quality of lignite, and, as it was found close to the surface, it is presumed larger quantities can be found more deeply embedded. Some gas and indications of oil also are said to exist in the locality of the coal find. It is not probable any active investigations will be made until spring.

Missouri

Windsor—Two men were entombed and 300 had a narrow escape in the afternoon of Jan. 13, when an explosion wrecked the mine of the Bowen Coal Co., near Windsor. The day shift, comprising 300 miners, had been out of the workings only 30 min. when the explosion occurred. The cages were thrown off the guides and jammed in the shaft by the force of the blast. Rescue parties were immediately organized and through another shaft entered the west part of the mine, but no trace of the shotfirers was found. Efforts to enter the east part failed because of the smoke and heat. There is no gas in the mine, and it is believed dust caused the explosion. As soon as the explosion occurred, the fans were reversed, and an effort made to draw the gases from the mine, but this failed, because the brattices that direct the air currents were shattered by the explosion. The mine has been considered one of the safest and best equipped in the state.

Ohio

Ashtabula—This city is experiencing a coal famine. Dealers are entirely sold out, but shipments of coal are expected daily.

Gallipolis—One hundred and fifty coal barges are held up at the mouth of the Great Kanawha River in a dangerous freeze-up. Rivermen fear considerable damage when the ice breaks up.

Steubenville—A heavy ice gorge at Cables Eddy, on the Ohio River, three miles above this place, broke Jan. 18, and carried away a towboat, 18 empty coal

barges and a wharfboat. Three of the barges were sunk.

Youngstown—A number of the merchant furnaces, which have large ore mines in the Lake Superior district, and coal mines in the Pennsylvania and West Virginia districts, have signified their intention of entering a steel merger, which, it is reported, will take place here soon.

Martins Ferry—Three hundred miners, employed by the Moore's Run Coal Co. in its operations west of this city, are on strike because of a claim that they are not getting full weight for coal mined. The men object to the "dumper" in use at the mine.

Pennsylvania

Bituminous

Washington—The Vesta No. 5 mine, at Fredericktown, idle for more than a year, has resumed operations. A large new tipple has been built and much modern machinery installed. Only about 225 men are to be employed; later a much larger force will be taken on.

Charleroi—It was reported here recently, on excellent authority, that negotiations have about been completed by which the Diamond Coal & Coke Co. will take over the coal holdings at Charleroi of the Pittsburg Plate Glass Co., known as the Charleroi Coal works. Twelve hundred acres of virgin coal land are included in the reported transaction. The purchase price is in the neighborhood of $1,250,000.

Pittsburg—The mines of the Pittsburg-Buffalo Co., at Marianna, Penn., have resumed operations, and immediate employment will be given to 500 additional men. The 200 coke ovens operated by the company t Marianna will be lighted and employment for more than 1100 men will be afforded next month. The mines now have a daily output of about 3000 tons, and this will be increased to 4000 tons next month.

The coal operators of western Pennsylvania, Ohio and Indiana decided at a joint meeting held here, Jan. 18, to accept the invitation of the miners to meet in Indianapolis, on Jan. 25, to negotiate a wage scale.

Colver—The construction work on the new tipple which the Link-Belt Co. has recently designed for the Ebensburg Coal Co.'s mine here, is well under way. This tipple will be one of the largest and most uptodate installations in this vicinity, being equipped with loaded and empty car hauls, shaking screens, rock conveyors, etc.

Anthracite

It has been announced that the Monongahela Coal & Coke Co. will this spring build a block of 23 houses near California for the employees of the Crescent mine.

Monongahela—The Dunkirk mine, of the Pittsburg & Westmoreland Coal Co., resumed operation recently, after being shut down for a month. Over 250 men are employed.

The Webster mine of the Henderson Coal Co. will be ready to run the latter part of this month.

Pittston—Firemen, ashmen and others employed about the Clarence colliery of the Hillside Coal & Iron Co., had a miraculous escape from injury or death, Jan. 12, when one of a set of five boilers at the colliery exploded, completely wrecking the fireroom and sending portions of the boiler flying for a distance of a hundred yards. At the time of the explosion the ashmen and firemen happened to be outside the fireroom.

Wilkes-Barre—Cold spells during December had the effect of keeping up the demand for anthracite coal and the price per ton averaged $4.89 during that month. This gives the mine workers an increase of 7 per cent. over the regular rate of wages. It will be applied on the January earnings. For the two months previous the sliding scale was 8 per cent., and the prospect is that January will witness another record-breaking demand for coal.

It is rumored here that the coal operators have decided to grant a general increase of 10 per cent. in wages to the miners at the expiration of their contract, on March 31. This will be the only concession the operators will make, but it is regarded as a stroke which will prevent any effort to strike. The offer will be made to the miners as soon as their demands are presented.

Shenandoah—Six miners were seriously injured, Jan. 12, when a box of dynamite caps exploded at the Knickerbocker colliery.

Washington

Ellensburg—What is believed to be the most important coal strike yet made in this state was recently reported here. Nine hundred feet of gangway have disclosed a seam from 14 to 20 ft. thick and a borehole 840 ft. deep shows nine distinct veins of good coal. The coal is apparently an excellent grade of bituminous and suitable for coking. Capital has been raised for development and a tipple will be built at an early date.

West Virginia

Parkersburg—A deal has been closed whereby the Spruce Park Coal Co. becomes owner of 3400 acres of coal land in Logan and Lincoln Counties, for a consideration of $250,000. C. H. Blair, of Philadelphia, president of the company, was in Parkersburg, to close the deal, and said the company already has made arrangements for leasing a large part of the land and will itself operate the remainder of the property.

Welch—The United States Coal & Coke Co., operating at Gary, McDowell County, lighted 1100 coke ovens recently, giving employment to a number of men at the ovens, and necessitating the employment of many more men in the mines, in order to provide the needed increase in output.

Keyser—The case of the Central R.R. of New Jersey against the Davis Coal & Coke Co., claiming $2200 demurrage on cars of coal shipped over its lines to tidewater after transfer from the Western Maryland R.R., was heard here, Jan. 19, and a settlement of $1925 agreed upon.

Fairmont—Full operations are being resumed in the Annabelle mines of the Pittsburg-Buffalo Co. at Annabelle, Marion County, and the Dorothy mine in Raleigh County will be operated to its full capacity. Two hundred men will be needed next month at each of the two mines. Contracts have been closed for the entire output of the coke ovens of the company during the present year. At Annabelle, 1000 tons a day is being mined. This will be doubled in February, and in a few months it will run at its capacity of 6000 tons a day. Dorothy mine will turn out 4500 tons daily within a few months.

Wyoming

Kemmerer—Five men were killed and 18 injured, Jan. 20, by a dust explosion in mine No. 4 of the Kemmerer Coal Co. The explosion occurred in what is known as the second north entry, 100 ft. from the main slope and 1000 ft. from the surface. The force of the explosion was confined and only those working in the immediate vicinity were injured. Miners in other portions of the mine made their way to the surface uninjured. The fans remained in operation and the afterdamp soon was cleared from the entries.

Canada

Nova Scotia—The Dominion Coal Co., one of the subsidiaries of the Dominion Steel Corporation, will soon have five new collieries in the Lingan district, the best coal section of Nova Scotia; two more in Morien and three others at Springhill, making 10 collieries added to 10 old ones. Expenditures for these and other additions will aggregate $5,475,000, of which $3,250,000 is still to be spent. Production this year is expected to total 4,500,000 tons of coal.

Alberta—A new discovery of coking coal has been made at Cardston, near Lethbridge, and a company has been organized under the name of the Cardston Coal & Coke Co., with a capital stock of $150,000, to develop the property. The company has secured leases and will commence work at once.

Personals

Dr. R. N. Mackey, formerly of the Moses Taylor Hospital, has accepted a position with the Red Cross Society and will be detailed in the near future for mining work, a special car being provided for his use.

Col. R. A. Phillips, general manager of the coal department of the Lackawanna R.R. Co., has published a book on "How to Prevent Mine Accidents." The book will be distributed to all Lackawanna mines for benefit of the employees.

Charles L. Fay, mining secretary, Pennsylvania State Y. M. C. A., was in Washington last week and secured Dr. A. J. Holmes, Director U. S. Bureau of Mines, as one of the principal speakers at the Y. M. C. A. state convention to be held, Feb. 22-25, at Bradford, Penn.

Earl Bradbury has returned to Rock Springs, Wyo., to assume the duties of assistant chief engineer for the Union Pacific Coal Co., to which position he has just been promoted. Mr. Bradbury has been stationed at Rock Springs at different times during his work with the company, but has recently been stationed at Hanna.

G. A. Burrell, chief chemist of the U. S. Bureau of Mines, Pittsburg, Penn., recently made a trip of inspection through Alabama and Tennessee. At Birmingham, Ala., Mr. Burrell visited the newly equipped state laboratory in company with Chief Mine Inspector Nesbit and made analyses of air from several Alabama mines.

Kuper Hood, well known in middle-west and southern coal circles, has been appointed general manager of the Thacker company, succeeding F. H. Benedict, who will remain with the company in an advisory capacity until April, when he will go to the Pacific Coast to settle permanently. Mr. Hood was formerly assistant manager.

William Griffith, mining engineer, Scranton, Penn., has been appointed one of a committee of five of the American Mining Congress to coöperate with the Secretary of the Interior regarding the most feasible plan for the development of mineral and coal lands in Alaska. Mr. Griffith has been engaged in development work in Alaska for several years.

John P. Walter, who for nine years has been chief engineer for the Pennsylvania Coal & Coke Co., at Cresson, Penn., has resigned and will sever his connection with the company, Apr. 1. Mr. Walter leaves with the best wishes of his associates for his future success and the deserved recognition of his employers of his ability in handling the problems that have confronted the coal company in its many operations.

Obituary

John Farrell, a first-aid man attached to the Bureau of Mines, was killed, Jan. 20, while examining the condition of a gaseous mine, at Cherry Valley, Penn.

John N. Luther, assistant general manager of the Spring Valley Coal Co., died suddenly, Jan. 17, at the Mercy Hospital, in Chicago, following an operation. Mr. Luther had been an official of the coal company nearly 20 years.

William Immenhort, Jr., assistant general manager of the Marmet-Hahn Coal Co., Columbus, Ohio, was drowned recently in the Ohio River. Mr. Immenhort, who was 35 years old and well known to the coal trade, was looking after the company's fleet of barges, which were at the time caught in an ice jam and in some danger of being carried away. He fell from one of the barges and his body was not recovered for several days.

Construction News

Harrisburg, Ill.—The O'Gara Coal Co., which has 17 coal mines in this county, is preparing to sink two new shafts east of Harrisburg, where options are held on coal under 3000 acres of land.

The Saline County Coal Co. is sinking a shaft two miles west of Harrisburg.

Glacier, Wash.—The Washington Anthracite Coal Co. is planning the erection of a tipple and complete surface works to handle the output of their mine here. H. O. Watrous, Glacier, is manager.

Washoe, Mont.—The Montana Coal & Iron Co. is taking bids for sinking a rock slope approximately 315 ft. long and on a 15-deg. pitch, on their property here. E. M. Cortright is engineer and W. W. Worthington, Washoe, is president of the company.

Brownsville, Penn.—George F. Hosack, president of the Cross Creek Coal Co. has awarded the contract for sinking two shafts near Burgettstown, to the Brownsville Engineering Co.; contract price, $90,000. The shafts are to be 270 ft. deep.

Birmingham, Ala.—The Pratt Consolidated Coal Co., of Birmingham, will expend $75,000 for improvements at its Flat Creek mines, the betterments to include a new prison, hospital and other accessories for about 300 convicts.

Charleroi, Penn.—The Monongahela River Consolidated Coal & Coke Co. will build 23 houses at its Crescent mine, California, Penn., and it is understood, will install a 150-hp. steam turbine at the Coal Bluff mine, Gastonville.

Beech, W. Va.—The Spruce Bend Coal Co. has just placed an order with the Link Belt Co., Chicago, for a car-haul and shaking-screen outfit to be furnished and erected complete at their mine.

New Publications

COLORADO SCHOOL OF MINES MAGAZINE FOR JANUARY, 1912. 22 pp., 6¾x10 in., 25c. Colorado School of Mines Alumni Association, Publishers, Golden, Colo.

PRODUCTION OF COAL AND COKE IN CANADA, 1910. By John McLeish, B. A. Bulletin of Department of Mines, Canada. Government Printing Bureau, Ottawa.

This is an advance chapter of the annual report on the mineral production of Canada, 1910, giving statistics of coal and coke production, exports and consumption for the calendar year 1910, and also for the past 30 years. Figures are tabulated and given by districts.

THE USES OF PEAT FOR FUEL AND OTHER PURPOSES. By Charles A. Davis. Bulletin No. 16, Bureau of Mines, 1911. 214 pp., 6x9 in., 1 plate. Free on request.

There are extensive and widely distributed deposits of peat in the United States, but until quite recently its production for fuel on a commercial scale has been accorded but little attention. This bulletin by Mr. Davis is a comprehensive treatise on the subject of peat in general, its formation, composition and uses, and on the origin and characteristics of its several forms. Processes for the preparation and manufacture of peat fuel are reviewed in detail, including such matters as the mechanical equipment of plants, costs, methods of operation and commercial possibilities. These data are necessarily acquired largely from the practice in European countries where the peat industry has reached a comparatively advanced stage of development. The use of peat in connection with gas producers is emphasized as giving particularly gratifying results, and its value as a raw material for other products than fuel is explained at some length by numerous examples. Tabulated analysis are given of samples of peat from practically every known area in the United States.

Trade Publications

General Fire Extinguisher Co., New York. Bulletin, "Grinnell" Automatic Sprinkler. 24 pp., 7¾x10½ in., illustrated.

Ingersoll-Rand Co., New York City. Bulletin, Form 4204, "Arc Valve" Tappet Rock Drills. 16 pp., 6x9 in., illustrated.

The positive quality of the valve movement in this drill renders it peculiarly useful when steam is used and when water of condensation is likely to be encountered. Catalog shows sectional views of drill and also gives list of duplicate parts, together with descriptive table of sizes and capacities.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The return of milder weather has effected a considerable change in market conditions. Transportation, while by no means back to normal, has improved materially; the result is that heavy tonnages are being moved. The mines have increased their output and there is again some evidence of surplus coal.

The movement to Atlantic coast ports has probably suffered the most and there is still a pronounced fuel shortage at these points. The railroads were tied up and water cargoes ice-bound, while the coal was frozen and difficult to handle; however, conditions now are much easier.

In Pittsburg and vicinity, the mines are working better time, and the production is heavy. Railroad service is still in bad shape, but improving, and the market is active, particularly in slack. The cold weather has cleaned up all free coal in Ohio and prices are stronger, especially in the smaller sizes, for which there is a heavy demand; weather conditions also affected transportation, especially on the Ohio River, where heavy losses, due to ice-floes, have been narrowly averted. The customary winter storing of slack, usually effective at this time in West Virginia and Tennessee, has not yet started because of the curtailed production at the mines.

In the Middle West, the situation, as regards supplies, is much improved, and the market is softer. The scarcity of coal, due to poor railroad service, has been relieved, and it is generally believed that continued warm weather will result in a heavy influx of standard sizes. In the West and on the Pacific Coast the trade is quiet and unchanged.

Boston, Mass.

Conditions early in the week bordered on distress for many of the shippers and dealers. Cargoes were ice-bound along the coast, and rivers and inlets ordinarily navigable were impassable. Spot deliveries of bituminous were therefore in demand and as high as $4.35 on cars, Providence, was paid for temporary supply. At Boston, many consignees have been on the ragged edge, but managed to pull through when milder weather let in some delayed arrivals. At the loading piers, dumping is slow because of frozen coal, and the whole market is decidedly irregular.

Water freights are the same as last week, $1@1.10, Hampton Roads to Boston, with premiums of 10@20c. for shoal boats. The rate to Providence is $1, and for New York loading 75c. has been paid. Shippers continue cautious over making charters.

The following are current prices for Pocahontas and New River steam:

Providence, on cars	$4.10@4.35
Boston, on cars	4.20@4.35
Shipments from Hampton Roads, f.o.b.	2.70

New York

The market here during the past week has been extremely active. Owing to the unusually cold weather, railroad transportation has been almost completely tied up for four or five days, with the result that the tonnage on hand at the piers has been gradually reduced. Coal at the piers is in a badly frozen condition so that there has been delays in loading of from three days to a week, which has made it difficult for shippers to satisfy the demands of their customers. This delay in loading at the piers has created a shortage in the supply of loaded coal; consequently water cargoes have commanded a considerable premium over f.o.b. coal, depending upon the urgency of the demand. Some loaded cargoes are reported to have sold as high as $3.40 alongside.

Car supply at the mines has been short all during this extreme weather so that it will be some time before the standing tonnage at New York is again at the normal.

There has been a strong demand for the higher grades of steam coals and all of these are practically out of the market for the present, as the shippers, without exception, have all they can do to take care of contract obligations. West Virginia steam coals f.o.b. New York are quoted from $2.55 to $2.65; ordinary Pennsylvanias $2.65 to $2.75, with the better grades out of the market.

Philadelphia, Penn.

While the weather has moderated considerably in this vicinity compared with the last week or two, the dealers continue to be quite busy in delivering orders. The offices of the local wholesalers are besieged with dealers, begging shipments on their orders for almost every size, particularly stove, chestnut and pea, which are in short supply. The streets, however, are now clear of ice, and the expensive deliveries have been eliminated.

The scarcity of certain sizes has resulted in pinching some of the dealers who have taken contracts at low prices with operators who have not been able to furnish them with the coal and they are compelled to pay considerably higher prices for the size required. One instance is noted of a concern having a contract to supply a hospital with buckwheat at a price of $1.15 at the mines, and it is understood that they were compelled to pay $1.50 at the mines for the coal. A number of instances of this kind occurred, and confirms earlier predictions that there would be a "squeeze" on some sizes before the winter season had passed.

The wholesale market was never better; even egg coal is no longer consigned to the storage yards, but applied on direct orders, and there is delay of two to three days in making shipments at that. Prompt shipment of any size at the present time is not promised, and on stove, chestnut and pea, orders have to take their turn; from one to two weeks elapse before even one car of these sizes will come out. Broken coal demand still exceeds the output, while the stocks of pea and rice have been entirely disposed of, and the production of these sizes is entirely inadequate to supply the market at the present time.

Pittsburg

Bituminous—Mine operations are being conducted to better advantage, as the severest of the cold snap is over. The percentage of operation is higher and coal movement is also much better, so that a fair supply is now being given to consumers. A disposition to stock up against the expected suspension of mining is beginning to be manifested, and the mines will have little difficulty in finding business to work up to the output the weather and shipping facilities will permit, from now to the end of March.

The coal market is steadier, fancy prices being less often paid. We quote: Nut, $1.05@1.10; mine-run, $1.10@1.15; ¾-in., $1.20@1.25; 1¼-in., $1.35@1.40; slack, 70@75c. per ton at mine, Pittsburg.

Connellsville Coke—While there are signs that the movement of coke will loosen up, spot coke continues scarce and is commanding practically as high prices as at any time. In the past week sales of small lots of prompt furnace coke have been made at all the way from $1.85 to

$2, depending upon the exigencies of the case. It now appears as if the higher prices had come to stay, as operators are asking about the same range on contract coke.

The price situation is undoubtedly greatly helped by the prospect that there will be a suspension in the union districts Apr. 1, which would furnish a considerable market for Connellsville coal, the scarcity making up for the fact that Connellsville coal is at a freight disadvantage of 15c. a ton over the Pittsburg district. Operators would rather sell their coal at $1.10, at mine, than accept lower than present prices for coke. We quote: Prompt furnace, $1.85@2; contract furnace, $1.80@1.90; prompt foundry, $2@2.25; contract foundry, $2.10@2.25.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Jan. 13, at 391,432 tons, an increase of 68,000 tons, and shipments at 3620 cars to Pittsburg, 5051 cars to points West and 670 cars to points East, a total of 9341 cars, an increase of 250 cars.

Buffalo, N. Y.

There is a decided improvement in the demand for slack in the bituminous market, though the local trade is not offering it at a very uniform price. There is a certain lack of confidence in this trade, as a result of a long period of control by the consumer, that keeps most dealers from making a steady price and sticking to it.

The late holiday season was not over before there came on a week or more of severe weather, so that the output of all mines tributary to this market has been unusually light. In fact, the entire January output will be much smaller than anyone would have estimated, but the trade is not able to obtain any advance in prices. The expected stocking up against a possible strike does not materialize, which is a great disappointment also. In fact, the dealers as well as consumers are about agreed that the prospect of an April strike is small.

As a rule the orders on contract are more liberal than they were. The cold weather would alone insure an increase, and business is at least as good as it was last year. Quotations are therefore a little more confident at $2.50 for Pittsburg three-quarter, $2.40 for mine-run and $2 for slack. Coke is stronger at $4.25 for best Connellsville foundry and $3.50 for stock coke.

Cleveland, Ohio

Conditions in this market the past week have been rather serious on account of coal not being brought in by the railroads. Prices on all grades have increased in consequence, more especially in slack coal.

A number of mines in the Ohio district have not worked on account of the severe weather, which disabled their equipment, and the coal in transit has been delayed on account of snow blockades. In the past few days, however, the railroads have brought in considerable coal, which was quickly delivered to the customers, and now little is remaining on track and the prospects do not look bright for any large quantity coming in the next week.

Conditions, however, up to the present have not developed any serious shortage, but should the weather continue severe, there certainly will be a shortage in the next 10 days. Coal has been in transit from mines in West Virginia to this market for some 13 to 14 days, which should arrive here, when conditions are normal, in about four days. The same thing exists in the Ohio and Pennsylvania districts.

Columbus, Ohio

While the weather during the early part of the year was favorable for a good demand, it also interfered with mining and transportation, and now coal men are clamoring for higher temperatures. The change in the thermometer came toward the middle of last week and as a result conditions have improved.

The demand for domestic grades is still good and prices are ruling firm in every particular. There is also a good demand for the steam grades and as has been the case for some time prices for the small sizes are up. The fine-coal trade has been the feature of the market since the close of Lake navigation, and prices have steadily risen from 35 and 40c. until they are now 75 and 80c. Even at these prices fine coal is difficult to secure and many manufacturers are using mine-run instead. Retailers have been having a harvest, with prices strong and up to the usual winter level in many cases. There is also quite an appreciable increase in the requisitions of manufacturing establishments for steam tonnage.

Prices which prevail in Ohio fields are:

Domestic lump in Pomeroy Bend district	$1.65@1.75
Domestic lump in the Hocking Valley	$1.50
Three-quarter inch	1.35
Nut	1.15
Mine-run in eastern Ohio	1.00@1.05
Mine-run in the Hocking Valley	1.05@1.15
Nut, pea and slack	0.70@0.80
Coarse slack	0.60@0.70

Cincinnati, Ohio

The last week has been a strenuous one for the coal men in this market. To add to the ordinary troubles, such as tie-ups on the railroads, there has been a serious river situation which at this time threatens to parallel the excitement of several years ago when thousands of tons of coal were lost in the Ohio River by reason of ice gorges and later high water.

The extreme weather undoubtedly cleaned out any free coal that was on the market, but it is predicted that with the easier movement of coal resulting from the warm weather there will be another large amount of fuel ready for delivery and concerns which have been ordering more freely than they could store, in the hope that someone would be able to ship, will find themselves overstocked unless another cold snap should again relieve the situation. Such another extended cold spell would indeed put a keen edge on the market. The retail price of domestic fuel was advanced 25 to 50c. a ton, but this was due to the increased cost of delivery on account of the ice and snow. It was stated by dealers that even this did not nearly cover the added expense.

Charleston, W. Va.

Conditions have undergone no material change. The cold weather has continued to affect mining and shipping but prices for domestic are as good if not a little better than reported last week. With the breaking of the weather, however, production will increase and the output for the month will, in all probability, show a considerable increase over the same month last year, which was below the average.

A shortage of cars on the Kanawha & Michigan caused a shut down at nearly all the mines the latter part of last week and the early part of the present one. The shortage is reported to be due to a block on the lines in the Middle Western states, causing a slow return of the cars. The Kanawha & Michigan was the only line in West Virginia that during the past year caused any serious delays at the mines through car shortage. All the coal over this line, however, goes West and North—the lake points and Western markets.

Louisville, Ky.

The local coal situation remains practically unchanged. The flurry resulting from the record breaking cold spell, when dealers in both domestic and steam coals were pushed to the limit to supply the demands, passed away without any serious trouble. Prices are remaining unchanged and it seems now as if there will be little change before the drop which always accompanies the coming of spring. One thing seems certain and that is if the Louisville dealers can handle a situation such as that early in January, they will be able to meet most any condition which may develop this winter.

Nashville, Tenn.

One cold spell of weather continues to follow the other, and the conditions in the cities and towns in this district are critical. They are all practically out

of coal; there is no regular price and nearly anything is offered for spot shipments.

A bad shortage of cars was in evidence during this week on the L. & N., and this, together with freezing temperatures in the mining fields, was the cause of the entire district not being able to produce over 40 to 50% of its usual tonnage. The way it looks at the present time is that the only thing which can save the situation is at least one week of unusually mild weather accompanied by a good supply of empty cars for loading.

Screenings are still in big demand. This is the time of the year that many of the large users of screenings attempt to accumulate storage piles for the spring months when the mining of lump coal ceases. But it has been all that they could do to get enough to run from week to week; consequently they have accumulated nothing and will very likely find themselves in a bad fix this coming spring.

Indianapolis

The situation here has well nigh cleared up toward the close of the week. Of course, there is a stack of orders from the Northwest, to be filled as soon as possible. The commission found that the 16-hour law greatly hindered the railroad companies from rushing shipments. Under this law the crew may not work over sixteen consecutive hours.

Coal prices here and elsewhere in the state have been increased on an average of 25c. a ton. Local dealers say that the stock of coal is low, but they do not anticipate a famine.

Chicago

Milder weather has resulted in a softening of the market and a decline in the unusual prices that prevailed during the recent cold snap.

The full effect of the change is not yet apparent, but there are enough indications to demonstrate that a downward movement is well under way. Coal dealers do not expect a remarkable drop, but the decline, they say, will be of a substantial character.

A scarcity of coal has been one of the chief features in the recent market excitement. Service on the Chicago & Eastern Illinois has been crippled, and the Illinois Central has had thousands of cars of coal which it was unable to handle. Almost every effort to move smokeless coal in this market has been blocked at some junction point. Freight-traffic managers of Western roads say that with a rising temperature a heavy influx of coal in the Chicago market may be expected, and marked alterations in price schedules now in effect are sure to follow.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.62@2.87
Steam lump	2.37@2.87
Screenings	2.37@2.87
Springfield:	
Domestic lump	$2.57@2.82
Steam lump	2.32@2.82
Mine-run	2.32@2.82
Screenings	2.32@2.82
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.27@2.77
Mine-run	2.27@2.77
Screenings	2.27@2.77
Pocahontas and New River:	
Mine-run	$3.15@3.30
Lump and egg	4.20@4.30

Coke—Prices asked for coke are: Connellsville and Wise County, $4.50@4.65; byproduct, egg and stove, $4.85; byproduct, nut, $4.55@4.65; gas house, $4.85.

St. Louis, Mo.

Conditions this week are somewhat on the order of last week, with the exception that the market has broken considerably. It is impossible to give any scale in prices, for, while Carterville opened at $2 for lump and egg, there were times when it went down to $1.65, and the Carterville sizes of nut were much on the same order, going at $1.60 as an average. Carterville screenings opened at about $1.25, but broke during the middle of the week, although indications are that they may go higher the latter part of the week. This same thing applies to Franklin County when it comes into St. Louis, but the past week or two has seen little of this coal in this market.

There is no Saline County nor Springfield coal coming in, and Murphyboro Big Muddy is hard to get at any price. The Mount Olive coals started out at about $1.90 at the mines, but has weakened some, as the demand is not as great, and coal is now moving freer.

Minneapolis—St. Paul

Cold crisp weather has continued throughout the present week, but has not been so severe as during the first two weeks of the month. A few cars of coal have been received at the various yards and some record-breaking time has been made in cleaning them up. Railroads are confiscating considerable coal for their own use. Hard coal is scarce, especially stove and the smaller sizes. Nut coal has not been sold as readily as in former years. Last year the price of nut coal was raised 25c. and dealers claim it had a tendency to stimulate the demand for other sizes.

Retail prices have not advanced any, with the exception of Pocahontas lump and egg, which advanced 25c. per ton, when the price at the docks was raised 50c. Wholesale prices at the docks are reported to be at circular. Illinois mines have all withdrawn price lists, and a number have no coal for sale at all.

Circular prices in the Twin Cities are as follows:

Anthracite	F.o.b. Dock	Minn.-St. Paul	Retail Delivered
Egg and stove	$6.50	$7.75	$9.00
Nut	6.75	8.00	9.25
Pea	5.25	6.50	7.75
Buckwheat	3.75	5.00	6.25
Pocahontas			
Lump and egg	5.00	5.90	7.50
Mine-run	3.25	4.15	5.50
Screenings	2.75	3.65	5.00
Sunday Creek Hocking			
Lump	3.50	4.40	5.75
Stove	3.50	4.40	5.75
Dock-run	3.10	4.00	5.35
Screenings	2.25	3.15	4.50
Youghiogheny			
Lump	3.50	4.40	5.75
Dock-run	3.20	4.10	5.45
Screenings	2.50	3.40	4.75
Smithing	4.25	5.15	6.50
Cannel (all rail)			8.00

Portland, Ore.

The cold spell that swept over this territory did not last long and as soon as it was over, the rush for fuel ceased with the melting of the snow and ice. So abrupt was the check on the business that dealers have seen fit to reduce coal values 50c. per ton, bringing the price on Australian and Rock Spring coals down to an even $10 per ton, including cost of delivery within the city. Bunker coal is quoted at 50c. less per ton, but there has been no demand for such coal here for some time. The coasting steamers are burning oil and the foreign steam craft that come here are either fully supplied or coal at British Columbia. Vessels in the oriental trade usually carry coal from the other side.

Production and Transportation Statistics

Chesapeake & Ohio Ry. Co.

The following is a statement of the coal and coke traffic over the lines of the Chesapeake & Ohio Ry. for November, and five months ending November, 1911, in short tons:

Destination	November	5 Months
Tidewater	284,872	1,603,154
East	200,002	869,036
West	825,597	4,798,682
Total	1,310,471	7,270,872
Coke	18,605	93,040
From Connections		
Bituminous	18,464	94,122
Anthracite	2,273	15,411
Grand total	1,349,813	7,473,445

Norfolk & Western Ry.

Statement of total coal and coke shipments over the N. & W. Ry. for December and the year 1911, in short tons:

Destination	December	Year 1911
Tidewater foreign coal	101,118	995,400
Tidewater foreign coke	5,713	75,867
Tidewater coastwise coal	293,850	3,084,674
Other domestic coal	1,413,644	15,363,913
Other domestic coke	116,988	1,434,985
	1,931,313	20,954,839

Ohio Coal Traffic Statement

Statement of bituminous coal mined in Ohio and shipped over railroads specified, November and first 11 months of 1910 and 1911, in short tons:

OHIO COAL TRAFFIC STATEMENT

Railroads	November 1910	November 1911	Eleven Months 1910	Eleven Months 1911
Hocking Valley	465,215	444,543	4,301,978	3,306,526
Toledo & Ohio Central	218,601	204,767	2,007,069	1,743,903
Baltimore & Ohio	199,434	199,388	2,237,989	1,647,304
Wheeling & Lake Erie	356,010	392,082	3,459,033	3,353,577
Cleveland, Lorain & Wheeling	249,685	298,420	2,813,142	2,795,274
Zanesville & Western	109,976	124,261	1,088,447	1,048,866
Toledo Division, Pennsylvania Co.	209,006	196,708	2,069,139	1,743,890
Lake Erie, Alliance & Wheeling	142,448	122,326	1,166,382	1,142,741
Marietta, Columbus & Cleveland Ry	7,098	2,248	90,042	24,541
Wabash, Pittsburg Terminal Ry	7,155	1,072	62,071	53,097
Kanawha & Michigan Ry	....	19,103	....	104,747
Total	1,964,628	2,004,918	19,295,292	16,964,466

Imports

The total fuel imports for November, 1911, were 102,475 tons, valued at $299,-443, and for the first 11 months were 1,101,228 tons, valued at $3,241,478.

Coastwise Movement

Statement of domestic coal shipments by water from five principal Atlantic ports for November and first 11 months, 1910 and 1911, in long tons:

Ports	November	11 Months
New York	2,344,362	22,907,744
Philadelphia	617,832	6,444,082
Baltimore	246,186	3,904,028
Newport News	228,382	2,440,418
Norfolk (1)	423,040	4,214,834
Total, five ports	3,859,802	39,911,106

(1) Includes amount shipped by the Virginian Railway at Sewells Point, Va.

Exports

The total exports for November, 1911, were 2,122,753 tons, valued at $6,621,-927, and for the first 11 months of the year 23,139,169 tons, valued at $71,377,-595. These figures include bunker fuel laden on vessels in foreign trade.

Various Railroads, Rivers and Canals

Statement of coal and coke movement over different railroads, rivers and canals for November and first 11 months, for the years 1910 and 1911 was as follows, in short tons:

COAL AND COKE MOVEMENT OVER VARIOUS RAILROADS, RIVERS AND CANALS

Railroads	Month of November 1910	Month of November 1911	Eleven Months 1910	Eleven Months 1911
Baltimore & Ohio[1]	3,159,141	3,403,842	33,712,324	32,208,476
Buffalo, Rochester & Pittsburg[3]	746,010	750,748	7,438,306	7,497,928
Buffalo & Susquehanna[3]	170,115	178,649	1,580,855	1,768,109
Chesapeake & Ohio[1 2]	1,125,020	1,588,262	13,659,569	13,589,330
Erie[3]	581,166	667,786	5,805,619	6,678,894
Huntingdon & Broadtop Mountain[1 3]	100,478	101,593	1,150,281	1,012,111
New York Central & Hudson River[3]	703,777	723,061	7,194,792	7,351,102
Norfolk & Western[1 3]	1,698,876	1,962,155	18,427,493	19,023,526
Pennsylvania (east of Pittsburg and Erie)[1 4]	5,747,408	5,961,138	60,047,801	58,908,439
Pittsburg & Lake Erie[1 4]	1,472,209	1,440,529	16,483,283	14,846,979
Pittsburg, Shawmut & Northern[3]	127,956	139,538	1,146,812	1,323,189
Southern Railway[2]	378,886	350,290	3,564,793	3,156,688
Virginian Railway[1 3]	222,297	288,621	1,492,386	2,558,332
Western Maryland Railway	250,501	227,058	2,979,255	2,412,906
Rivers and Canals				
Chesapeake & Ohio Canal	22,112	22,568	184,882	186,440
Davis Island Dam	80,200	166,870	1,660,495	2,554,140
Monongahela River	683,247	810,348	8,703,580	8,296,493

[1] Includes coal received from connecting lines. [2] October and ten months' figures. [3] Includes company's coal. [4] Does not include company coal hauled free.

Foreign Markets

Germany

The production, imports and exports of fuel in the German Empire for the first 11 months of 1911 was as follows, in metric tons:

	Production	Imports	Exports
Coal	147,309,185	9,958,356	24,806,125
Lignite	67,081,079	6,463,976	52,582
Briquettes	*20,029,757	195,984	2,236,907
Coke	23,025,879	549,013	4,079,834

*Including subsequently reported quantities.

Great Britain

The following is a comparative statement of the British exports for the years 1910 and 1911, in long tons:

	1910	1911
Anthracite	2,445,932	2,454,523
Steam	45,190,390	47,119,017
Gas	10,142,708	10,504,172
Household	1,549,735	1,540,710
Other sorts	2,776,711	2,980,844
Coke	964,053	1,064,839
Briquettes	1,470,791	1,612,741
Totals	64,520,320	67,276,846

The outlook in regard to the labor situation is serious, and strong conditions are in evidence in nearly all departments for early deliveries. For backward loading most sellers are inclined to hold their coal in the meantime. Quotations are approximately as follows:

Best Welsh steam coal	$4.32@4.44
Seconds	4.20@4.32
Thirds	3.84@3.96
Best dry coals	4.14@4.20
Best Monmouthshire	3.90@3.96
Seconds	3.66@3.72
Best Cardiff small coals	2.34@2.40
Seconds	2.16@2.22

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½% discount.

Spain

Imports of coal into Spain for the first 11 months of 1911 were 1,864,315 tons as compared with 1,828,108 tons for the same period in 1910. Coke imports for this period in 1911 were 293,841 tons as compared with 268,690 tons in 1910. Practically all imports are from Great Britain.

Financial Notes

Lehigh Coal & Navigation Co. has declared the regular quarterly 2% dividend, payable Feb. 29, to stock of record Jan. 31.

Jefferson & Clearfield Coal & Iron Co. has declared the usual semi-annual dividend of 2½% on preferred, payable Feb. 15 to stock of record Feb. 6.

The Dominion Coal Co. has declared the regular semi-annual dividend of 3½% on its preferred stock, payable Feb. 1 to holders of record Jan. 18.

The Colorado Fuel & Iron Co.'s charter expires on Oct. 21, 1912. Under the Colorado laws the company may apply for a 20-year extension on a vote of two-thirds of the stock outstanding.

The Pittsburgh Coal Co., contrary to expectations, earned the 5% dividend on the preferred stock in the fiscal year ended Dec. 31, 1911, according to officers of the company. Payment on the preferred dividend takes $1,353,590. In 1910 the earnings applicable to the preferred dividend amounted to $1,965,450.

The Reading Coal & Iron Co. has done an annual business of $35,000,000 without paying dividends. To a speculator this fact at once suggests large buried equities, since it is not conceivable that the coal company has been doing business without earning the same handsome margin of profit that other hard-coal concerns have made.

Joseph H. Hoadley, who is absolutely in control of the Alabama Consolidated Coal & Iron Co. as yet, is endeavoring to have $490,000 first consolidated gold 5s underwritten for the purpose of taking up and retiring the $426,000 first extension and improvement sinking fund gold 6s, which are held by the St. Louis Union Trust Co. as security for borrowed money. As the first-named bonds will probably not yield to the company more than 80, and the bonds which it is intended to retire with the proceeds of the sale are worth par, there will be a difference of $29,000 yet to be paid, which will be included in the general financing of the merged company, so it is said.

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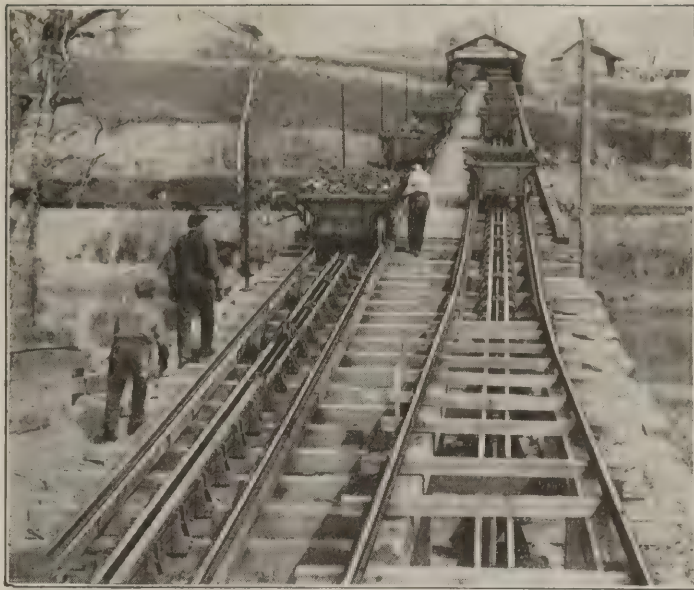

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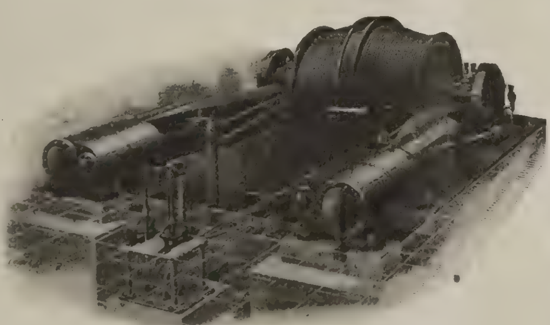

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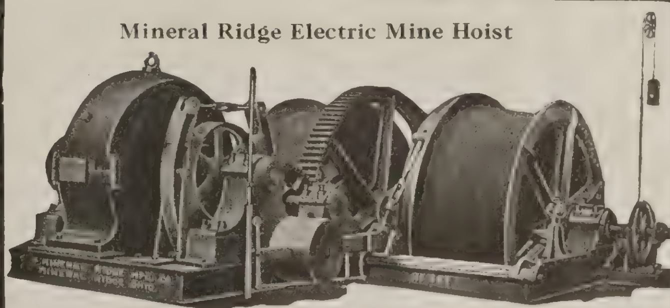

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Wanted—Coal miner, to run undercutting machine or act as shift boss on American-owned mine in Arctic region; salary $125 per month and expenses, beginning May 1; two-year contract. Full particulars to "Arctic," 1004 Oliver Building, Boston.

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Advertisements under this head 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Wanted—Contract work (mine, mill, etc.), or assistant, by married physician; one year hospital experience; also private practice in Pennsylvania. Address Box 5, care Coal Age. Jan. 27.

Position wanted as manager or general superintendent; twenty-eight years' experience in mining, and have filled positions from door boy to general superintendent; I am a graduate mining engineer, familiar with every detail in producing, washing and coking coal, including costs and accounts; married and temperate in habits; references furnished. Address Box 6, care Coal Age.

Position as assistant superintendent or superintendent is desired by a man of ability and push, having two first mine foreman certificates, gaseous mines or otherwise, expert on ventilation, opening new mines and reopening old mines, by salary or contract; best of references furnished on request. Address Box 9, care Coal Age. Feb. 10.

Wanted—To get into communication with bituminous coal mining company which is in need of a high class mining engineer or superintendent; am thoroughly conversant with all modern and uptodate methods of mining, mine development, haulage, power, coal cutting and coal handling machinery; am well up on the question of costs and with my experience and knowledge of mining am able to take the kinks out of an expensive operation and reduce the cost; only a strictly first class proposition will be considered; can furnish highest references. Address Box 8, care Coal Age.

C A

COAL AGE

Devoted to Coal Mining and Coke Manufacture

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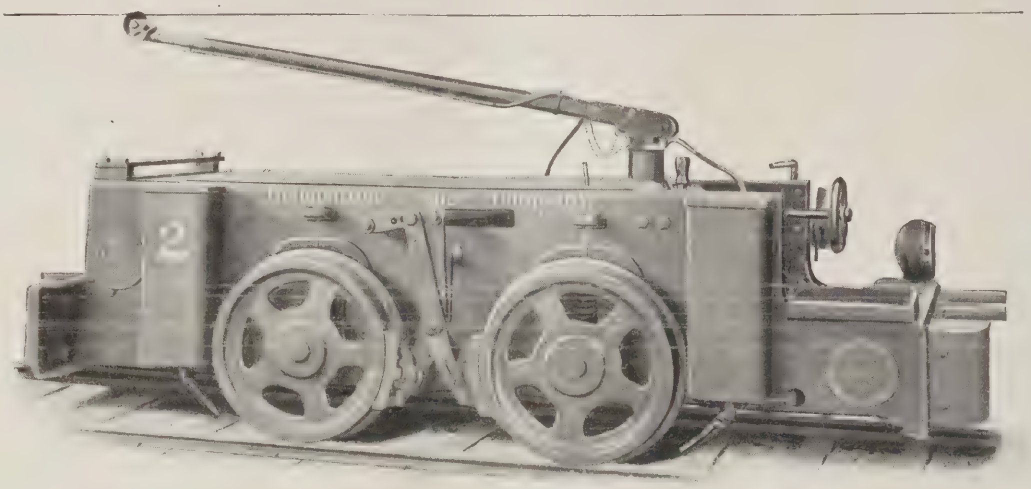

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C A

COAL AGE

Vol. 1 NEW YORK, FEBRUARY 3, 1912 No. 17

THE bitter fight of the socialist element of the United Mine Workers, to have the Indianapolis convention indorse *government ownership of industries*, and declare for *political as well as industrial union*, compels attention of thoughtful men to the recent amazing spread of socialistic sentiment.

No intelligent person any longer believes that the industrial world will go back to an unorganized individualistic production and distribution of wealth. In fact, the most radical utterances, or what is termed "advance thought," concerning the regulation of big business, have emanated lately from our famed captains of industry; men who were expected to champion individualism in its highest degree.

A glance at the record of events leading up to the advent of the present social and industrial situation shows there is little occasion for surprise. With an insistence no less certain than the laws of gravity, social evolution has pursued its steadfast way. The advance has been of necessity born, and arguments as well as pleas have failed to retard its progress.

A couple of centuries ago, the lighting of streets in towns was a matter of individual enterprise; every householder was supposed to have a lantern before his door. The system failed through the selfish neglect of the individual and it was necessary to create laws compelling the display of a street light at each house. Soon it became apparent that the lighting of the streets was for the common good, and therefore was a communal function; immediately the householder was relieved of individual duty, and who of us would care to return to the early practice?

In like manner, every house once had its own well. But it was perceived that water was a common necessity, and the community undertook to furnish the supply. Lately, many people want to know, "why the supplying of water and light is any more a communal function than the supplying of artificial heat or the provision of transportation in our streets"? Probably in the future, as in the past, the science of one age will be the common sense of the next.

The cry has always been raised, "Don't deprive the world of the incentive that lies in individual effort." However, the early malcontents have been hushed, and we are today wrestling with the greater problem of how to democratize business. We have wallowed in the throes of excessive competition, the certain outgrowth of which is excessive coalition. The proposed remedy for the latter may be one thing, or it may be another—whatever the cure, it has yet to be proved.

We of the coal industry have little to fear and perhaps much to gain from the application of newer theories and the more restricted regulation of our business. When Prussia wanted coal mines, she went into the market and bought enough stock to give her control. New Zealand followed the same plan and the fuel industry in both countries was helped rather than hurt by the move.

Without holding any brief for socialism, or entering into a discussion as to whether the principles of the creed can be safely applied, we are secure in saying that such outbursts as occurred at the miners' convention are prophetic, rather than ominous. Many coal men with much at stake now invite reasonable government regulation, and if the will of the people goes further and demands government ownership, there is no doubt but that Uncle Sam can buy one mine, or many—all are for sale; sentiment won't interfere.

The principal danger to society today is from the inability or refusal of many people to distinguish communism and nationalism from socialism. The motto of the latter is, "Every man according to his deeds"; that's not so bad. What we have to fear are the disciples of the other two forms of social faith; these men too often follow the red flag of industrial death and physical violence. Firedamp in the mine is no less deadly when called by a different name, and hydrogen sulphide is just as foul when corked in a bottle labeled "Attar of Roses" It's the man behind the mask we dislike most—the pirate who strives to loot under the guise of a patriotic support of a plausible principle.

The Lignite Fields of Colorado

By R. A. Pierce *

Description of a field that holds an important place in the commercial trade of Colorado. The coal is a high-grade lignite and the seams vary from 4 to 11 ft. in thickness. Machines are used, and, as a general rule, the mines are dry.

*Chief engineer, Northern Coal & Coke Co., Denver, Colo.

The lignite coal fields of Colorado lie in the northern part of the state and immediately east of the Rocky Mountains. The workable beds are irregular in outline and extent, and are mainly confined to Boulder County and the southern part of Weld County. Coal has been found as far north as Wyoming, but its quality is such that it has no commercial value. It has also been mined to the west of Denver near Golden, and to the east near Scranton, but was never extensively developed owing to the inferior quality.

The field is divided into five general districts. The Marshall district, the Erie district, the Louisville district, the Lafayette district and the Dacono district. Each district is named after the principal town in that section. The working seams are all geologically related to one another, but have become separated and distinct by faults or erosion.

Rex No. 1 Mine, Louisville, Colorado

Historical

Coal was first mined around Marshall in 1863 and it is one of the oldest, if not the oldest district in the state. In 1864, which is the earliest record obtainable, 500 tons was produced in this field, the product coming from the Marshall, Golden and Scranton mines.

Closely following the opening of the Marshall field, development of the mines around Erie was started. With the completion of the railroad, and the rapidly increasing demand for coal, the production of the Erie district for 1872 was 54,340 tons. The mining excitements and the rapid growth of Denver and adjoining mining towns, created a heavy demand and the mines were soon working to capacity. Together with the Marshall mines this district produced the main supply of coal until 1888.

Next of importance was the opening of the Simpson mine in Lafayette, and the reopening of the old property at Louisville known as the Welch mine. Other openings followed in rapid succession and today the bulk of coal produced comes from these two districts.

The Dacono district is the newest one in the field. In 1907 the first properties were opened and eight mines are at present producing, the largest of which is the Puritan.

Geology

The coal beds are entirely confined to the sandstone and shales that constitute the Lower Larimie formation of the Upper Cretaceous period. The general stratigraphic conditions remain practically the same from Denver to the north line of the state.

On the west, and along the foothills, the formation is considerably disturbed, the strata having been sharply upturned, which together with numerous faults and folds, has complicated mining operations. At Marshall we find the greatest displacement has taken place, the coal being broken and numerous croppings found. Two general faults originate to the south of town, and traverse the coal in a northeasterly direction. The main, or north fault has a general trend of N 40° E, but gradually swinging north, while the fault on the south runs in a more easterly direction. The area south of this latter fault has been but slightly disturbed and contains a large body of workable coal; little, however, has been removed from this side of the fault, the earlier workings being on the north.

From the foothills, the coal rapidly flattens out to the east, and is in a more nearly horizontal position, with a general dip to the south and east which follows closely the contour of the prairie.

The deposition of the coal is mostly in synclines, separated by folds which have become eroded and in many cases

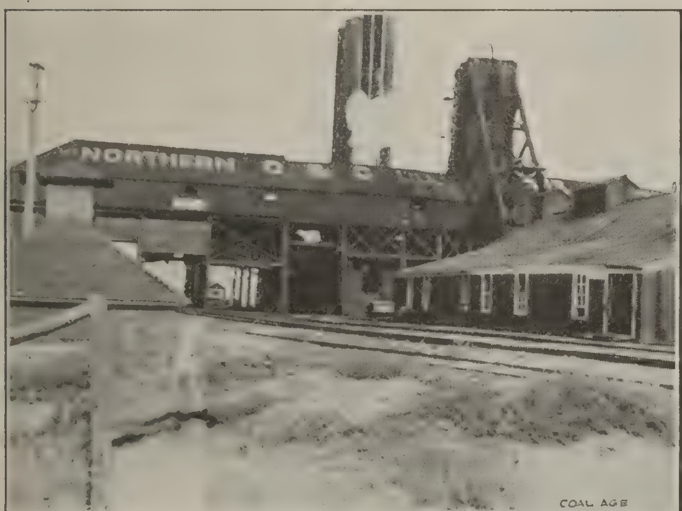
faulted. The axes of these synclines are northeast and southwest, and the basins have a varying width of from one to three miles. Local faults, of light throw, are encountered in mining, especially in the Louisville syncline.

The Coal

Most of the coal seams lie within 300 ft. of the surface and vary in size and number in the different districts. At Louisville, two seams about 60 ft. apart are worked, and the seams commonly mined vary in thickness from 4 to 11 ft. Coal under 4 ft. is considered unworkable under present conditions, but as the thicker coal is exhausted and the demand increases, 4 ft. and even 3 ft. will be worked at a profit.

Industrial Mine, Superior

Gorham Mine, Marshall



Views of Simpson Mine, at Lafayette, Colorado, Showing Tipple, Power Plant and Machine Shop

The general character of the coal throughout the district is the same, although that nearest the foothills is of a superior quality, due to regional metamorphism.

The coal represents the highest grade of black lignite, although according to the carbon-hydrogen ratio classification, it closely approaches the lower-grade bituminous. The physical properties are such as would indicate that it belongs to the lignite coals; namely, a lower specific gravity, burning with a clean flame, noncoking and slaking on exposure. This coal has been classified by the government as a sub-bituminous.

The following is a typical average analysis for coals in the different districts:

District	Carbon	Hydrogen	Nitrogen	Oxygen	Sulphur	Ash
Marshall	67.03	5.15	1.25	22.50	0.30	3.77
Erie	65.95	5.23	1.40	22.83	0.43	4.16
Louisville	66.03	5.00	1.28	23.08	0.43	4.18
Lafayette	65.10	5.13	1.25	21.58	0.29	6.65
Dacono	65.33	5.00	1.40	21.07	0.46	6.74

The coal shows an average calorific value of 11,200 B.t.u. in air-dried sample. The moisture is variable, being less in the western portion and increasing to the east. For producer-gas purposes, the tests made at St. Louis by the government, show satisfactory results, 1.71 lb. of dry coal giving one electrical horsepower as compared with 4.85 lb. under the steam boiler, showing a gain of 183 per cent. in efficiency.

Prospecting and Developing

The irregularity of the coal beds renders imperative the thorough prospecting of any tract before starting operations. The usual method of prospecting is with the churn drill, using pipe rods. Faults and splits in the coal can be determined easily and without great expense, owing to the light cover and the soft overlying strata. Satisfactory results have been obtained with the churn drill as shown by checking the actual measurements of the coal whenever exposed in the workings, with the records as shown by drilling.

The following table will show the relative cost per foot throughout the district. This includes all costs except casing:

Depth	Cost per ft.
0 to 400	$0.50
400 to 500	0.75
500 to 600	1.00
600 to 700	1.50
700 to 800	2.00

The size of the hole on starting is dependent on the depth it is expected to go.

The area worked by one shaft as a general rule is not great, and accounts for the large numbers of mines, short life and the less expensive equipment used. The new plants, which have been installed in the last few years, are more modern and uptodate, and more territory is acquired and systematically drilled and prospected. The shafts are placed near the center of the property, or if the measures have a definite pitch the shaft is sunk with reference to securing the proper ventilation and drainage of the mine. First-motion hoists, self-dumping cages and other improved labor-saving devices are also being used in the newer plants.

Methods of Development

The greater part of the coal is taken out through shafts which vary from 50 to 275 ft. in depth. These are usually three-compartment shafts, two for hoisting coal and the third for pipes, ventilation and manway. The cages are single deck and carry one car.

The room-and-pillar system is used generally through the field. The usual method of exploitation is to drive two parallel entries, with 50-ft. pillars, in opposite directions from the shaft; cross entries are then turned at intervals, depending on the length of the rooms, at 90 deg. to the main entry, 175 to 225 ft. being the average length of the rooms. These cross entries are carried to the boundary line, if the distance is not great, the rooms being worked as the entry advances and the room stumps and chain pillars removed on the retreat. When the territory to be developed is large, additional entries are driven parallel to the main entry, at intervals of about 700 ft., blocking the cross entries into panels.

Casino at Hecla Mine, Louisville

By maintaining one pair of cross entries as a main haulage road, the coal from all panels can be delivered to the shaft with a minimum amount of haulage. Rooms are driven on sights and about 36 ft. on centers, 20 ft. being the average room neck.

The roof is mostly shale and disintegrates readily on exposure to the air. Where the thickness of the coal will permit, roof coal is left to protect the entries. Timbering is required in all the rooms.

The methods of mining throughout the field are comparatively simple, and only slight changes in the different districts are necessary, due to the difference in the physical characteristics of the seams. The measures are approximately flat, and the minor faults are not troublesome. The water made is not excessive, except possibily in the Erie field, where constant pumping is necessary. Very little gas is encountered and no serious trouble has ever occurred from this source. Under these favorable conditions, mining with some definite plan of operation is easily accomplished, and such a plan is generally adhered to, especially by the large companies.

Mining

The method of mining the coal at the face is with an undercut of about 4 ft. by air machines, and in coal up to 8 ft. thick, three holes are placed across the face about midway of the vertical height. The center hole is inclined to open a cut, and the side holes are placed near the rib to break the coal. The usual charge is about 12 to 14 in. of FF black powder.

Hecla Mine, Louisville

The pillar work is mostly hand mining and is started at the top of the room and drawn back to the stump. This is carried back in blocks of half the pillar or the full width. In cases where the pillar has been made larger than the average, which is 16 to 20 ft., a skip is first taken along the side.

Where bone or slate is encountered in the coal, it is removed in the mine, and in narrow work loaded into pit cars. These are taken to the surface and dumped. The miner is paid so much per inch-yard for removing slate or bone from the coal. In narrow work, where it is loaded into cars, 25 to 35c. per car extra is paid for loading, the price depending in the size of the car.

Wage Scale

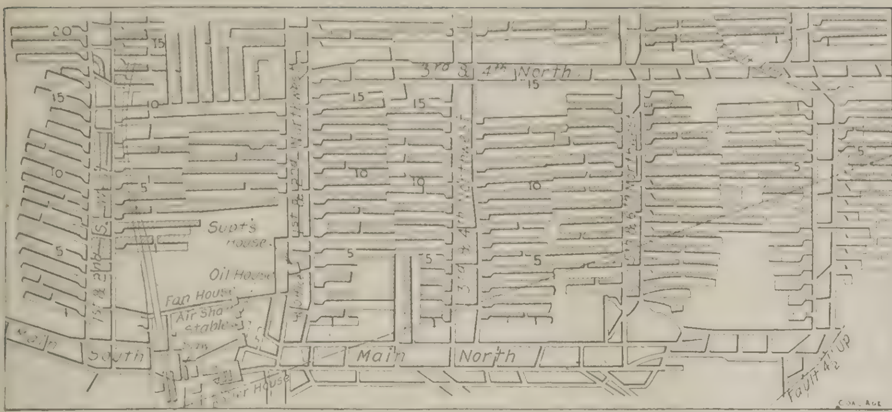
The price paid for loading coal after machines is from 34½c. to 43½c., depending on the height of coal and the district. Pick work runs from 47c. to 68⅔c., depending on the height of coal and the district. Narrow work is paid for by the yard, ranging from $1.20 per yard to $2.25, depending on whether hand or machine mining.

The total number of men employed in and about the mines will average 1750 for 1908-9-10. Coal is hoisted for eight hours during the day, the shift commencing at 7.30 a.m. and working until 4 p.m., one-half hour being taken at noon.

The coal is put on the market in three sizes, run-of-mine, lump and slack. The lump is made by passing over a 2½-in. shaking screen and the slack is the coal passing through a 2½-in. screen. The average proportion of lump and slack coal is 60 per cent. lump, 40 per cent. slack.

Surface Equipment

The mine cars are dumped over home dumps in most cases, the car crossing over the tipple scales before passing into the dump. Two dumps are provided, one



Map of Lehigh Mine, Illustrating Typical Method of Working

for each compartment, in mines where the empty cars cannot be run around the shaft and caged, as the loaded car is removed. Crossover dumps are used on tipples having room enough to operate. As most of the mines are operated from both sides of the shaft the bottom is provided with switches and sidings permitting the coal to be caged from both sides.

An effort is made to keep the coal as clean as possible by removing the bone and slate before coming to the surface. The lump coal is loaded into box-cars to protect it from the weather, while the slack and mine-run are loaded in open cars. All precautions are taken to make the coal as merchantable as possible. Box-car loaders are used to load the lump coal.

The companies have built at each camp, accommodations for all their men, and can operate their mines independent of the towns which are situated in the districts. This policy was adopted after the labor trouble in April, 1910. Prior to this, most of the men lived in the town nearest to the mine in which they worked.

The camps have their own water system, the water being supplied from holes drilled to the artesian flow which is about 800 ft. deep. Streets have been laid out, and electric street and house lights are used in most of the camps.

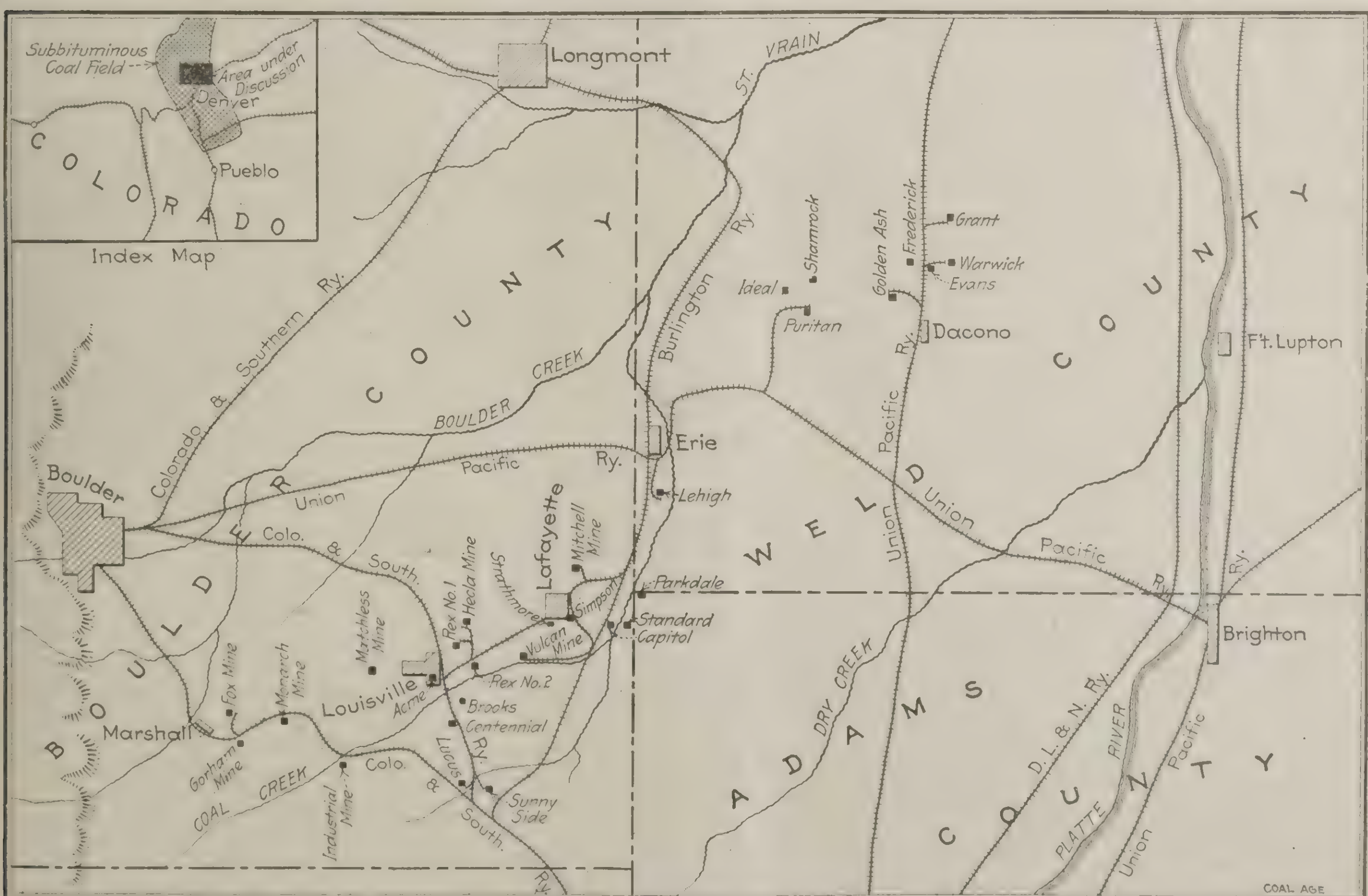
The houses are mostly of the four-room variety. A few five-room houses were built, but are not in demand by the ordinary coal miners. Large boarding houses have been built for the single men, the largest of which will accommodate 75 persons. Wash houses containing hot and cold water, cement floors and 74 lockers are placed in each camp.

We have built at our main camps, club houses for the amusement of the men and play grounds for the children. The play grounds are equipped with swings, turning poles, slides, etc. The casinos are equipped with pool and billiard tables, card rooms, reading room, store where soft drinks, tobacco and supplies are sold. The camps are all in charge of one person who is responsible for the sanitary condition and the order kept.

Summary.

The mine-run and slack coals are used for steam purposes, while the lump supplies the domestic trade in Denver and towns in the northern and eastern part of the state. During the winter months some coal is shipped into Kansas and Nebraska.

During the year of 1910 there were 33 mines in operation representing 21 separate corporations or individual operators. The largest of these companies is the Northern Coal & Coke Co., operating 10 mines. The National Fuel Com-



Portion of the Northern Colorado Lignite Field, Showing Railroad Connections

pany operates 4 mines and the balance are independent operators. The Northern Coal & Coke Co. produced for the year 491,770 tons and the National Fuel Co. 245,277 tons.

In the following table will be found the amount of coal mined in Boulder and Weld Counties for the last 11 years compared with the total production of coal in the State:

COAL OUTPUT OF COLORADO

Year	Total Production of State	Boulder & Weld Counties
1900	5,495,734	719,748
1901	6,210,405	559,131
1902	7,522,923	871,699
1903	7,775,302	918,807
1904	6,776,551	858,921
1905	8,989,631	978,443
1906	10,308,421	149,824
1907	10,965,640	1,602,946
1908	9,773,007	1,494,277
1909	10,772,490	1,665,068
1910	12,104,887	1,091,755

The decrease in 1910 was due to a strike being called in April, lasting throughout the year; although no settlement has been made up to the present time, the mines are all in good condition and ready to work full capacity during the winter months. There is some evidence that a strike may occur in southern Colorado; in this event, the lignite mines would be taxed to capacity.

European Wash House Practice

The question of the health of the miner is receiving especial attention in this country at the present time. In view of the important nature of the problems it will be useful to make a brief examination of the present methods of equipment adopted in this and other countries, particularly in such districts as the Belgian, where such provisions appear to be very fully adopted. On the Continent there is little difficulty in inducing the workers to take advantage of the facilities provided, and there appears to be a strong objection on the part of the men to appearing in the streets in a dirty condition. Of the tctai number of Belgian collieries, 45 are known to be provided with sanitary installations.

The Dolcoath Mine

The following particulars as to what has been done in the provision of baths at the Dolcoath tin mine in Cornwall are of interest. They were supplied to H. M. Chief Inspector of Mines, R. A. S. Redmayne, by R. Arthur Thomas, general manager of the mine.

The lavatory is contained within a brick building, 38 by 28 ft. (see Fig. 1). The sides of the room are occupied by 36 enamelled wash basins countersunk into a slate bench. These basins are provided with hot and cold water, and the waste therefrom is conveyed by a pipe into a half-round enamelled earthenware gutter. Ten bath-rooms, each 7 ft. 6 in. by 5 ft. 6 in., occupy the central portion of the building.

This structure is in the form of sectional partitions, each containing a bath. The gradient of the cement floor towards the enamelled earthenware gutter enables all the waste and overflow from the baths and wash basins to be conveyed away from the building.

The following details refer to the plan Fig. 1: *A*, wash basins, white enamelled 12 in. diameter, countersunk into slate bench *B*, and fitted with a pipe conveying waste into the enamelled earthenware gutter *D*. The baths *F* are enamelled inside and on the roll, and are complete with hot and cold globe cocks, plug, and pipe conveying waste into the gutter *D*.

This is the second of a series of articles on wash house construction. European practice (especially the Belgian) is further advanced than the American. This article is the most comprehensive yet published on the subject.

Note—Abstract of paper appearing in the Iron and Coal Trade Review (London), Nov. 24 and Dec. 5, 1911.

Each man before entering the bath usually has a preliminary wash of the hands and face in the basins provided, and the actual time occupied in the bathroom is from 8 to 10 minutes. On an average the men have a bath once a week, but may do so daily if desired. They do not contribute towards the cost of the upkeep or the interest on the capital expended. The "dry" and baths are under the sole control of the management.

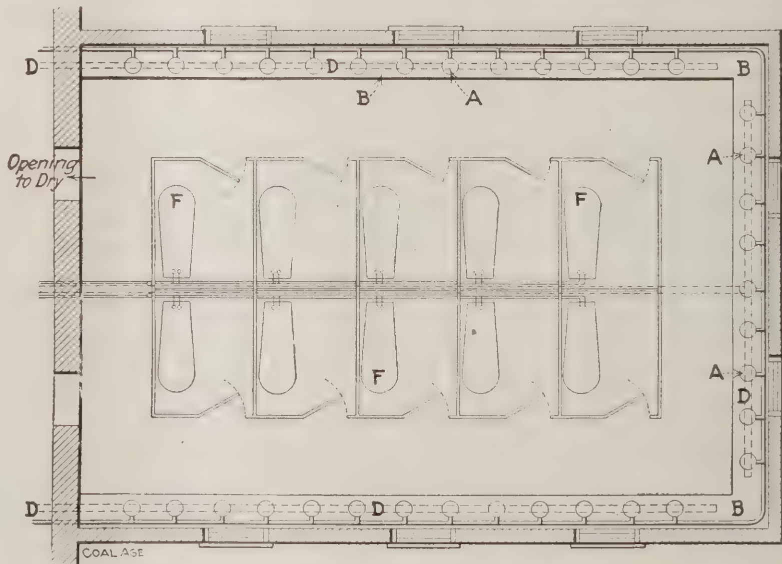


Fig. 1. Plan of Baths at the Dolcoath Mine

The Wharncliffe Silkstone Colliery

A beginning in the provision of miners' baths and changing accommodation was made some time ago at the Wharncliffe Silkstone Colliery, but is only for a small percentage (about 3 per cent.) of the 1825 persons employed. The following particulars have been kindly given by G. Blake Walker:

There are eight shower baths and six slipper baths, 48 lockers for clothes and an attendant's room, the initial cost being about $2400. The cost of upkeep (attendance, heating, lighting and depreciation) is $7.20 per week. The men using the baths each contribute 48c. per quarter and provide their own soap and towels. The baths are used with fair regularity by 48 men, but there is no demand for extension. A man can usually wash and change in 15 minutes; some do so in 10 minutes.

Monceau-Fountaine Collieries

The management of the Société Anonyme des Charbonnages de Monceau-Fontaine, which within recent years has equipped its pits at Pieton, Goutroux and Marchiennes with dressing-rooms and douche baths, has recently installed a fine equipment at its No. 8 pit at Forchies.

The central area is flanked on three sides with annexes. The central building is the dressing-room of the workmen. In the annexes are the entrance hall, the lamp-room, the miners' baths, the engineers' bathing-room, the space reserved

to the overseers, the women's dressing-room and baths, the clothes-room, and the room for the payment of wages.

The entrance hall gives access to the dressing-room and baths for the men and boys and to several accessory rooms, as will be noted in the plan, Fig. 2. It is for the use of the engineers, miners, etc., and is closed at the ends by swinging doors. It is capable of being warmed. The workmen's dressing-room is 130 ft. long, by 40 ft. broad, by 24 ft. high.

The Miners' Bath

Eight hundred men engaged at this pit daily use this room for changing clothes. Each man has his own clothes-hanger entirely to himself. The system of retaining the clothes consists of suspending them in the upper part of the dressing-room. Thus while the man is in the pit, or having left work has gone home, the warmed air constantly renewed by the ventilating appliances in the room traverses the damp or soiled clothing and dries and purifies them.

The suspension of the clothing is obtained by means of a small galvanized iron chain passing over two small pulleys fixed to a grille formed of sectional steel held by the roof trusses. When suspended, each set of clothes hangs clear of those of the other workmen. Each hoist is provided with a lock and key, the latter being kept in the possession of the user, so that theft is impossible. The only other interference with the free space of the dressing-room are the benches, of which there are eight.

Lamp Room and Engineers' Baths

Separate from the dressing-room there are two groups of miners' baths, comprising 120 cabins or compartments. Each cabin has two compartments. The first, closed in front by a sliding curtain, is used for dressing and undressing. The second, behind the first, has an overhead spray. All the cabins are finished in enamelled brick with rounded corners. They are reinforced with iron stays in the interior of the walls. The average time taken by a workman in the bath itself is about five minutes, and about nine gallons of water are used per bath.

TABLE 1. DETAILS CONCERNING EQUIPMENT OF EUROPEAN WASH HOUSES

Name of Colliery	Number of Shower Paths for Miners	Initial cost of installation	Maintenance cost per month, heating, lighting and attendance	Number of men employed	Number and percentage of men using the baths	Cost per bath, including soap, brushes and salaries of attendants	Number of clothes hoists
l'Esperance et Bonne Fortune, three shafts.......	146	$20,439	$127	1735	1215 70%	$0.008 to 0.01	1905
No. 1 Sainte Marguerite...	40	5,859	65	620	395 64%	0.007	400
No. 2 Aumonier..........	38	4,925	78	575	525 91%	0.006	400
No. 1 Saint Giles.........	40	6,910	46	700	490 70%	0.004	500
No. 2 Piron, a Saint Nicolas	50	6,073	44	760	525 70%	0.004	550
Bonne-esperance Batterie Violette...............	Ninety-six for men; 15 for women	13,237	156	980	800 82%	0.007	1200
Gassonlagasse...........	Thirty-three for workmen, seven for officials. Four for engineers	8,915	63	700	450 65%	0.006	?
No. 1 des Kessales........	22	4,283	49	494	293 60%	0.007	400
No. 2 Dhoire............	22	4,866	49	502	310 62%	0.007	400
Cockerill................	60	9,733	4.87 per diem	1030	950 92%	0.005	1000
Hassard..............	36	3,309	33	804	200 25%	0.007	599
Sclersinval-Benoit........	36	2,336	54	360	270 75%	0.008	300
Marihaye...............	33	6,891	54	310	217 70%	0.014	Nil

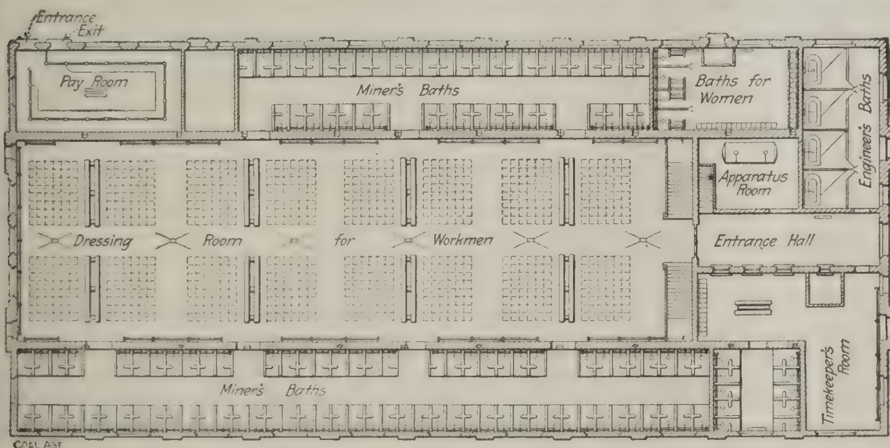


Fig. 2. Miner's Baths at the Monceau-Fontaine Colliery

The engineers' bath-rooms consist of four cabins of enamelled brick, 10x10 ft. and 6 ft. 6 in. high. A somewhat similar arrangement is installed at the St Charles pit of the Charbonnage Poirier. The engineers have at their disposal a bath of enamelled iron, fed by a bronze tap, which gives hot or cold water as required. A douche is also provided, and included in the equipment of the bath-room are a clothes chest, a chair, etc.

The Overseers' Bath

In the overseers' quarters, which include a dressing-room and bathing accommodation, is a clothes drier of iron with a double face suitably heated, and 20 clothes receptacles. The overseers have ten brick compartments in the bathing-room similar to those provided for the miners.

The water for the baths is mixed with steam in two mixers of boiling and cold water, thermometers indicating the boiler water temperature and that of the water going to the baths; the temperature is variable according to the different hours at which the supply is used. At night, both arc and incandescent electric lamps are used in order to provide efficient illumination in all parts of the building.

Twenty ventilation shafts placed in the walls of the central building and surmounted by cowls insure efficient ventilation, while ventilation of the dressing-rooms and lamp-room is also well looked after. Efficient means for the disposal of the waste water are also provided, and the whole equipment provides a notable example of modern hygienic principles applied in a most practical form to the purposes of a mine.

Belgian Practice

The accompanying table is submitted by R. A. S. Redmayne, giving particulars of thirteen installations in respect to cost of erection and maintenance of baths, and the number of persons using the same. The provision of douche baths was not obligatory before July 5, 1911.

By this law they have to be established and maintained at all new collieries, but the workmen are not obliged to use them.

In regard to the above it may be noted that at the St. Nicholas and Bonne Fortune pits there are six shower baths for surface women workers, and latrines are provided at each installation, in addition to a few superior baths for officials. At l'Esperance and Violette collieries there are also 15 shower baths for women workers, and 40 women use them. At the Marihaye pit the dirty clothes of the workmen are washed on the premises at small cost, for this purpose a washhouse and drying-room having been erected.

This costs about $21.87 per month, and slightly increases the cost per bath. The actual time expended in bathing varies from 3 or 4 minutes to 10 minutes.

Summary of Costs

Epitomizing the tabulated results of the 13 collieries named, we find that the equipment for about 785 shower baths costs $97,777, or, roughly, $12,458 per 100 baths which is about $10,220 per 1000 men. The cost of maintenance is a little less than $973 per month, or, roughly, $122 per month per 100 baths. The total number of colliers employed at these mines when the figures were taken, i.e., in 1906, was 9570; of these 6640 used the baths daily, or about 70%. The average maintenance charged per bath was a little over ½ cent.

Taking the coal field of Liege, the average cost works out at about 0.8c. per bath taken for the 25,078 underground workmen at the mines, which is the number given in the official statistics for 1905. The total number of shifts worked were 7,604,320 and the total expenditure would be about $59,215 for the whole of the collieries of the province of Liege, the total output of coal from which was 5,874,410 tons. This gives a cost of about 1.04c. per ton, the total cost of production being $2.41 per ton. Of this the proportion of miners' baths, therefore, is 0.41 per cent.

Taking into account the interest on, and redemption of, the capital involved in constructing the baths at 15 per cent., the total cost per bath amounts to 1.4c. or 1.8c. per ton. The capital cost of erecting the baths varies from $9.73 to $17 per head, but for the last figure a very elaborate installation can be provided. At a cost of $9.73 per workman using the baths, a fairly complete installation can be provided. With 500 workmen the cost per unit may be stated as varying between $9.73 and $14.60 and taking a cost price of $11.65 per workman, and a rate of 15 per cent. for interest and amortization of capital as well as depreciation, and allowing 300 working days to the year, the capital cost works out at 0.6c. per bath.

French Practice

The provision of baths for miners in France is not compulsory, though many collieries have voluntarily provided them for the men. Mr. Redmayne, however, is informed by M. Leon (Mining Inspector for the Pas-de-Calais) that the provision will, in the very near future, be made compulsory. A rule is to be issued before the end of the year to the effect that douche baths with a dressing-room shall be constructed at the entrance to each working colliery in those cases where the number of men simultaneously employed underground exceeds 100. The scale of the installation shall be such as to allow of the workmen to bath as fast as they come out of the mine.

The douche baths will be placed at the service of the surface workers under such conditions and at such hours as shall be fixed by the mine manager. The Lens Colliery Company, Pas-de-Calais, has built at the Nos. 5, 8, 12 and 13 pits baths with 44 cabins each, but they are only used by miners coming from villages some distance away. The use of baths on the part of the miners is not compulsory, nor is it intended to make it so.

German Practice

In Westphalia the provision of miners' baths by the owners is compulsory, but the use of the bath on the part of the men is optional; practically all the workmen, however, make use of them. The building and installation of miners' baths cost about $19,460 for every 1000 workmen, the yearly consumption of water is about nine cubic metres per man, and the coal required for heating baths and buildings about one ton per man per year, the cost amounting to about 4.5c. per man per week.

J. S. Martin, I.S.O. (late H.M. Inspector of Mines) gives the following particulars regarding the washing establishments at three large collieries:

COLLIERY A—INTENDED FOR ABOUT 3000 WORKMEN

Cost of buildings	$34,550
Cost of inside fittings	19,470
Total	$54,020

This building, however, included a pay hall, office for surface and underground officials, as well as officials' bath room and lamp room, the latter alone costing $3942. The number of men employed underground is about 2600, of whom 100 work on the night shift, leaving 2500 to make use of the establishment on the day and afternoon shifts. During the changing of the shifts the men make use of the establishment, i. e., between 2 and 3 o'clock, about one-half of the men coming out while the other half change into their pit clothes.

COLLIERY B

No. 1 pit; 2000 men and boys:	
Cost of buildings	$28,700
Cost of inside fittings	10,700
Total	$39,400
No. 2 pit: 1000 men and boys:	
Cost of buildings	$15,570
Cost of inside fittings	6,570
Total	$22,140

In both cases the buildings include offices for underground and surface officials, lamp room and baths for managers and officials.

At Colliery C, employing about 1600 persons underground, the cost of maintenance, supervision and water supply is $2480 per annum, i.e., $1.54 per man employed underground.

The cost of erecting the buildings as well as maintaining them is borne by the owner. The use of the baths on the part of the men is not compulsory, but the men in the great majority of cases use them without exception, except in the Ruhr District and in Silesia.

In accordance with instructions issued by the management the workmen are obliged to bring clean working clothes with them every Monday, and to take their dirty clothes home on Saturday. If this is not done they are subject to a penalty. Special regulations do not exist for the working of the establishments; the workmen, however, mostly conduct themselves with propriety while in the building.

Canadian Coalettes

A "coalette" factory has been added to the list of industries of Fort William, Ont. Consul General John E. Jones, of Winnipeg, explains that Fort William was selected because it is here the great barge transportation companies have their wharves and coal docks and because practically all the coal coming from Pennsylvania mines is routed through the Great Lakes to Fort William.

This new $100,000 enterprise is financed by local capitalists, and has a contract with the several railroad and lake transportation companies for the coal dust or screenings collected at their dumps. The company has installed a Renfrew (plunger type) coalette machine, manufactured at St. Louis, Mo., with a capacity of 10 tons per hour.

The company has been quite successful, being able to market immediately its entire output, and is considering the installation of several new machines.

The "coalettes" find ready sale in Canada as far west as Edmonton, and are sold in Winnipeg at $9 per ton, as against $10.50 for hard furnace coal. Wholesale prices vary from $4.75 per ton for the coalettes made from American anthracite to $5 per ton for those made from Pocahontas coal. The company transacts its Western business through agencies.

Air, Electric and Mule Haulage

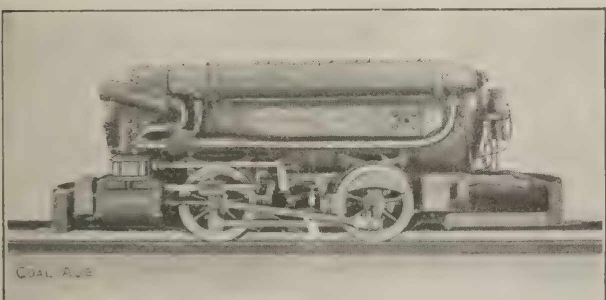
By C. B. Hodges*

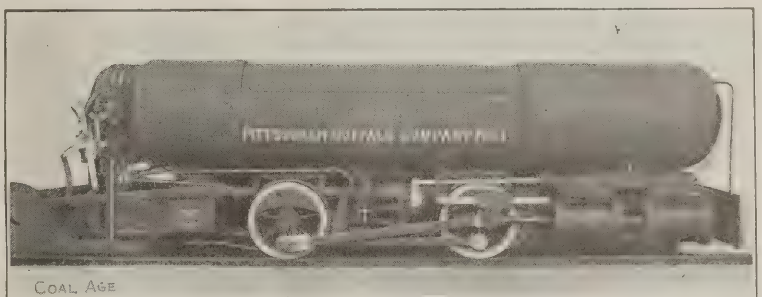
Comparisons of costs for different types of mine haulage are apt to be misleading unless carefully corrected to compensate for variance of conditions. Cost of compressed-air and electric haulage differs but little and for gathering service the mule is still a close competitor of both.

*Manager of sales, compressed-air department, H. K. Porter Co., Pittsburg, Penn.

Technical papers from time to time publish statements that it costs so many cents or fractions of a cent per ton-mile to haul coal with mules, compressed-air locomotives and electric locomotives, respectively, the generally accepted hypothesis being that the cost descends from the mule to the electric locomotive, with the compressed-air locomotive somewhere in between.

Eli T. Conner's paper, "Anthracite and Bituminous Mining," in the COAL AGE of Nov. 18, 1911, contained some figures in regard to the cost of gathering coal with electric locomotives and gathering coal with mules, and hauling it to the surface with an electric locomotive. These figures urge me to show how utterly foolish it is to compare mere ton-mile computations of the costs resulting from the use of various types of motive power without making a thorough analysis together with radical corrections to compensate for the disparity in conditions and requirements.





COMPRESSED-AIR LOCOMOTIVES FOR GATHERING AND MAIN-HAULAGE SERVICE

Comparison of Costs

The mine Mr. Conner selected as an example had a capacity of 8140 gross tons per month and the grades in the rooms were 12 per cent. He does not state how steep they were on the entries. The figures presented here for comparison are for compressed-air locomotives and mule haulage and were taken from the books of a coal mine in western Pennsylvania having a capacity of about 35,000 tons per month. The grades in this mine are variable, some of them in favor of, and some of them against the loads, and are in places as steep as 6 per cent. The capacity of the mine cars is two tons, and their empty weight 2700 lb. In the case of the electrically operated mine, the car capacity was not definitely stated, but presumably it was about 3000 lb., and the weight of the car itself about 1300 lb. A comparison of figures for the two cases is given in Tables Nos. 1 and 2.

TABLE I. ACTUAL COSTS ON THE BASIS OF 553 LOCOMOTIVE HOURS PER MONTH, OR TWO SHIFTS PER DAY, FOR A FOUR-TON ELECTRIC LOCOMOTIVE AND A SIX-TON COMPRESSED-AIR LOCOMOTIVE IN GATHERING SERVICE

	Hours		Hourly Rates		Amount, Dollars		Tons		Cost per Ton	
	Electric	Air	Electric	Air	Electric	Air	Electric	Air	Electric	Air
Locomotive runners	553	553	22½	30 5/9	124.43	168.97	4045.19	10,404.6	0.0307	0.0162
Brakemen	692	553	20	28 8/9	138.40	159.76	4045.19	10,404.6	0.0342	0.0153
Total labor					262.83	328.73	4045.19	10,404.6	0.0649	0.0315
Supplies					18.42	78.00	4045.19	10,404.6	0.0045	0.0075
Repairs and maintenance					18.00		4045.19		0.0045	
Power					20.00	117.56	4045.19	10,404.6	0.0050	0.0113
Interest 6% on $10,000 for one month					50.00		4045.19		0.0123	
Interest 6% on $5,900 for one month					......	29.50	......	10,404.6	......	0.0028
Depreciation eight years					35.42	......	4045.19	....	0.0088	......
Depreciation 10%					......	49.17	....	10,404.6	......	0.0047
					404.67	602.96	4045.19	10,404.6	0.1000	0.0578

TABLE 2. RELATIVE COST PER MILE AND DATA FOR ESTIMATE

Average haul with electric locomotive	3600 ft.
Average haul with compressed air locomotive	2100 ft.
Total ton miles, electric locomotive	2758
Total ton miles, compressed air locomotive	4138
Total cost per ton mile, electric locomotive	14.68c.
Total cost per ton mile, compressed-air locomotive	14.57c.

Working two shifts is a decided advantage to either electric locomotives or compressed-air locomotives as compared with mules, because mules cannot be worked two shifts, whereas locomotives can, thereby distributing the increased interest and depreciation charges over double the number of hours. As a matter of fact, the compressed-air locomotives at the mine cited above, only worked one shift, but the costs per hour and per ton have been held exactly the same as they actually were with the exception that the interest and depreciation are distributed over 553 hours per month and over the amount of coal that would have been gathered in 553 hours had the locomotives continued to work at the same rate which they maintained for nine hours per day and six days in the week. This was done in order to make the costs more truly comparable.

It should be observed in connection with the above figures for cost per ton and ton-mile that neither of these costs is in general an accurate basis for testing the comparative merits of the two types of haulage, particularly as regards gathering service, although the same considerations apply to a more limited extent in connection with main haulage. When gathering, the locomotive necessarily spends most of its time in collecting the trip, while the ton mileage is run up by the long haul between the point where the coal is gathered and the point where it is delivered. The expense of haulage does not increase directly in proportion to the length of the haul because the time spent in gathering remains a constant regardless of the length of the direct run. Usually if an analysis is made of the power expended and time spent in gathering and in hauling the gathered cars to the terminus, it will be

found that the strictly gathering service is the most expensive part of the work.

Necessary Corrections

Changing those items in the foregoing table which are either manifestly not chargeable to the gathering type of locomotive or else need correction, Table No. 4 is derived. The figures are for the same locomotives working under the same conditions as before, but with the engineers and brakemen receiving the same rate of pay, and with Mr. Conner's charge for power increased from $20 to $50 per month, and with the item "depreciation 8 years, $10,000" raised to $84.20 per month. The reason for changing the rate of $20 per month for power as given in Mr. Conner's paper is explained in following paragraphs.

Based on the corrected and equalizing figures of Table 4 the cost per net ton-mile would be 17.55c. for electric locomotive and 12.32c. for the compressed-air locomotive.

Mule Haulage

In the same mine where the compressed-air gathering locomotives operate, horses are used for gathering coal in another part of the mine. The coal gathered by both the small air locomotives and the horses is hauled to the foot of the shaft by large compressed-air locomotives. The cost of gathering by horses in this mine is as follows:

TABLE 3. COSTS OF GATHERING BY HORSES

	Day	Week	Cost per Ton
Nine drivers at $2.60 per day	$23.40	$140.40	
One d iver at $2.70 per day	2 70	16.20	
Total labor		$156.60	$0.0318
Stable expense		83.60	0.0170
Th rteen horses, $3250 depreciation 5 years		12.50	0.0025
Interest, 6% on $3250		3.75	0.0007
		$256.45	$0.0520

With the ten drivers, eleven work horses and two spares, 4918 tons of coal were gathered per week and hauled an average distance of 900 ft., giving the cost per ton as stated above in detail and a total cost per ton-mile of 30.6c.

The cost per ton for gathering with mules or horses in the mine to which Mr. Conner referred was as follows:

TABLE 5. COSTS OF MULE HAULAGE

			Cost per Ton
Average distance of mule haul			1200 ft.
Drivers, 250 hr. at 30c	$75.00		
Drivers, 398 hr. at 18c.,	71.64		
Drivers, 294 hr. at 19c	55.86		
Drivers, 310 hr. at 20c	62.00		
		$264.50	$0.0646
Stable boss		35.00	0.0086
Blacksmith, shoeing		30.00	0.0074
Feed		79.20	0.0193
Miscellaneous supplies		18.52	0.0043
Depreciation, 5 years		25.00	0.0062
Interest 6% on $1500		7.50	0.0018
Total		$459.72	$0.1122
Total cost per ton mile			49.4c.

The coal gathered by the mules in this mine cited by Mr. Conner was hauled to the pit mouth, an average distance of 2500 ft., by an electric locomotive.

The comparative figures for main haulage in the two mines under consideration, one using electricity and the other compressed air, are given in Table No. 6.

The electric locomotive moved the coal an average distance of 2500 ft. and the compressed-air locomotive hauled it for an average distance of 3400 ft., so the costs per ton-mile, is as follows:

For electricity: $\frac{2500 \times 4095}{5280} = 1938$ ton miles

$\frac{209.83}{1939} = 10.83$c. per ton mile

For air: $\frac{3400 \times 19{,}688}{5280} = 12{,}677$ ton miles

$\frac{386.31}{12{,}677} = 3.05$c. per ton mile

Correction for Cost of Power

In explanation of the correction of Mr. Conner's figure of $20 per month for power as given in Table 1 and increased to $50 in Table 4, it should be noted that the costs of power per ton-mile for gathering and main haulage as given in Mr. Conner's paper are as follows:

Cost for power in gathering	$20.00
Ton mileage as calculated from Mr. Conner's paper	2758

$\frac{\$20.00}{2758} = \$0.00726$ per ton mile

For main haulage, as calculated from Mr. Conner's paper:

$\frac{\$20.00}{1939} = \$0.01032$ per ton mile

TABLE 6. MAIN-HAULAGE COSTS—ELECTRIC LOCOMOTIVES AND COMPRESSED-AIR LOCOMOTIVES

	Hours		Hourly Rates		Amount		Tons		Cost per Ton	
	Electric	Air	Electric	Air	Electric	Air	Electric	Air	Electric	Air
Locomotive runners	277	277	$22\frac{1}{2}$	$30\frac{5}{9}$	62.32	84.6[illegible]	[illegible]095.10	19,687.7	0.0153	0.0043
Brakemen	346	277	20	$28\frac{8}{9}$	69.20	80.0[illegible]	[illegible]095.10	19,687.7	0.0169	0.0041
Total labor					131.52	164.66	4095.10	19,687.7	0.0322	0.0084
Supplies					2.65	......	4095.10	......	0.0006	0.0013
Repairs and maintenance					7.24	25.3[illegible]	4095.10	19,687.7	0.0018	
Other repairs and maintenance					5.71		4095.10		0.0014	
Power					20.00	80.18	4095.10	19,687.7	0.0049	0.0011
Interest on investment, 6% on $5,000					25.00	......	4095.10	......	0.0061	
Interest on investment, 6% on $8,650					......	43.25	......	19,687.7	......	0.0022
Depreciation eight years					17.71	......	4095.10	......	0.0042	
Depreciation eight years on $8650						72.83	......	19,687.7	......	0:0037
					209.83	386.31	4095.10	19,687.7	0.0512	0.0197

It will be seen from these figures that the cost per ton-mile is 42 per cent. greater for the main haulage than for the gathering service.

The costs of power per ton-mile for the same two classes of service at the mine that I investigated were:

For gathering: $\frac{\$117.56}{4138} = \$0.0284$ per ton mile

For main haulage: $\frac{\$80.18}{12677} = \$0.0063$ per ton mile

These figures show the cost for gathering with compressed-air locomotives to be 4.48 times as great as for main haulage. There are many reasons why the cost for power per ton-mile for gathering should be much more than for main haulage, but none why it should be less,

TABLE 4. ACTUAL COSTS CORRECTED FOR COMPARISON—COMPRESSED-AIR LOCOMOTIVE AND ELECTRIC LOCOMOTIVE IN GATHERING SERVICE

	Hours		Hourly Rates		Amount, Dollars		Tons		Cost per Ton	
	Electric	Air	Electric	Air	Electric	Air	Electric	Air	Electric	Air
Locomotive runners	553	553	$22\frac{1}{2}$	$22\frac{1}{2}$	124.43	124.43	4045.19	10,404.6	0.0307	0.0120
Brakemen	692	553	20	20	138.40	110.60	4045.19	10,404.6	0.0342	0.0106
					262.83	235.03	045.19	10,404.6	0.0649	0.0226
Supplies					18.42	78.00	4045.19	10,404.6	0.0045	0.0075
Repairs and maintenance					18.00		4045.19		0.0045	
Power					50.00	117.56	4045.19	10,404.6	0.0123	0.0113
Interest 6% on $10,000 for one month					50.00	......	4045.19	......	0.0123	......
Interest 6% on $5,900 for one month						29.50	......	10,404.6	......	0.0028
Depreciation eight years on $10,000					84.20	......	4045.19	......	0.0208	
on $5,900						49.67	......	10,404.6	......	0.0047
					483.45	509.75	4045.19	10,404.6	0.1193	0.0489

unless a condition when all the main haulage is up hill and all the gathering is down hill might be cited as an exception.

In all the above figures it is the ton of coal moved one mile in the desired direction that is considered. In actual service, the cars and the locomotive must be moved as well as the coal, and because the car and the locomotive must move approximately twice as far as the coal in order to get the empty cars back to the loading place, the gross ton mileage is nearly twice the net ton mileage for main haulage. For gathering work the gross ton mileage will be from four to six times the net ton mileage because in gathering cars from the rooms the locomotive must make many movements with only one car or without any cars. While doing this work the percentage of net to gross tonnage is exceedingly low because the locomotive itself forms a large part of the total weight of the moving train.

Any remaining inconsistency in the relative costs of main haulage and gathering service with the compressed-air locomotives is readily accounted for by considering the following adverse conditions of gathering as compared with main haulage: Ordinarily the gathering locomotive has poorer track than the main-haulage locomotive; a greater percentage of curves, more frequent stops and starts, and a somewhat lower efficiency, because of handling only one car at a time instead of being loaded approximately up to its capacity.

From the foregoing considerations it seems certain that Mr. Conner's figure of $20 as the cost of power for the electric gathering locomotive needs correction; more especially as this locomotive operated two shifts per day, while the main-haulage locomotive operated only one shift.

Mr. Conner's conclusion that, as it cost only 10c. per ton to gather and haul 4045 tons of coal per month with one locomotive working two shifts, and as it cost 16.34c. per ton to gather 4095 tons of coal with mules and haul it 2500 ft. to the pit mouth, there is, therefore, an advantage of not less than 4c. per ton in gathering by electric locomotives, does not seem to have sufficient support to make it generally true.

Gathering Locomotives vs. Mules

In the mine using compressed-air haulage, coal was gathered and hauled by mules an average distance of 900 ft. at a cost of 5.2c. per ton and was afterward hauled an average distance of 3400 ft. by main-haulage compressed-air locomotives at a cost of 1.97c. per ton, giving a total cost for gathering and hauling of 7.17c. per ton, a lower figure than any that Mr. Conner quotes. This figure is also slightly lower than the results achieved with compressed-air gathering and main-haulage locomotives in sections of the same mine where the gathering locomotives worked but one shift, as is shown by the following costs:

Gathering by compressed-air locomotives	6.72c. a ton
Main haulage	1.97c. a ton
Total cost	8.69c. a ton

Thus it is seen that the coal was delivered to the shaft bottom more cheaply by mules and main-haulage locomotives than by gathering locomotives and main-haulage locomotives; but in order to achieve these results with the mules it was necessary to keep the mule haul down to 900 ft. or less in order to enable the animals to gather, as they did, 41.6 two-ton cars per mule. If the mules had to haul the coal an average distance of 1200 ft., as did the gathering locomotives, and had been forced to encounter the adverse grades that the locomotives did, the cost for mule haulage would have been 50 per cent. greater, throwing the balance again in favor of the gathering locomotive. In other words, it was possible to obtain the good results that were obtained with mules in this mine only by working them in selected places under the most favorable conditions, all of which goes to show that it is extremely dangerous to draw general conclusions in regard to the relative economy of the various types of haulage unless the conditions are strictly comparable, or accurate corrections are made to compensate for differing conditions.

Conclusions

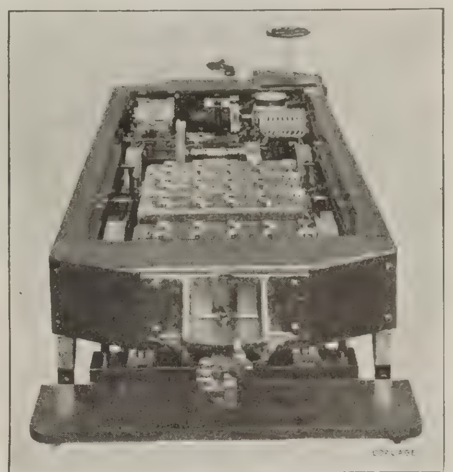
The writer does not believe that the foregoing figures in regard to the relative cost of haulage by electricity and compressed air represent with any degree of accuracy the relative merits of the two systems. The much greater tonnage handled by the compressed-air locomotives gives them a decided advantage, but there is a lamentable dearth of accurate information in regard to the relative costs of the various systems of haulage. Many of the opinions expressed in regard to relative economy are founded largely on prejudice, with little or no basis of accurate information, and a consideration of the above figures in regard to capacity and performance show, if they show anything, that the relative costs of haulage by the two systems depend more upon their intelligent installation and handling than upon either type of haulage, and that with equal energy and experience the difference in the cost of haulage by either system will appear only as small fractions of a cent. Further, they show that if the mule haul can be kept short and the grades not too steep, the mule in gathering service is a close competitor with either type of locomotive and will remain so until the general advent of the three- or four-ton mine car enables the locomotive to get more coal each time it makes a trip up the room.

Storage Battery Locomotives

The success of the storage battery equipment for electric vehicles has been so marked that it has been applied to electric cars, electric locomotives, etc. The storage battery locomotive is designed for service where a trolley system cannot be installed or is not desirable, and finds applications especially in short distance hauls at low speeds. These locomotives may be built to haul their loads or to carry them on the platform.

Advanced Mechanical Construction

The General Electric Company is now placing a storage-battery locomotive on the market. The mechanical design is in accordance with the most approved and uptodate practice. The frame consists of two steel I beam sides and two steel channel ends, carefully fitted at the joints



End View of Locomotive Truck Impelled by Storage Batteries

and held rigidly together with steel angles and heavy bolts. The end frames are faced with wood bumpers to which suitable coupling devices are attached, these latter being designed to suit the customer's cars. The cast-steel pedestal jaws which carry the journal boxes are bolted to the lower web of the side frames.

The cast-steel journal boxes are of special design and are fitted with roller bearings which ensure efficient mechanical transmission of power and so effect economy of battery current. The weight of the car is supported from the journal boxes by two heavy coiled springs.

Brake tension is effected by a screw and nut appliance, the brake spindle having a square thread on which travels a nut carrying an equalizing bar which is attached to the brake-lever system. This furnishes an efficient method of braking, as a slight exertion only on the part of the operator is required and the brakes are automatically locked in any position without the use of pawls or ratchets.

The wheels are pressed on and securely keyed to the axles. The latter are made of a special grade of steel and are case-hardened at the journals, so that there is very little wear either on the roller bearings or on the axles.

Electrical Efficiencies

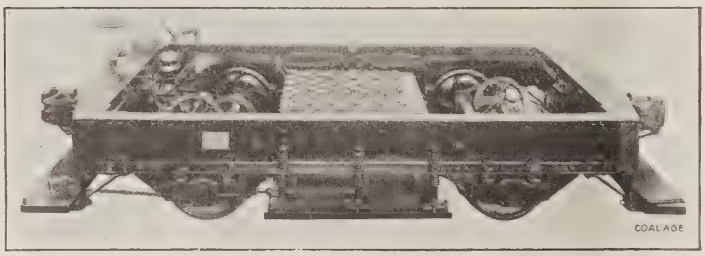
The motors used are of the automobile type designed to be operated by batteries and have characteristics that effect the maximum possible economy in the use of battery current. They have high efficiency, large overload capacity and practically sparkless commutation. The high efficiency is obtained by designing them with a small air gap and running the iron at low magnetic densities; by virtue of the latter, the speed and torque characteristics are steeper than in the case of the ordinary series motors, a feature which tends to reduce the overload which can be thrown on the battery. The armature shaft rotates in ball bearings and consequently the friction losses are light and the wear of the bearing is practically negligible.

The motors are compactly designed, yet they are readily accessible for inspection and repairs. They are also dust and moisture proof and are mounted in a cast-steel suspension cradle, one side of which is supported on bearings on the axle while the other side is spring suspended from the locomotive frame, this manner of suspension being equivalent to standard railway practice. The motor drives the axle through double reduction gearing. An intermediate shaft which is supported in the housing of the bearing and cast integral with the suspension cradle carries the intermediate gearing.

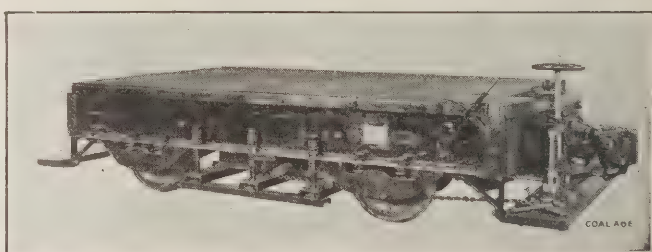
As the service required of a storage battery locomotive is ordinarily performed at low speed, the use of the double reduction gearing permits slow speeds to be obtained without any rheostat losses and, due to the large gear reduction from armature shaft to wheel tread, high tractive efforts are obtained at comparatively small current inputs to the motor. When carrying light loads these locomotives have speeds of from 4 to 5 miles per hour, while on heavy loads the speed is from 2 to 2½ miles per hour.

The storage batteries are especially designed for the service, being very rugged in construction and due to the use of specially constructed plates, have high ampere hour efficiency. The battery cells are grouped in four or more trays and are mounted in an angle iron crate which is spring-suspended from the locomotive frame.

A 20-ton Load of Castings Carried by Storage-battery Truck



Locomotive Equipped with Storage Batteries; Cover Plates Removed



Storage-battery Locomotive Complete with Iron Floor Plates

When robbing pillars the yield may be increased at least 2 per cent. by the use of posts set 3 ft. apart, tight up against the coal, to protect the stump from roof falls.

Kentucky's Coal Output

An estimate of the production of commercial coal by the Kentucky mines for the calendar year 1911, has been given out by the Chief Inspector of Mines and Director of the State Geological Survey. The estimate, which is based on returns that had been received up to Dec. 24, indicates that the output for the last year fell about 1,550,000 tons short of that for the year 1910. A number of companies had not reported for the month of November on the date named; hence the output of some important companies for November and December is estimated.

As indicated by the returns received, the output for the year was about 13,170,227 tons, the production of the respective districts being about as follows:

Western (including 1,057,000 tons estimated)............	6,800,276
Southeastern (including 566,000 tons estimated)............	4,019,545
Northeastern (including 506,000 tons estimated)............	2,350,406
	13,170,227

The total for the year 1910 was 14,720,011 tons. The returns for 1911 indicate a loss of over 1,500,000 in the western district and a loss of about 235,000 tons in the southeastern district, but a gain of about 312,000 in the northeastern region. Although the output was much less than for 1910, it exceeded the production for 1909 by 2,800,000 tons.

There were no large disasters during the year, and so far as reported the total number of fatal accidents was less than for 1910 (the 50 lives lost through explosions during the latter year being omitted from the comparison).

Notwithstanding the fact that 1911 proved rather a bad business year for the coal industry, the interest of investors in Kentucky has not flagged. The development of mines in the eastern coal field is increasing rapidly. Harlan county began shipping commercial coal in October, and is expected to become an important producer in 1912. Letcher county will become a commercial producer in 1912, and a large output is expected from it. The Survey correspondence indicates much interest on the part of capital in the western coal field also. Two reports covering a large part of this field, which with others have been awaiting publication for some time, are to come from the press by May.

Causes of Iowa Mine Explosions

By John Verner*

The mines in Iowa, which are dry but nongaseous, appear to be subject to explosions when first developed and immune when further extended. The movement of air is retarded by the greater resistance of the lengthened passageways. This results in slower feeding of coal dust and air to the explosion flame, preventing propagation beyond the point of origin.

*Chariton, Iowa.

Coal mining in Iowa commenced in a very small way about the year 1840. There was little increase in production during the following years and in 1867 the annual output had only reached 150,000 tons. From that time progress in the coal industry was more rapid and in 1883 Iowa produced 4,500,000 tons or within 500,000 tons of the combined coal production for that year of West Virginia, Kentucky and Tennessee. In 1910 the output of the Iowa mines amounted to nearly eight million tons.

Only about one-seventh of the coal produced in this state is mined without the use of powder, and the great remainder of the output, owing to the hardness of the coal and the absence of a sufficiently soft clay to permit undercutting, is blasted from the solid. In all mines producing coal in this manner the room-and-pillar method is used together with the double-entry system.

Mines Are Generally Dry

The mines are generally dry and many of them more or less dusty, but there is no provision either by law or through voluntary action on the part of the operator for the systematic artificial humidifying of dry mines. In the recent session of the Iowa legislature it was provided that "The owner, operator, lessee or person in charge of any mine shall not permit the accumulation of dust upon and along the roadways; and where the roadways are dry and dusty shall cause the same to be sprinkled at least once each week and as much oftener as conditions may require."

It is conceded, however, that the intent of this measure is to improve mine sanitation rather than to increase mine safety. The shots are prepared by the miners and are examined before they are charged, the examiners having the power to prohibit the charging of any shot they consider unsafe. The firing is done, generally by the examiners, at the end of the shift and after the miners have left the mine. The shots are set off by fuse and are fired in rapid succession.

Much powder is used and in the larger mines the daily consumption of a ton of powder is of frequent occurrence. Owing to the high cost of yardage and for other good reasons the elaborate ventilating methods found in many Eastern mines cannot be used in Iowa, but nevertheless the mines are now somewhat efficiently ventilated, although in former years their condition, in this respect, was often unsatisfactory. This condition resulted mainly from bad management but perhaps an important cause was the entire absence of firedamp, which has never been found in any mine in this state.

Explosions Are Infrequent

No explosions, causing loss of life or great destruction of property, occurred in the Iowa mines prior to 1892. In that year, on Nov. 8, the Pekay explosion occurred, killing three miners and wrecking the south side of the mine. On Feb. 14, 1893, the explosion in the Cedar mine caused the death of seven persons, but the years 1901 and 1902 proved the most disastrous in this respect. In these two years seven explosions occurred, doing much damage in the mines affected and killing 27 miners. The loss of life would have been very much greater had it not been for the fact that shotfirers were employed in all the mines, except one.

To prevent these disasters the legislature in 1902 enacted a law requiring the examination by competent persons of all shot holes before they are charged and this method has proved fairly effective, for under its application mine explosions have become less frequent, those occurring since 1902 being of comparatively little extent and showing a correspondingly decreased destructive force. During the last three years only one explosion occurred, and that a small one, which did no material damage and caused no loss of life.

A detailed description of past Iowa mine explosions would be of no particular benefit at this time, but it may be of some value to those interested in the explosion problem to have a knowledge of the conditions in some representative mines before explosions made their appearance in Iowa and about the conditions that existed in other mines, visited by explosions, before and after their occurrence.

Mine No. 1 was opened by the Whitebreast Coal Co. in Lucas County in 1876 and Mine No. 2 in 1880. The mines were dry and turned out to be large producers, measured by the Iowa standard, No. 2 employing more than 400 men during its best years. They were opened by skilled and experienced miners, much pick work was done, powder was used sparingly, the shots were well prepared and as the squib was used to fire them, the holes were firmly tamped all the way. The shots were lighted one at a time in a place and the miners did their own firing at quitting time.

Miners Change Mining Methods

In this manner the work was done for several years with satisfactory results and then a change came, first in the way of shot preparation and then in the method of firing. The miners in narrow work found that by drilling the holes 2 or 3 ft. ahead of the cut, coal cutting was made less laborious and more of it could be done in a given time. Of course, the amount of powder used was much increased by this practice, which brought with it an increase in the production of fine coal.

Then to escape the unpleasant and somewhat dangerous task of going back through the powder smoke to fire their second or third shots, the miners generally resorted to the use of fuse. To avoid cutting the latter the holes were tamped loosely with dry drilling dust. In the meantime the mines had become quite extensive, with the workings a considerable distance from the shafts, the air courses were much obstructed by falls and otherwise, the ventilation was unsatisfactory and the presence of black-damp became noticeable, especially on the returns.

The mines remained dry and the accumulation of dust increased to such extent that great clouds of it were raised by men and mules traveling on the haulage roads. Occasionally a water car, discharging its contents through a hole in the rear end, was used to wet the roads between the rails, but this was not done through any fear of a possible explosion, but to abate somewhat and for a little time the existing dust nuisance. Such conditions existed for years and continued until the mines were abandoned. Yet hundreds of heavily charged shots, tamped with dry coal dust, were fired daily by the miners at the end of the shift, in probably less than ten minutes, and it is a conservative statement to say that fully 5 per cent. of these shots blew out their tamping and that at least another 10 per cent. were more or less ineffective, yet nothing occurred to show that there was danger in the presence of the great accumulations of dry dust.

A Mysterious Difference between Old and New Mines

It might be said that the dust in these mines was not of an explosive nature and it would be difficult to disprove this, were it not for the fact that an explosion occurred in Mine No. 3. This mine was opened adjacent to No. 2, connected with the latter, which was still in operation and which in turn was connected with the workings of No. 1. The first explosion in Lucas County occurred in No. 3, a new mine, well ventilated, with roomy roads and air courses containing little dust, and worked under the same methods that had been used for years with impunity in the older mines. This happened twelve years after the opening of No. 1 and after several million tons of coal had been produced from the same seam.

The Pekay mine, located in Mahaska county, was opened in 1891. A number of the men, who had worked for years in Mines 1 and 2, came to the new mine and brought with them the practice of blasting in use in those mines. But they soon discovered, as in Whitebread No. 3, that the practice found safe in one mine under apparently like conditions may be extremely dangerous in another, for a violent explosion occurred in the Pekay mine while its workings were yet within a few hundred feet of the shafts.

I examined the mine shortly after the explosion and found that although several kegs containing powder were exploded in different places, the presence of coal dust undoubtedly was a large factor in extending the explosion through all the south side and part of the north side of the mine. The disaster naturally made the men more careful in placing their shots, but aside from that no other preventive measures were taken and it appeared that their absence brought no harm, for several years passed and the mine remained apparently safe.

A Similar Increase in Safety at Pekay Mine

In 1899 I was assigned to the 2d Iowa inspection district in which the Pekay mine was located. I found the mine in an unsatisfactory condition especially with regard to ventilation, the air courses being much obstructed by falls of roof and otherwise throughout their entire length. The south workings still remained dry and dust accumulations had increased with the mine's extent with no provision for the systematic sprinkling of the dust in the dry parts of the mine.

The miners evidently had come to the conclusion that there was no further danger from explosions, for the shots were tamped with dry dust and very rapidly fired by fuse at the end of the shift. I found that as many as five holes, tamped loosely with dry dust, had been fired almost simultaneously in one room without the slightest evidence of bad effects. In addition to all this, blown-out and ineffective shots were a daily occurrence. The dust contained in the mine seemed to have lost its power to do harm, for the mine was worked safely for years under above mentioned conditions and until it was abandoned 10 years after the explosion.

A New Mine and Several Explosions

In 1899 and 1900 the Whitebreast Fuel Co. opened Mine No. 4 in Lucas county, a few miles west of the location of Mines 1 and 2. The new mine was dry and there was some dust. Shot examiners passed judgment as to the safety of the shots prepared by the miners and fired those accepted after the day force had left the mine. But these safeguards, while removing the possibility of great loss of life, did not prevent explosions, for in January, 1901, a violent explosion occurred, killing the shotfirers, followed by another a month later of still greater destructiveness. In January, 1902, a third explosion wrecked a part of the mine and killed the shotfirer.

I had charge of this mine as inspector and examined it carefully immediately after each explosion. I found that explosion No. 1 was caused by improperly prepared and overcharged shots, that No. 3 was caused the same way and that in No. 2 the two shots in the room where this explosion started, did their work fairly well and were not overcharged and that all three explosions were propagated and extended by the presence of dust.

Three explosions in one year was plain evidence that the mine was worked under extremely dangerous conditions and that a decided change in the methods used was necessary for the better protection of life and property. But there was no change. The miners and the mine management were well aware that the danger was due primarily to the use of powder but they concluded that it must be used or the coal left unmined.

No sprinkling or spraying system was installed to keep the dust in moist condition, because it was generally realized that it would be of little practical value in rendering harmless the fresh dust at and near the working faces, that was produced daily in comparatively large quantities by blasting and the handling of the shattered coal. But there was the expectation that the danger would become less threatening in the future, and this expectation was based upon observation of conditions in other mines and the belief that increased extension of the mine would decrease the possibility of an explosion.

Whether this faith in future events was fully justified or not, the fact remains that no further explosions occurred in this mine, although it continued in operation for six years after the last explosion and remained dry until the end, with dust accumulations increased in proportion with the mine's extent, and with no perceptible decrease in the number of blown-out or ineffective shots.

Two of Three Factors Are Constant

In the two mines named explosions occurred only during the first two years of their existence. What, then, was the cause of their disappearance and continued absence during the remaining years of their operation? It has been found that only three elements are necessary in the make-up of a dust explosion—air, combustible dust and flame. These elements were present in those mines when the explosions in them occurred, but they were likewise present afterward, with no noticeable difference in the condition, quality and quantity of the dust, with dry coal dust used for tamping in the Pekay mine until the last, with the continued abundance of flame at shotfiring time and with no appreciable decrease in the number of blown-out shots.

The only apparent difference in mine conditions was the constantly increasing distance between the live workings and the shafts, longer and less open air courses, and less satisfactory ventilation. At first glance it appears to be more than doubtful that this difference in distance, etc., was a factor in preventing further explosions, but a careful review of the whole situation not only removes that doubt, but brings the conviction that their continued absence must have been due, in some manner, to the change in the conditions named.

A dust explosion in a mine is started and propagated through intense combustion of the available fuel, and intense combustion requires intense draft. Many, however, believe that this has no application in a dust explosion, and that propagation is accomplished by the flame striking into the dust cloud which has been driven ahead of the explosion by the latter's force. It is a complicated theory and the assumed process appears unnatural.

If the dust is driven ahead of the explosion, the same is true of the air, and with dust and air receding at an equal ratio with the flame's advance, it seems impossible to maintain sufficiently intense combustion to produce explosive results. I believe that the laws applying to a mine fire apply with equal force to a dust explosion in a mine, and that intense draft, which is such a powerful factor in starting and spreading the former, is even more potential in starting and extending the latter, for in a mine fire such draft becomes a destructive agency mainly through chemical action, while in a dust explosion its power is exerted both in a chemical and physical way by carrying not only the oxygen, but also the fuel to feed and enlarge the explosion's flame.

The Insucking Theory

Abel says: "As the explosion originates and as it progresses, the motion of the air is such that particles of coal dust must be whirled up into it." Mallard and Le Chatelier conclude that "the propagation appears to be effected by the internal movements of the air instead of by conductivity or radiation." Peckham and Peck are more definite and declare "it is a draft carrying a thick cloud of dust that is dangerous," and the correctness of their view is proved by the facts brought out in the investigation of the Delagua and other explosions.

In fact, every extensive dust explosion has furnished good circumstantial evidence of the presence of intense draft opposite to its advance, evidence that is further strengthened by the direct testimony of credible men, who were caught in explosions, thrown to the ground by the inrushing air, felt the explosion's heat pass over them immediately after in an outward direction and who lived through the ordeal to give their experience.

If draft is recognized as an indispensible factor in a dust explosion, it follows that, with other conditions the same, the character of draft facilities in a mine may be considered the deciding influence between safety and danger. All the Iowa explosions referred to above started within 1200 ft. from the shafts, and the entries leading from the shafts to their starting points were roomy, of fair height and clear of obstructions. Draft facilities were consequently good and explosions occurred.

But as the workings moved further and further from the shafts, as the entries and air courses increased in length and became obstructed in various ways, draft facilities were impaired correspondingly and explosions ceased to occur. A fire of a given size burning in the furnace in a new mine produces a certain amount of draft. To maintain this draft unimpaired as the workings of the mine are extended, the fire must be increased in proportion; with the fire kept at its original size, the draft decreases with the mine's extent.

Under this law the heat of certain shots fired in the Pekay mine and in Mine No. 4, while these mines were yet of small extent, was sufficient to cause a draft strong enough to convey to the flame the required amount of air and dust to start an explosion, but as the distance between the workings and the shafts increased, the same heat of like shots under otherwise different conditions was insufficient to cause a draft of adequate force to furnish the vital means for the production of explosive results.

Draft and Draft Facilities Control Explosions

The established proof that draft and draft facilities are controlling factors in a dust explosion will have an important part in hastening the definite and final solution of the explosion problem. It will materially assist in the right adjustment of matters about which there is now much doubt and controversy. It will furnish the explanation for the great scope and destructiveness in mines of the Marianna and Monongah type. It will clearly show why the presence of moisture cannot be depended on to stop an explosion under way and why the danger from dust explosions can only be successfully resisted through the concentration of efforts against it at their possible starting points.

Coal Mine Ventilating Equipment

By W. M. Weigel *

The Capell type of centrifugal ventilator embodies a number of distinctive features. This is the fourth article of a series dealing with mechanical ventilators.

*Associate professor of mining, Pennsylvania State College, State College, Penn.

The Capell type of fan is used to a great extent in the bituminous districts of Pennsylvania. It is usually of smaller diameter than the Guibal design and operates at a correspondingly higher rotative speed. The entire fan and casing are constructed of steel plate and iron, and the incasing spiral expands more rapidly than in the Guibal type, thus making the area at the cut-off proportionately greater.

In the original form of Capell fan the wheel had two sets of blades. The outer set, as in the ordinary fan, extended from the circumference of the inlet to the rim of the wheel, and curved backwards from the direction of rotation. The inner set, equal in number to the outer, extended inward nearly to the center of the fan and projected a short distance into the inlet opening. These projections were bent forward to draw the air into the fan and deliver it through the ports, or openings in a cylinder separating the two sets of vanes. The tips of the inner blades were located about halfway between the inner ends of the outer blades. Fig. 2 shows the shape and position of the blades and the openings between the two sets.

Recent Design

In the modern form of this fan, the inner cylinder with ports is done away with. The details of a fan wheel built by the Capell Fan and Engineering Co. are illustrated in Fig. 3. The main blades extend inward to about halfway between the circumference of the inlet and the center of the wheel and their inner ends project out into the fan drift in the form of scoops. Three short blades are placed between each pair of main blades and, as shown, are of a length less than the distance from the circumference of the inlet to the outer circumference of the wheel. Their tips do not extend to the circumference.

All the blades curve forward in the direction of rotation. A small auxiliary blade, called a tail wing, is introduced as shown in the illustration, at the back of

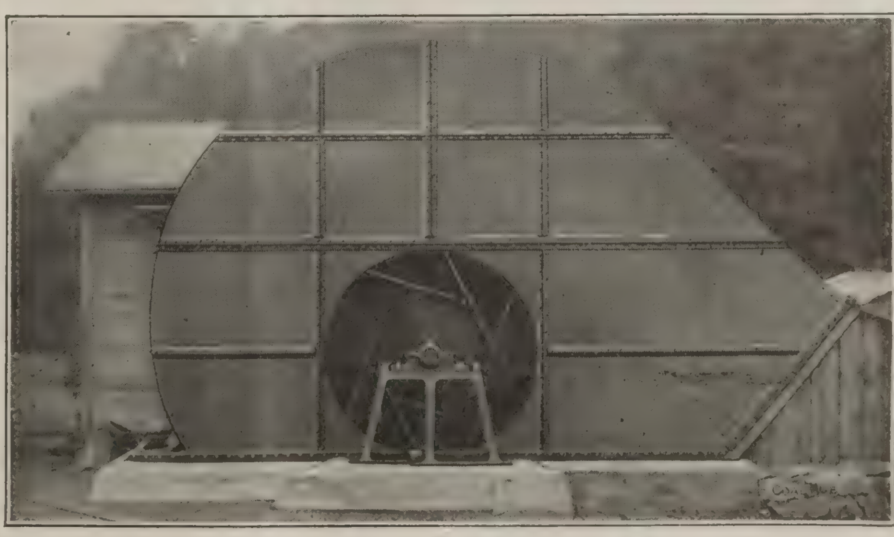


Fig. 1. 12-ft. Beard-Stine Fan, Patton, Penn.

the main wing, its object being to decrease the area between the outer tips of the blades and hence cause an increase in the velocity of the escaping air instead of permitting an expansion of the air at this point. Fig. 4 shows the outlines of the wheel and casing of an 11 ft. x 4 ft. "double inlet" fan arranged for either blowing or exhausting. Table 1 gives the results of a test of a 16 ft. x 8 ft. fan at the Sterling Mine, Fayette Co., Penn.

Modern Steel Plate Fans

Many forms of fans have been introduced in recent years which are neither of the strictly Guibal nor Capell type, some combining distinctive features of both, some resembling one more than the other and some built upon entirely new lines.

A general view of a Beard-Stine fan, made by S. B. Stine, Osceola Mills, Penn., is shown in Fig. 1; the housing being arranged for blowing into the mine. This form of fan is distinguished by the shape of the blades and the spiral casing of the Guibal type. All parts except

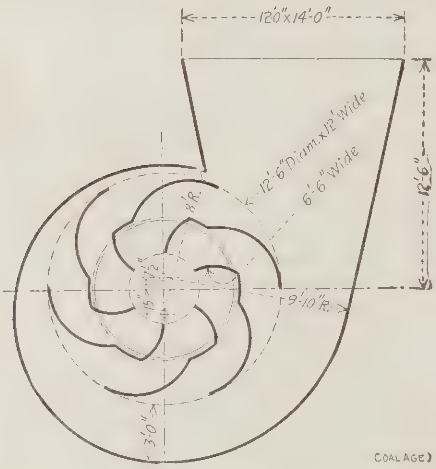


Fig. 2. Capell Fan

the foundation are made entirely of steel or iron. Fig. 5 shows the details of a portion of the fan wheel. The radius of the inlet is a little greater than half the radius of the wheel.

The steel plate blades, of which there are eight or ten, start at the circumference of the inlet, making an angle of about 30 deg. with the tangent, and curve forward in the direction of rotation until they assume a radial direction about midway in their length and continue in a radial line from here on to the tips. The blades are fastened at their center, by two angles, to a steel plate web which is secured between the two halves of the double conoid of cast iron that forms the hub. The inner corners of each blade are also stayed from the rim of the hub by means of round iron rods. This construction leaves the inlets free and unobstructed.

The blades are inclosed on the outside by annular steel disks, or cheek plates. The width of the blades is the same at both their inner and outer ends. This fan is always built with an inlet opening on each side; the curved surfaces of the hub serving to deflect the air currents into the blades.

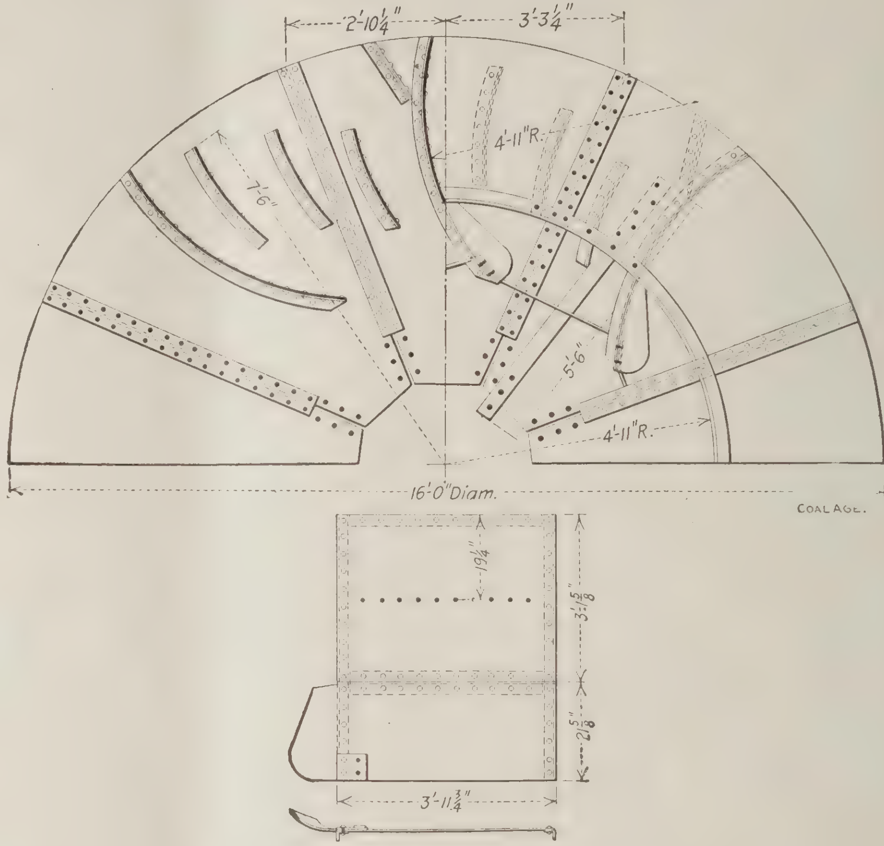


Fig. 3. Details of Capell Fan Wheel

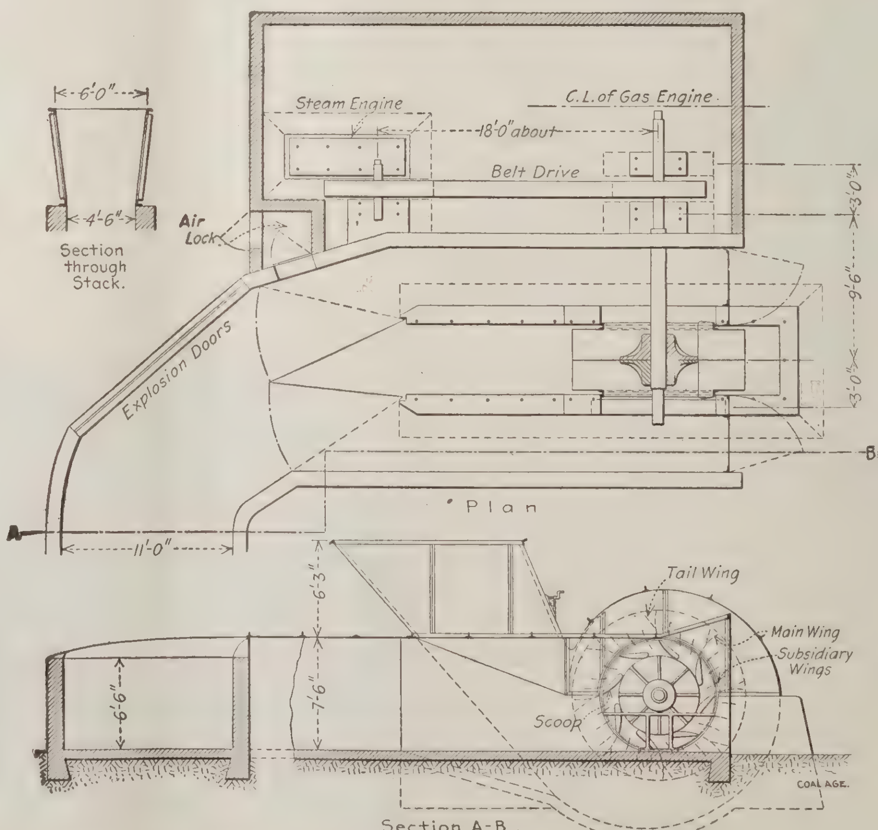


Fig. 4. Capell Fan and Housing, Showing Reversible Setting

Allis-Chalmers Fan

Table No. 2 gives the results of a test of a fan, built by the Allis-Chalmers Co. for the Lehigh Valley Coal Co., at Wilkes-Barre, Penn.

The Allis-Chalmers Co. has for some years been building large centrifugal ventilators, up to 35 ft. in diameter. These fans are in some respects similar to the Beard-Stine fan, notably in that they are always of the double-inlet center-draft type and the blades are supported by sheet-steel arms or web plates, clamped between two cast-iron centers, so shaped as to present the least possible resistance to the air as it enters the fan.

The sides of the fan are inclosed from the periphery of the intake to the periphery at the blade tips, with the idea of preventing loss of air due to clearance between the fan and the casing and also of securing a rigid form of construction. The casing is usually of steel plate, reinforced by angle iron.

TABLE 1. TEST OF CAPELL FAN AT STERLING MINE. C. C. C. CO., FAYETTE COUNTY, PENN. SIZE OF FAN 16x8 FT. DIRECT CONNECTED TO A 20x20-IN. HARRISBURG ENGINE.

Test Made Oct. 13, 1907. Tests Directed by J. P. Clarke, Chief Engineer.

Test	Time P. M.	R.P.M.	Pe ipheral Speed	Depression: Theoretical Water Gauge = H	Depression: Observed Water Gauge = h	Air Measurement: No. Split	Air Measurement: Velocity	Air Measurement: Area Sq. ft.	Air Measurement: Corrected Area	Air Measurement: Volume	Air Measurement: Total Volume	Volume of Fan	Volume of Fan × Speed	Volumetric Efficiency	Manometric Efficiency	Horsepower in Air
1	1:35	75	3770	1.805	1.1	1	460	7615	73.15	32,649	....	1608				
1	1:35	75	3770	1.805	1.1	2	1263	4316	40.16	50,722	....	1608				
1	1:35	75	3777	L.805	1.1	3	2300	4312	40.12	92,276	175,647	1608	120,600	145.64	0.609%	30.45
2	1:50	100	5026	3.163	2.1	1	680	7615	73.15	49,742	....	1608				
2	1:50	100	5026	3.163	2.1	2	1877	4316	40.16	75,380	....	1608				
2	1:50	100	5026	3.163	2.1	3	3566	4312	40.12	143,068	268,190	1608	160,800	166.78	0.664%	88.75
3	2:05	125	6283	5.014	3.0	1	750	7615	73.15	54,863	....	1608				
3	2:05	125	6283	5.014	3.0	2	2573	4316	40.16	103,332	....	1608				
3	2:05	125	6283	5.014	3.0	3	4100	4312	40.12	164,492	322,687	1608	201,000	160.54	0.598%	152.54
4	2:20	150	7539	7.210	3.8	1	897	7615	73.15	65,616	....	1608				
4	2:20	150	7539	7.210	3.8	2	3116	4316	40.16	125,138	....	1608				
4	2:20	150	7539	7.210	3.8	3	4733	4312	40.12	189,888	380,642	1608	241,200	157.81	0.527%	227.92
5	2:35	158	7941	8.010	4.3	1	1050	7615	73.15	76,807	....	1608				
5	2:35	158	7941	8.010	4.3	2	3140	4316	40.16	1[illegible]6,102	....	1608				
5	2:35	158	7941	8.010	4.3	3	5000	4312	40.12	200,600	403,509	1608	254,064	158.82	0.537%	273.41

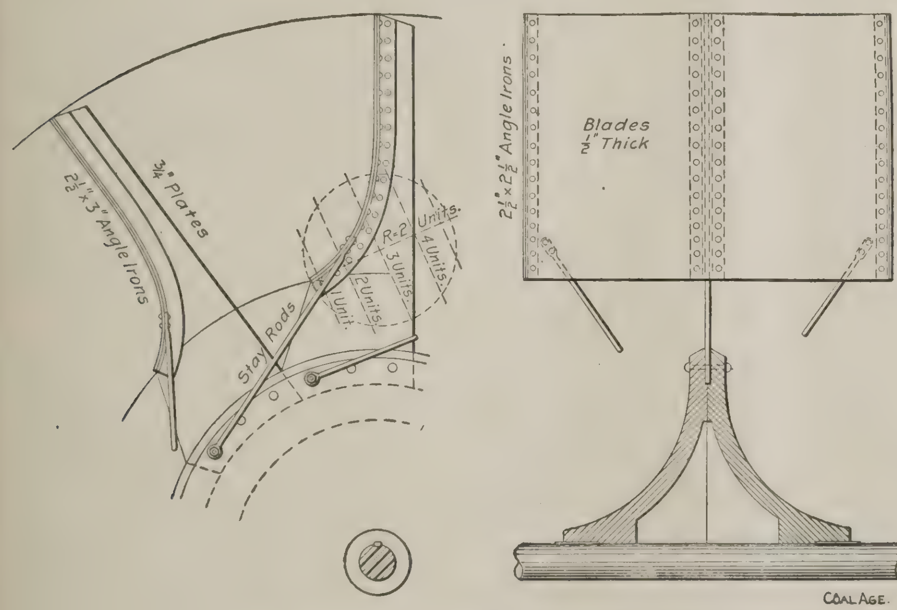


Fig. 5. Details of Beard-Stine Fan

TABLE 2. TEST OF 28 FT. FAN, "HENRY COLLIERY," L. V. C. CO., WILKES BARRE, PA.

Speed, R.p.m.	W. G., Inches	Quantity, Cu.Ft.	Horsepower on Air	I.Hp.	Efficiency	Barometer, Inches	Temp. Fahr.
25	0.4	150,000	9.454	15.45	61.19	29.36	48
50	1.2	292,000	55.214	93.72	58.90	29.36	48
75	3.0	476,000	225.020	317.80	70.80	29.37	50

Outer diameter of fan........ 28′ 0″
Inner diameter of fan........ 12′ 6″
Length of blades........ 7′ 9″
Width of blades........ 7′ 8″
Expansion of casing at cut-off........ 6′ 6″
Double intake area of fan........ $2\ (0.7854 \times 12.5^2) = 245.4$ sq.ft.
Fan drift { east side, area, 120 sq.ft. / west side, area, 121 sq.ft. } .... total area, 241 sq.ft.
Shaft '2x12, a ea 144 q. ft.
Single Corliss engine, size, 24″x48″, direct connected.
Explosion doors arranged to give a 3-in. W. G. at 75 r.p.m.

The efficiencies given above are the combined efficiencies of the engine and the fan, which materially lowers the result at these speeds below the normal working speed (75 r.p.m.) because of the increased friction ratio. Assuming 90% engine efficiency at 75 r.p.m. the power delivered to the fan was 286 hp., making the efficiency of the fan alone at this speed 78.67 per cent.

Coal Workers' Disputes

Records just made of the time required for deciding cases brought before the Anthracite Conciliation Board, the arbitration tribunal established by the Roosevelt strike commission for settling differences between hard coal mine-workers and operators, show great promptness in reaching decisions.

Altogether one hundred and ninety-three grievances have been presented. Two are now pending, and one lapsed without any decision. The time required to reach decisions in the remaining one hundred and ninety is shown as follows:

Decided on the same day as presented, 3; decided in less than one month, 24; decided in between one and two months, 46; decided in between two and three months, 17; decided in between three and four months, 17; decided in between four and five months, 11; decided in between five and six months, 9; decided in between six and seven months, 11; decided in between seven and eight months, 9; decided in between eight and nine months, 3; decided in between nine and ten months, 9; decided in between ten and eleven months, 4; decided in between eleven months and a year, 6; cases not decided within a year, 21.

As all decisions of the Board are retroactive, postponements cannot mean a money loss to the mine-worker. If it is decided that he is entitled to higher rates for certain work, he receives back pay from the day on which his grievance was filed.

United Mine Workers' Convention

Special Correspondence

The miners have indorsed Socialism and repudiated the National Civic Federation by constitutional amendment. Future national elections and conventions are to be held biennially. Wage contracts were approved as presented by committees.

A Socialist Victory

Socialists in the convention of the United Mine Workers of America won a decided victory when they succeeded by a large majority in amending the constitution of the organization to permit it to indorse the Socialist party. The clause in the constitution forbidding the miners to take any political stand was stricken out by the amendment that was adopted Jan. 22.

The convention already had gone on record as favoring government ownership of all industries, but a resolution indorsing the Socialist party as the party of the working classes was voted down as being contrary to the constitution and a substitute declaring the "miners should unite on the political as well as industrial field," was adopted.

The preamble to the constitution also was amended to read that the miners are entitled to "full value of their toil," instead of to "an equitable share."

Biennial Elections and Conventions

Alarmed by the constantly increasing expense of conducting the affairs of the mine workers, leaders of the organization pressed to passage a constitutional amendment that officers shall be elected every two years instead of every year after 1912.

Elections have cost the miners $200,000 each in recent years, according to the announcement of the constitution committee. This committee recommended also that the national conventions be held biennially. The conventions are held at an expense of $7000 per day and seldom are of less than three weeks' duration.

Former President Thomas L. Lewis attempted to have the question of biennial election submitted to a referendum vote, but failed by a vote of 418 to 376.

Wage Scales Approved

Demands for wage increases of 10c. a ton for bituminous coal and 20 per cent. for anthracite coal were indorsed by the convention. Representatives of the bituminous miners arranged to present their proposed new wage contract to the operators of Indiana, Illinois, Ohio, western Pennsylvania and West Virginia, Jan. 25. The joint conference of the anthracite miners and operators will be held in New York, Feb. 27.

The principal provisions of the draft of a new contract for the bituminous miners, submitted to the convention by its scale committee, were approved without change. They are:

Flat 10c. a ton increase in wages for pick and machine mined coal, run-of-mine basis.

Twenty per cent. increase for day labor.

Working day of seven hours "at the working place."

Five hours to constitute work day on Saturday.

Wage contract for period of two years, beginning Apr. 1, 1912.

In regard to the anthracite field, a recommendation that the demands of the tridistrict convention, held at Pottsville, Penn., Oct. 31, 1911, be made a part of the demands of the convention was passed. The demands of the anthracite district, in brief, follow:

A one-year contract.

A workday of not more than eight hours.

A 20 per cent. increase of wages over those awarded in 1903.

A minimum scale of $3.50 a day for miners, and $2.75 a day for laborers engaged in construction work.

Coal to be mined and paid for by the ton of 2240 lb., wherever practicable.

Election Fraud

Investigation of fraud in an election of national officers of the United Mine Workers of America is to be made by the executive board of the organization.

After the report of the committee on officers' reports had been made to the miners' convention, stating that "the person guilty of having stolen" the votes of 40 local unions of Illinois, cast in the election of 1910, had not been identified, a resolution was adopted instructing the executive board to make inquiry "with the purpose of uncovering the thief."

Bituminous-coal operators and miners of the "central competitive field," comprising Illinois, Indiana, Ohio and western Pennsylvania, arranged to meet in a wage conference, Jan. 26. This conference was to have been held Jan. 25, and no reason for the postponement was forthcoming from President White. It was announced that the three original states to the agreement—Pennsylvania, Ohio and Indiana—will caucus together, and that Illinois and West Virginia would not be permitted to enter these caucuses, although these two states would not be barred from participating in the discussions of the conference. It is understood that if a wage contract is negotiated it will be accepted as standard in the other bituminous districts.

Joint Scale Conference

A "courtesy" victory was won by the miners at the first day's session of the joint conference of operators and miners, when it was agreed to permit the executive officials of the miners to attend the sessions.

Great interest was manifested, because it was the first time since 1906 that the central states were represented, thus presenting a united front to the equally solid array of the miners' delegation.

It was not until the afternoon session that the joint conference formally organized by electing J. C. Kolsen, president of the Indiana Bituminous Operators' Association, chairman; Edwin Perry, secretary-treasurer of the miners' organization, secretary, with C. E. Scroggs, of the Illinois association, associate secretary.

President John P. White, of the miners, read the demands as they had been ratified by the convention, and these were not discussed. After the adjournment of the conference the operators of the four states met separately and re-wrote the miners' scale demands. The result was a parallel of the miners' document, and its provisions, in part, read as follows:

All coal be paid for on the lump or mine-run basis as preferred.

A flat 10c. per ton decrease, dead work to be paid for at a corresponding decrease.

A uniform day of nine hours at the working place.

Eight hours to constitute a day's work on Saturday.

This contract shall be entered into for a period of four years.

Constitutional Amendment

The charge by John Mitchell, former president of the United Mine Workers, that the resolution demanding he resign from the Civic Federation, or leave the union, was adopted by a convention that was packed against him, was met by the national convention of miners with an amendment to the constitution prohibiting members of the union from being members of the Civic Federation. The amendment was adopted almost without discussion.

Under the constitution as amended, a mine worker cannot be affiliated with the federation in any way whatever. The amendment reads as follows: "Mine managers, top foremen, operators, commissioners, and persons engaged in the sale of intoxicating liquors, or members of the Civic Federation, shall not be eligible to membership."

Delegates from West Virginia, Alabama, Tennessee and Kentucky met to formulate a request for the miners' organization to take steps to extend the union in these states.

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CIRCULATION STATEMENT

Of this issue of Coal Age, we will print 7000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Equitable Taxation

The people of Scranton have for many years endeavored to find a satisfactory solution for the perils and loss of capital resulting from the instability of the foundations under their city. The means suggested for protection have been a matter of interest to every coal-mining man, east and west, and especially in the anthracite region. It appears that the Board of Trade and its energetic secretary, M. K. Edgar, and perhaps the operators also, who are busily engaged in knocking out the props below the city, have concluded that all the anthracite operators are interested now to such a considerable extent that they should supply the funds so badly needed for the city's welfare.

At a meeting of the Scranton Board of Trade, January 15, a committee reported that the coal mined should be taxed to create a fund for safeguarding the surface against settling. This report was adopted and President H. C. Reynolds will appoint a committee of 15 to act in conjunction with the taxation and legislation committee in devising a law to be presented at the next meeting of the legislature.

The heads of the big coal companies as well as the independent operators in all parts of the state will be consulted by the committee, and it is intended to hold a convention in Scranton some time during the summer, at which the various cities and counties in the coal belt will be represented and to which the coal companies will be invited to send delegates.

Without awaiting the result of this conference, whereat the delegations will receive the alluring hospitalities of the business men of Scranton, we venture to forecast that there will be no result but disappointment and abdominal repletion as an outcome of the meeting, because many coal companies in the anthracite region are not in like difficulties to those working near Scranton, and even if they are, their obligations of surface support are not equal.

It is a safe assumption that those who are mining coal which jeopardizes only their own property or which lies too deep to create apprehension of surface destruction will not favor the imposition of such a tax. Nor will those companies favor it who own the houses jeopardized or who operate where the houses they must support are relatively cheap, because if the tax is to be adequate for such universal support, then it is sure to be excessively burdensome. Nor again will operators who have been careful to obtain leases and coal ownerships which are free or even noncommittal as regards surface support, be likely to range themselves side by side with those who have agreed to leave large pillars.

It is the embarrassed man who first suggests "we will all have one purse," and we have it on good authority that of such a one we should beware. The law maxim that the buyer should take care of himself is a maxim founded on medieval standards of right. It may need modification as far as the seller is concerned, but we are sure that the maxim should apply as regards third parties. If the buyer does not guard himself by buying only such coal as is situated in places where dwellings are not likely to be built, or where the coal is deep, he is to blame. If he does not secure surface as well as coal, or does not have a clause making the destruction of the surface his proper privilege, then the regrets are his; he must foot the bill. Some Scranton operators would lay that burden of the negligent, in equal part on the back of the prudent buyer of an adjacent property who has laid out his "good money" for his own protection.

The same argument applies to a level tax on coal for the protection of the miner. There is little doubt but what the operator with gas and bad roof and a dust potent for mischief, would not hesitate to advocate the spread of risks over the whole industry by an indemnity fund continually replenished by a tax on coal. But such a provision would be manifestly as unfair as it would be to force the use of safety lamps where gas is un-

known; or to compel water cars in mines where the workings are naturally saturated.

When a coal property is bought, the proneness to accidents goes with it. It would be wrong to put as great a tax on a mine working a seam exposed to the surface on all sides, as is placed on a mine working a deeply sunk bed. The gas, dust and roof conditions are all different and a well conducted mine in the latter case might be less safe than a badly managed mine in the former.

The Case Against the Canary

The physiological data regarding animals of every kind is steadily growing, but is still incomplete. If we are not mistaken, the blood content, the amount of hemoglobin it contains, the percentage of carbon dioxide in the expired air, the number of complete breaths per minute and the volumes of normal respiration and of residual air, have not yet been investigated for the more important forms of animal life.

But Miss Florence Buchanan has contributed to our knowledge, many interesting facts concerning respiration and pulse beats, and from these, some estimates may be formed as to the relative resistance of animal life to such gases as saturate the blood to the exclusion of oxygen. From them we may discover whether there is not some animal which will have a more suitable resistance to carbon monoxide than the extremely sensitive canary.

It is a conclusion borne out by measurements, that other conditions being equal, the amount of heat demanded by any animal which maintains an even temperature depends on three causes, the temperature it maintains, the covering by which it is protected and the size of the animal. A large animal needs to generate less heat in proportion to its bulk than does a small one because it exposes a smaller surface to the air for each unit of weight.

It consequently "burns" less carbon, if that expression be permissible in describing a flameless combustion. The product of this combustion is carbon dioxide, which passes off with the breath. Miss Buchanan shows that a canary weighs 20 grams and makes 11.7 grams of carbon dioxide per hour for each kilogram of its weight. A guinea pig weighs 300 to 500 grams and delivers 1.8 grams of dioxide, whereas a man weighing 20,000 to 100,000 grams emits only 0.6 grams of the same gas in one hour, for each kilogram the scales register. It is easy to see that the canary must inhale a larger quantity of air though whether the proportion to that intaken by man is in the ratio of 11.7 to 0.6 per kilogram of their respective weights we cannot say because we are not informed as to the proportion of carbon dioxide in the expired gases.

Miss Buchanan somewhat tantalizingly evades the points which are most interesting to us. Instead of blood content, she gives us two data both less conclusive, but both highly suggestive. The canary has a heart which is 1.04 per cent. of the whole body weight. The guinea pig's heart percentage is only 0.40; the percentage for man is 0.59.

While there is this small difference in the proportionate heart sizes, there is a large and important difference in the rapidities of pulse heat. The canary's pulse beats 1000 times per minute, the guinea pig's frequency of pulsation is 300 while the ebb and flow of blood in man occurs only 70 times per minute.

If hemoglobin in an animal is proportional to blood content, and blood content, proportional to weight, and moreover, if the proportional saturation of the blood is equal to the product of the size of the pump actuating that blood multiplied by the number of strokes, then it is clear that the canary, guinea pig and man will absorb roughly in proportion to 25, 3 and 1, if the arterial system is presented with an equal quantity of gas through its recognized vehicles—the lungs. It is not permissible, however, to accept any such conclusion offhand. But it is interesting to note how closely these ratios parallel those of expired carbon dioxide.

To what conclusions does this argument lead? Perhaps to this, that an animal approaching a guinea pig in size and pulse-rate is the best animal to use for protective purposes in mine-rescue work. Such an animal would give a factor of safety of 3 provided that it were active in a like degree to man. It might be suggested tentatively then that the red squirrel, a hardy, active, perching, light and readily acquired mammal is to be preferred to the canary because while equally available in every way, it may in all probability have a more desirable resistance to blood saturation.

There will be many who will say that a factor of safety of 3 is inadequate, that a man who hurriedly climbs over falls and under dislodged rock, who carries loads and does many kinds of work, will breathe so heavily that he will need a larger factor for protection. Moreover he not only has to go in, but to come out, and his return will reduce the margin of safety to much smaller limits. There is some justice in such a contention, but it is to be hoped that a safety factor much nearer 3 than 25 will be ultimately adopted especially for those whose return is easy, who, while long in advancing can retrace their steps in a relatively short time.

It must be remembered that rescue work is not like other work; it is an heroic form of labor and nearly all rescue men will refuse to listen to a warning which simply declares that the atmosphere is so unhealthy that if inhaled for a few hours it will cause nausea, drowsiness and headache.

Comminution of Dust

Herr Belger at a meeting of the North of England Institute of Mining and Mechanical Engineers, on Dec. 9, 1911, started a new mode of attack on humidification. The conclusions he draws are interesting, if true, but it is pertinent to point out that the experimenter omitted to submit his specks of dust to the action of dry as well as to that of moist air. As physiologists and psychologists would express it, he provided no "control." He might then have discovered that disintegration was at least as rapid in dessicating air as in air which maintains the moisture of the coal.

Three specks of coal dust, the biggest not exceeding $\frac{1}{500}$th of an inch, and the smallest one-fifth as large, were kept at an even temperature of 88° F. in moist air. In a week the three specks had become eleven, and after two weeks these had become so comminuted they could not easily be counted. Herr Belger suggests that the practice of watering mines might result in such excessive comminution as to increase the dangers it was sought to avoid. It might be added, however, that in all probability dust, as it ages, may not only become finer, but also at the same time grow less readily combustible.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Sealing off a Mine Fire

[*In the Jan. 20 issue of* COAL AGE, *the editorial foreword called attention to the importance of having in mind a predetermined plan for immediate use in case of a serious mine fire. An invitation was extended readers to discuss the question, and the response has been gratifying. The general problem presented for consideration deals with a fire that has gotten beyond control, and that is located at the face of a pair of entries. The principal question is: Shall the first brattice be placed on the intake airway, or on the return side of the fire? The replies received are interesting and should result in bringing about a better understanding of the subject. Some of the letters from our readers follow, and all others who have not yet contributed an opinion are invited to do so.*—EDITOR]

Letter No. 1—I have had considerable experience in mine fires, and have only found it necessary in one or two cases to shut them off.

I close the intake first. This gives us a better opportunity to close the return. By closing the return airway first, the smoke is forced into the intake and fills it so completely that you cannot get so close to the fire on the intake side.

Of course, it is wise, if you have plenty of help, to work at both intake and return and try and close them as near simultaneously as possible, although it is not always practicable to do so. However, I have always found that one must be governed by circumstances under any and all conditions in fighting mine fires.

JOHN H. JONES.

Pittsburg, Penn.

Letter No. 2—In regard to the best method of sealing off a mine fire that has gotten beyond control, I desire to say that, as a general proposition, I would certainly put the first stopping on the intake side of the trouble. My reasons are: (1) This is the coolest and easiest place to work; (2) in most cases it would be quite impossible to put the stopping on the return side first.

After placing the first wall on the intake side, then by properly conducting the air, there should be no serious trouble in building a stopping on the return side.

EDW. H. COXE,

Birmingham, Ala.

Letter No. 3—Referring to your question in COAL AGE concerning fires in a mine, will say that I most heartily agree with the No. 4 superintendent and the No. 7 fireboss. My opinion is that the first stopping should be placed on the return airway. After such a wall has been erected on the return side of the trouble, the men would experience little difficulty in building a tight brattice on the intake, thus shutting off the fire.

W. H. CHURMLEY.

Memphis, Tenn.

Letter No. 4—I have just been reading your editorial foreword concerning mine fires and desire to say I would have proceeded as follows: In the first place, if I had thought there was danger of the flames getting beyond control, I would have sent word through the mine for all the men, except those required for the work of extinguishing the fire, to hurry immediately to the surface.

At the same time, I would have started (working from the intake side) to remove the stopping in the crosscut next outside of the one where the fire was located, if it was possible to get close. If not, I would remove the brattice in one of the crosscuts as near to the fire as I could get, working always on the intake side. I would do this in order to short-circuit the air and thus keep it from feeding the flame.

With the material thus removed, I would build a stopping on the intake entry. My reason for putting the stopping on the intake first is that the men would be working in fresh air.

A stopping can be removed much more quickly than one can be built; it is also a fact that by tearing out the stopping in the crosscut, the air current would be cut off the fire in much less time.

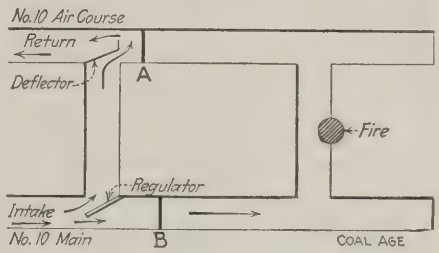
If there were other workings, especially places generating gas on the same split of air, I would endeavor to cut those workings off the split; that is, if they were located on the intake side of the fire.

GEORGE D. EVANS.

Pottsville, Penn.

Letter No. 5—Concerning the question asked in COAL AGE of Jan. 20, 1912, in the last paragraph on page 470, relating to the difference in judgment used by the two sets of officials, resulting in exactly opposite opinions as to the proper plan of attack, I would not consider it possible to prescribe a general method, which would work out with any degree of accuracy for all mine fires. It is true we have rescue helmets for work in all kinds of noxious gasses, but I venture to say not more than 5 per cent. of the bituminous mines have such appliances at the mine. A method of attack where helmets were immediately available, might work out with satisfactory results, while if the same methods were resorted to without helmets, it would certainly result in loss of life to the fire fighters.

If all mines were alike as to thickness of the seam, character of coal, roof and floor, condition as to wetness or dryness, the amount of inflammable gases generated, and the amount of air that could be circulated, then with equal appliances, a general method might be applicable in all cases; however, when conditions vary as widely as they do, it would be unwise to prescribe a hard-and-fast rule for general practice.



SHOWING LOCATION OF FIRE AND POSITION OF STOPPINGS

Fighting a fire without helmets should invariably be commenced from the intake or "fresh air" end, and if in the judgment of the fighters, a stopping should be erected in the air course or return, temporary means must be provided, so the men employed in erecting the stopping can be given fresh air; such an arrangement is shown in the accompanying sketch. It must be understood that in fighting a fire by the direct method, we should invariably do so from the intake end, and the method of procedure in the foregoing case would differ from the plan pursued in sealing off a fire that could not be conquered by the direct method.

In sealing off this fire, or isolating it, the brattice in the return, marked *A*, should be built first, and when completed, the brattice marked *B* should be erected. This would avoid the possibility of an explosion, which would certainly occur if brattice *B* were built first. As soon as the stopping *B* is erected, the supply of fresh air to the fire will be cut off. A large amount of gas will be

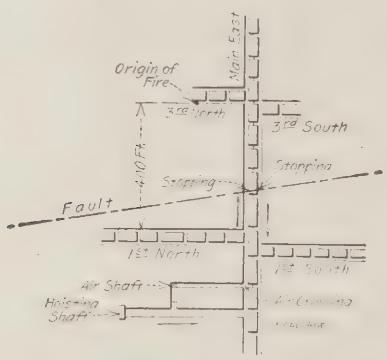
driven off by the heat which will expand the air, and the expanded air and gas will force itself over the fire, and an explosion will occur.

If brattice *A* is built first, an explosion cannot result, because the space between brattice *A* and the fire is filled with the products of combustion, or burnt gases, and this inexplosive mixture fills the space, backs over the fire, and returns to where brattice *B* should be built; also, while this building is going on, perfect safety lamps should be used, so that an explosion cannot occur. In my opinion, the No. 4 superintendent and the No. 7 fireboss were right in their judgment.

Johnstown, Penn. R. Z. VIRGIN.

Letter No. 6—I have had considerable experience with mine fires, but I do not feel that it is a safe plan to lay down any hard-and-fast rule as to how a person should proceed under all conditions. The method I have always adopted where it was necessary to seal off a mine fire, and where two stoppings were required, was to build both stoppings at the same time.

By this method the air current is cut off from the fire completely, there is no unnecessary delay and the danger from any accumulation and consequent explosion of firedamp is reduced to a minimum.



A CASE WHERE THE STOPPINGS WERE BUILT IN A FAULT

The accompanying sketch shows the position of a fire we had to stop off some time ago. The trouble occurred at the face of the third north entry, and extended out to the main east entry. When I was called to the scene, it was utterly impossible to approach the fire, because of the intense heat and large falls of roof.

We decided to seal off the trouble, and the place selected for the stoppings was in the fault shown in the sketch. A temporary wall was built in each entry with brattice lumber and soft clay, both stoppings being erected at the same time; immediately after these temporary brattices were built in, permanent walls of brick and cement were erected just outside the temporary stoppings.

Now, I may state that the north and east entries generated CH_4 and a few days previous to my going to attend to this fire, an explosion occurred at that same point, killing one man and seriously injuring another. These were the only two miners present in that part of the workings at that time.

My method of dealing with other fires has always been along lines similar to the plan outlined above. So far, I have had no occasion to change my ideas, and up to the present no serious accidents have resulted.

Canton, Ill. P. HOGAN.

Letter No. 7—Relative to the proper placing of stoppings when it is found necessary to seal off a mine fire that has gotten beyond control, I would say that, based on personal experience, if the mine is gaseous, stoppings should be erected simultaneously in the intake and return airways, if this be possible. From my personal experience with several mine fires, I do not think it admissible to lay down a positive rule that disregards local conditions. Each fire must be handled with full consideration of all the surrounding circumstances.

ELI T. CONNER.

Philadelphia, Penn.

Letter No. 8—Concerning the treatment of a mine fire that has gotten beyond control, I would suggest that if the fire is located at the face of a pair of entries, the trouble must be attacked from its intake side. I feel sure it would be impossible to approach it in any other way. I therefore agree with the superintendent and foremen at No. 7.

Anglin, Ky. NOAH BURTON.

Letter No. 9—Concerning the discussion of mine fires, and the best way to extinguish them, I want to say that the stopping on the intake airway, in my opinion, should be placed first. In a great measure, if not altogether, this cuts off the supply of oxygen that gives life to the fire.

The second stopping should, of course, be placed on the return side of the fire, and this should be done as quickly as possible to prevent any leakage of gas. If there is any other access to the fire, such points of entrance should be likewise walled off. It is always best to have the stoppings as near to the fire as possible.

Whenever such a plan can be followed, it is well to erect both stoppings at the same time. This latter method is the ideal one for sealing off a bad mine fire.

Republic, Ala. G. T. M.

Letter No. 10—Nothing is more important than quick action and proper treatment in the case of a bad mine fire. Men are endangered and property as well.

My plan of action would be to break down the stopping in the first crosscut, just outside the fire. Then I would build a brattice on the return airway, just beyond the crosscut, in which the brattice had been torn out. Next, I would use a canvas brattice to carry a current of air up the intake and as near to the fire as possible. I would then use fire extinguishers, if such were available. If oxygen helmets were handy, of course we could approach still nearer to the seat of trouble, and the split of air would not have to be carried so far up the intake entry.

If it became necessary to flood the fire, I would build a stout wall on the return side, and let a pipe project through the stopping so that the steam might escape. A wall would also have to be built on the intake side and both these stoppings should be of brick or concrete.

I certainly agree with the No. 4 superintendent and the No. 7 fireboss. To explain why, let me cite a simple case: Suppose we have a fire in the kitchen stove; then assume a man is at the end of the pipe or top of the chimney; if you shut the draft off, your pipe still feeds smoke. It is, therefore, necessary to close the pipe as well as the doors, and the fire will die out; the man at the end of the pipe would be safe. If only the draft were cut off, or the fresh air shut off first, the pipe would smoke and the man would perish.

Red Ash, Va. A. T. WADE.

Letter No. 11—As to whether I would place my first stopping on the intake or on the return side should I desire to seal off a mine fire, will say that my plan of action would depend entirely on physical conditions and circumstances in connection therewith. I have known it to be done in both ways with more or less success.

The general practice seems to be to close the outlet first, having in mind the construction by brattice or otherwise of a separate return on the intake to a point as near the fire as possible. My practice in combating mine fires is to use the direct method and with prompt action and proper appliances I have never seen a failure.

GENERAL MANAGER.

Scranton, Penn.

Letter No. 12—I think the No. 4 superintendent and the No. 7 fireboss were right in wanting to place the first stopping on the return side of the fire. This plan prevents the smoke and fumes from traveling to other parts of the mine. If you build the first stopping on the intake side of a fire, and you have no helmets available, it is then impossible to build a wall on the return airway, because of the smoke and fumes that you encounter.

If I should meet with a fire similar to the one described in COAL AGE last week, I would build both of the stoppings at the same time, erecting the brattices by building from the bottom up.

Bosworth, Ky. DAVID WATKINS.

Letter No. 13—I would advise placing the first brattice on the intake. The su-

perintendent and foreman at No. 7 mine were right.

GEORGE S. BARROWMAN.

Eldorado, Ill.

Letter No. 14—In discussing the best method of dealing with a mine fire, I desire to say that if local conditions are eliminated, there arises room for considerable discussion. It has been my experience to contend with but two fires and my training in this line, therefore, has been necessarily limited. In one of the fires referred to, we had no time to build stoppings and there was only enough time for us to effect a safe escape. The second fire was extinguished with water.

However, should I encounter a fire, such as was described in COAL AGE, and if I had no one with me whose experience in dealing with the problem was greater than my own, I would construct the stoppings on the intake and on the return simultaneously. My plan would be to do the work in the following way:

First, I would select a crosscut as near to the fire as possible and I would then have the men open this crosscut, short-circuiting the air, and in this way, partially cutting off a supply of oxygen from the fire. This, I believe, would also give the workmen ventilation in the intake and return. If conditions were such as to prevent building both stoppings simultaneously, I would attempt to construct the first stopping on the intake, short-circuiting the air at a point near the location of the stopping. I believe, however, that local conditions would have to govern the method of procedure.

G. M. SHOEMAKER.

Pennington Gap, Va.

Letter No. 15—In all our experiences in sealing off mine fires, we have closed the intake side of the fire first.

DOUGLAS BUNTING.

Wilkes-Barre, Penn.

Letter No. 16—As to the best method of sealing off a mine fire that has gotten beyond control, assuming, of course, as specified, that all local conditions be disregarded, the answer to this question, in my opinion, would be to build the first stopping on the intake side of the fire, as the stoppage of the air current passing over the fire would reduce the amount of the products of combustion in the return and give a better opportunity for the building of the second stopping. This procedure would be reversed in the case of workings giving off a large amount of explosive gas, in which case the return stopping should be built first to minimize the danger of accumulations of gas and explosions at the seat of the fire; in this case the intake air current should be utilized to dilute the gases given off and the stopping built in the return, despite the difficulties which would be encountered from the vitiated air from the fire.

In modern colliery practice, with reversible fans, or where the ventilation is so planned that the air current may be reversed at the location of the fire, the first stopping would properly be built on the intake side, the current then reversed and the second stopping built in good air.

In every case, in practice, local conditions will necessarily govern, and the location of stoppings cannot follow any general rule, but must be determined on the ground; the extent of the fire, character of workings, amount of water supply, presence or absence of gas in quantity, amount of timber affected by the fire, proximity of other danger points and facilities at hand for fire fighting, such as chemical extinguishers, oxygen helmets and the like, will necessarily have a preponderating influence in the decision of the question.

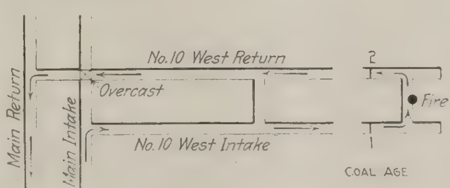
R. V. NORRIS.

Wilkes-Barre, Penn.

Letter No. 17—In discussion of the article on mine fires on the first page of COAL AGE, Jan. 20, I wish to state that I do not believe it possible to prescribe in general whether a fire at the face of a pair of entries should be sealed off, first on the intake, or first on the return side, because local conditions and facilities cannot be disregarded. The only general rule to be followed in sealing off a mine fire is to cut off the supply of air as quickly as possible, with due regard to safety.

To take the case cited (see accompanying sketch), we are confronted with the following conditions:

1. We are in a mine which generates gas, but is not considered dangerous, and therefore is the most dangerous kind of a gaseous mine.
2. The mine is ventilated by the pressure system.
3. The fire is at the point indicated on the sketch.



SHOWING PLAN WHERE FIRST STOPPING IS PLACED IN RETURN

It is assumed that rescue helmets are available to enable work being carried on in smoke, etc. With the above conditions before me, I would place the first stopping at the point 2 in the return airway.

The fire has been burning for some time without causing an explosion, with the conditions of ventilation and pressure as found. If we alter these conditions by building the first stopping at a point 1, in the intake airway, we will increase the chance, and in fact make conditions most favorable for the escape of any gases that may be present, with the consequent risk of an explosion.

On the other hand, by placing the first stopping at 2 in the return, we not only do not reduce the pressure until the last moment, when it is safe to do so, but also as quickly as the barrier is built in the return, the smoke and gases of combustion are driven back over the fire and aid in smothering the same. On completing the barrier at 2, the stopping at 1 can be built in comparative safety and the fire completely sealed off.

It is quite possible that conditions might make the placing of the first stopping at 1 instead of at 2 the best plan; but those local conditions must be known before the situation can be intelligently handled.

In conclusion I would suggest that many cases of uncertainty and hesitation (which may prove disastrous) in handling a crisis of this nature in a mine, may be avoided if managers, or superintendents, would get the foremen, firebosses, etc., together at least once a week, and with the mine plans before them, discuss thoroughly the best and safest method of procedure, in case of fire, "cave in," or any other possible accident or disaster that might occur.

I have used the plan outlined above with successful and gratifying results.

JOHN T. FULLER.

Honesdale, Penn.

[*Our space being too limited this week, letters from James Ashworth, John Verner and others will be published in our next issue.*—EDITOR.]

Truesdale No. 1 Coal Shaft

The two shafts at the Truesdale colliery of the Lackawanna company, near Nanticoke, Penn., although at present called upon to handle only a small amount of coal, were designed and equipped for taking care of a large output in the future. Steel headframes, self-dumping cages and the permanent hoisting-engine equipment were installed. On the front cover of this issue is given an interior view of the hoisting-engine house at No. 1 shaft, which extends to the Ross vein at a depth of 590 ft., and cuts the Baltimore vein on the way down. A landing will probably be established in the latter seam at some future time.

The hoisting engines for this shaft are provided with a tight and a loose drum for hoisting from several levels, and will wind 900 ft. of $1\frac{1}{2}$-in. rope, so it will be seen that considerable allowance was made for possible future developments. These engines were built for the Lackawanna company by the Vulcan Iron Works, Wilkes-Barre, Penn., and are 30x48 in., double-drum, direct-acting or "first-motion" engines of modern design with steam and hand brake and steam reverse. The drums are semi-conical and taper from 9 to 11 ft. The loose drum is controlled by a steam-operated clutch, which is, of course, not used at present in hoisting from only one level.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Alabama Mine Foremen's Examination Held at Birmingham, Ala., Jan. 22-27, 1912

First-Class Mine Foremen Questions

Instructions To Miners

Ques.—What instructions would you give to miners relative to their duties when hiring them; also what instructions would you give them when making your daily rounds?

Ans.—I would first test their ability to read and understand the printed and written notices that it is the custom to post in and about the mine, and instruct them to read and obey them absolutely.. If the mine generates gas, I would give each man careful instructions in regard to the danger of gas; the different kinds of mine gases; the use of safety lamps. If electricity is used in the mine, I would explain to him its danger and the need of constant care to avoid contact with a live wire or any charged iron pipe or tool.

When making my daily rounds I would observe his method of mining the coal, placing shots, caring for powder, charging and firing holes, setting posts and testing the roof. I would observe his safety lamp and give him further instructions, if necessary, in regard to its proper use.

Instructions To Firebosses

Ques.—If you were acting as mine foreman at a gaseous mine what instructions would you give to your firebosses relative to the performance of their duties?

Ans.—I would instruct them to do their work conscientiously and to faithfully examine every working place, in their respective districts, for gas and other dangerous conditions; and to mark the date at the face of each place examined, and place danger signals at the entrances to all places where gas or other danger is found. I would require them to enter, in a book kept for that purpose, a full report of each examination made of the districts in their several charge, and to sign such report. I would further instruct each fireboss to make a verbal report to me, after each examination and advise me personally of any dangers requiring prompt attention.

First Duties of Mine Foreman

Ques.—On entering upon your duties as foreman of a mine that has been in operation for some time, what would you consider your duty in order to make a reputation for yourself and do justice to your employer? What stand would you take with the men, and what would be your first duty upon taking charge and what would be the first thing you would call for?

Ans.—The mine foreman must make a calm, deliberate, but firm stand for what is right between man and employer. Much will depend on his judgment and tact in minimizing the numerous and, for the most part, trivial causes of friction that are bound to arise, from time to time, between the men and the company. The mine foreman's first duty is to prove by his actions and words that his desire is to treat fairly and honorably with both his employers and the men in his charge.

He should demand "a day's work for a day's pay" and treat all men alike on this basis, having no favorites. He should get next to his men in such a way that they will feel both the influence of his sympathy and the force of his will. After acquainting himself thoroughly with the mine and the men, he should call for an accurate mine map and study the same carefully, in every detail, to enable him to decide what, if any, improvements can be made in respect to ventilation, drainage, or haulage.

Ventilation of the Working Face

Ques.—What method would you adopt to have a continuous flow of air past the face of each working place?

Ans.—The air current must be properly directed so as to sweep the face in all working places. In longwall work this is a comparatively easy matter, because where the roads leading to the face are properly curtained with canvas the air follows naturally the line of the working face. In room-and-pillar work, however, it is more difficult to keep a steady flow of air continuously sweeping the faces of the several rooms and headings. As the rooms advance the face gets farther and farther from the last breakthrough by which the air enters the place; and, as a consequence, less air reaches the face, unless a temporary brattice of canvas is used or the waste is built up in the room in such a way as to conduct the air forward to the face.

In room work the breakthroughs or cross-cuts in the pillars between the rooms should be "staggered"; that is to say, they should not be driven opposite to each other; so that one breakthrough will always be not more than half their distance apart, from the face of the room. When this method is adopted it is easier to keep the air up to the face.

In order to insure a continuous air current in the mine workings, it is necessary, also, to build and maintain good airtight stoppings, brattices, doors and airbridges. Double doors should be used at all points between the main air course and return, so as to prevent the temporary short-circuiting of the air when one of these main doors is open to allow the passage of a man or mule.

Control of Two or More Air Splits

Ques.—If you had two air splits in a mine, would it be possible for one of them to work to the disadvantage of the other; and if so, how would you prevent it?

Ans.—Yes; assuming the splits have like cross-sections, the short one will take the most air; or, in other words, the shorter split will rob the longer one of a portion of its air. This is prevented by what is called a "regulator," which is a brattice or wooden stopping built in the airway that takes naturally more than its desired portion of air. The brattice is arranged with a central orifice or opening provided with a sliding shutter, to increase or decrease the size of the opening. By moving this shutter it is possible to obtain any desired division of the air current between the two splits.

Again, when one split runs to the rise and the other to the dip, there will generally be a variation in the circulation in the two splits, according to the season. For example, in winter, the intake air will be colder and therefore heavier than the warm return air. As a consequence, there will be formed, in the dip split, a natural air column assisting the established circulation in that split. Also, in the rise split, will be formed a natural air column opposing the established circulation in the rise split. In the summer, when the intake air is warmer than the return, the natural air columns formed will oppose the circulation of air in the dip split and assist that in the rise. Therefore, in this case, the dip split will rob the rise in the winter; and in summer the rise split will rob the dip. This will require an alteration of the regulator according to the requirements and the season.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Bunker Coal at the Panama Canal

Discussions before the House Committee on Interstate and Foreign Commerce during the past week have been made to turn in an increasing degree around the question of coal supplies for ships passing through the Panama Canal. The committee has been furnished with elaborate data as to vessel tonnage, the amount of space on board required for bunker coal, the amounts needed to be kept in store at the isthmus, in order to enable vessels to coal there, and a variety of other matters. From the navy standpoint, Secretary Meyer has urged the building of a fleet of 12 or 15 colliers, to furnish the coal supply on the isthmus that would be needed by American war vessels passing through the canal.

There seems to be a decided growth in the view that the problem of coal will play a most important part in connection with the question of toll rates. One of the plans which has been urged upon the committee is that of taxing vessels in proportion to their displaced tonnage, thereby imposing the taxation most heavily upon those that are already furnished with freight. This, however, would discriminate against various classes of the freight carried, and would presumably increase the burden upon those ships which attempted to pass through the canal with a full coal supply, instead of arriving light, and coaling after they had passed through the canal and had paid their tolls. Of course, if the tolls were simply a flat sum, paid at the same rate whether a vessel were loaded or not, this consideration would not figure, but it is already evident that the question of cheap and available fuel supply is to play a large part in determining the character of the freight that will go through the canal, and the rate of charge that must be made for it.

Leasing System for Public Lands

Conservation of public lands by means of the leasing system was discussed at length by the Senate committee on public lands, on Jan. 24, and it is more than probable that at the next meeting of the committee, the Newlands resolution, in favor of action by Congress at this session, will be adopted. The discussion of the 24th was a continuance of the one begun a week earlier, when it was proposed that instead of waiting to perfect a bill, the committee shoud give evidence of its intention to act by declaring in favor of the leasing system and then perfecting the details of a bill later.

Senator Newlands maintained that it was high time that action should be taken to protect our natural resources in coal, iron, etc., against monopolistic control under a system of leasing. It appeared that a substantial majority of the committee favored the leasing plan, provided that the revenues, apart from the expenses of administration, would be turned over to the states in which the resources were located.

It was urged that the Western states would not consent to any system that would make them provinces of revenue for the national government; that to withdraw these extensive and valuable tracts from the taxing power of the states would be to cripple them most effectively and to deprive them of the advantages which sister states had enjoyed by the transfer of title to individuals and the consequent taxation of the land. The committee was practically unanimous in the view that the control of the United States should be maintained, not for revenue, but simply to prevent monopoly; that the leasing system should not be pursued for profit, and that the proceeds of the leases should be turned over to the respective states.

It was suggested that the division be made on a basis of 25 per cent. to the general government and 75 per cent. to the states, and it is hoped a resolution will be presented at the next meeting that will insure harmony of action. For many years various conservation measures have been before this committee without substantial result, a fact urged by Newlands in advocating a declaration of policy, after which the perfection of a bill will be a comparatively easy matter.

Alabama

Birmingham—The Pratt Consolidated Coal Co. announces that two colliers will be built and equipped at a cost of $100,000, in preparation for the exportation of Alabama coal from Mobile and Pensacola.

The regular semi-annual examinations for mine foremen and fire bosses were held here Jan. 22 to 27, inclusive. Sixty-four entries were recorded on the first day.

It is reported that the Nashville, Chattanooga & St. Louis R.R. has renewed a contract for 125,000 tons of coal from the Whitwell mines of the Tennessee Coal, Iron & R.R. Co.

California

Salinas—The company operating the Stone Cañon coal mines in the southern part of Monterey County is soon to renew efforts to extinguish a fire which has been smouldering in one of the inclines for the last two years. It is proposed to sink a shaft some distance beyond the fire and to wall up the burning area. That part of the mine where the fire exists will then be flooded. At present no one can enter the incline owing to the presence of gases generated by the smouldering coal.

San Jose—A. B. Campbell recently filed suit in the Superior Court here against each individual stockholder of the Monterey Coal Co., the defendants numbering more than 100, in which he demands $331,231, alleged to be due as commissions on the sale of stock.

Colorado

Denver—Operation of coal mines by the consumer is the policy of the Consumers' League, of Denver, which has incorporated under the title of the Consumers' Fuel & Merchandise Co., for the purpose of running mines and delivering the output to its members. The plan is to sell five $10 shares to each consumer, entitling him to purchase coal and to share in any profit that may accrue.

The Colorado - Wyoming Coal Co., which has a capital of $6,000,000, recently elected officers. It reports holding 1200 acres of lignite coal and expects to produce a large tonnage when necessary improvements have been made. It is said that one mine at Tracyville will be able to ship 300 tons a day within a month. This company is affiliated with the Denver, Laramie & Northwestern R.R., which has recently approved plans for a 152-mile extension from Greeley to Elk Mountain.

Grand Junction—The city commissioners have instructed Director Shaffer, of the bureau of municipal activity, to find, if possible, a market for the millions of tons of undeveloped coal in Mesa County. It is intended to sell the coal on the Pacific slope, if possible, and Director Shaffer has been ordered to begin an advertising campaign with that end in view, and to make an effort to secure favorable freight rates.

Illinois

Duquoin—It is understood that 8000 acres of Franklin County coal land have been purchased by C. W. Seilley of Benton, representing ex-Mayor Busse of Chicago, and W. P. McMillan, also of Chicago. It is also said that a shaft will be started at once to open up this tract.

Marion—The roof of the Chicago Big Muddy Coal & Coke Co.'s mine gave way recently at a point under the water reservoir, and several narrow escapes from drowning were reported.

Belleville—The Missouri & Illinois Coal Co. has enlarged its mines at Rentchler Station, east of Belleville, and at Willisville, southeast of Belleville, and is installing an electric power plant at the St. Clair mine, near Freeburg, to furnish power for the St. Clair and Wilderman mines. A complete new equipment has been installed in the Star mine at Freeburg, including electric puncher mining machines, while a large new engine and electric mining machines are being placed in the Mulberry Hill mine.

The Illinois mine-rescue car arrived in Belleville, Jan. 21, for a stay of several weeks.

Indiana

Clinton—Five hundred miners at the Brazil Block mine No. 8 were recently imprisoned for the greater part of a day, when the hoisting rope of one of the cages parted and let the cage, loaded with coal, drop to the bottom of a 200-ft. shaft. It required about four hours to lift all the men out on the other cage remaining in service.

Booneville—An important business transaction was consummated Jan. 22, when Wilson Bros. sold their interest in the Wilson-White Coal Co. to the Erie Canal Coal Co. It is the intention of the new company to make extensive improvements to the property in order to increase the mine's output to at least 1000 tons per day.

Jeffersonville—An ice gorge here, Jan. 20, caused an estimated loss of $30,000, including boats and barges of coal, coal floats and other property. The gorge broke at 2 o'clock in the morning and in 20 minutes the destruction was complete.

Kentucky

Rockport—Refusal to enter the mines of the Rockport Coal Co. here when requested resulted in a wholesale discharge of the miners, and now nearly 100 men are idle as the result of the ultimatum issued by President Tucker, who declares the men shall not return to work while he is in charge.

Pineville—The commissary of the New Bell Jellico Coal Co. at Bell Jellico was recently destroyed by fire. The loss amounted to about $8000, and is said to have been covered by insurance.

Louisville—The stockholders of the Continental Coal Corporation have organized a selling company with a capital stock of $500,000, to handle the output of the corporation, which operates in the eastern Kentucky coal field. The new company has the same officers as the operating company and will have headquarters in Chattanooga. The Continental Coal Corporation was formed recently by the consolidation of various mines in Bell County.

The Consolidation Coal Co., operating in the Elkhorn field, reports eight mines opened and entries driven, and seven tipples in process of erection, while machine shops, stables and other necessary buildings are rapidly being built. Six more mines have been located and are in process of development. Two hundred miners' houses have been completed and 800 more are in process of erection. A central power plant has been started and temporary power plants are already in operation. All this and other work has reached such a state of development that upon the completion of the first transportation line, the Sandy Valley & Elkhorn R.R., Apr. 1, the present mines will be able to start with a production of at least 2500 tons a day, which will be increased rapidly.

Adjudging that the McNary Coal Co. has failed to carry out the provisions of its 20-year lease of 2100 acres of coal lands, belonging to the Krauth & Fable estate, in Muhlenberg County, Judge James Quarles has signed a judgment declaring the lease forfeited and annulling the contracts.

Nevada

Tonopah—A. S. Thomas, an experienced coal miner, recently made an examination of the Coaldale coal mines and returned to Tonopah with the assurance that in a short time coal from the new fields will be shipped into the southern country. The Nevada Coal & Fuel Co., under the supervision of T. E. Rovinack, has a force of men developing the large veins of coal on its property. The 8-ft. vein on the 75-ft. level is being drifted both north and south and continues its average thickness as the drifts advance. At the T. A. Darms property a shaft has been sunk to a depth of 320 ft. The shaft has a dip to the 280-ft. level of 95 deg., and from that point to the bottom the dip is 20 deg. This property covers an area of 960 acres and has been under development for the past two years, the principal owners being California capitalists.

Ohio

Byesville—Defective electric wiring was responsible for a recent fire which caused a loss of several thousand dollars and endangered the lives of 200 men employed at the Little Cape mine of the National Coal Co. at Byesville. The men escaped through an emergency shaft. The day crew of miners had entered the 100-ft. shaft and were at work when the fire was discovered. Exit by means of the main shaft was cut off and the emergency shaft probably saved many lives. Timbers in the mine were burned and tons of slate had fallen before the fire was checked.

Gallipolis—With the resumption of navigation on the Ohio River more than 1,000,000 bushels of Kanawha and Pittsburg coal, bound for Cincinnati and Louisville, were liberated from the ice. This precludes the possibility of a coal famine in those two cities.

Wellston—The Lake Erie & Ohio River Ry. & Transportation Co., and the International Mining & Manufacturing Co., which have for their purpose the development of coal lands in Jackson, Vinton and Scioto counties were organized recently. The railroad company has a capital of $8,000,000 and will have for its president and general manager, B. F. Howland, of New York. E. B. Bingham is president of the manufacturing company which is capitalized at $25,000,000.

Columbus—At a meeting of the Hocking Valley Operators Association, E. A. Cole and G. C. Weitzel, official heads, respectively, of the Sunday Creek company and the New Pittsburg Coal Co., were selected to represent that body at the joint-wage conference in Indianapolis. As these two corporations are the largest in the Hocking Valley and as this field dominates the state in such matters, it is safe to say that Ohio is committed to a revival of the interstate movement. Ohio coal interests insist that their representatives shall not recede in any way from opposition to a mine-run scale, such as prevails in Illinois, and if this obstacle cannot be overcome in the process of negotiations, Ohio, western Pennsylvania, and Indiana will tie up together.

Oregon

Beaver Hill—An explosion at the Beaver Hill mine, in the Coos Bay district, recently caused serious injuries to four employees. The explosion is reported to have been caused by an electric spark igniting the gas.

Klamath Falls.—Extensive operations are expected soon at the Cascade coal mines property north of Ashland. The property was recently optioned to Seattle capitalists for $300,000—the option to be good for ten years. A royalty of $4,000 is to be paid the first year and $8,000 per year thereafter. The first work to be undertaken is the sinking of a 1000-foot inclined shaft. For this and other work about the mine there will be installed a

complete new outfit of modern machinery. There are five and a half feet of coal now showing in the principal vein and it is expected this will increase to 12 or 15 feet.

Pennsylvania

Bituminous

McKeesport—Five hundred men were put to work Jan. 26, at the mine of the Monongahela River Consolidated Coal & Coke Co. at Bunola, near McKeesport. The mine has been shut down since last September.

Connellsville—The Dunlap-Connellsville Coke Co. awarded a contract Jan. 23 for the erection of 10 houses at the Garwood coke plant, near Brownsville, to cost $10,000. The company is preparing to fire to capacity its plant of 119 ovens, 57 of which are now in blast. Scarcity of labor is handicapping operations.

Within the past three weeks over 4000 idle ovens have been ordered into blast, but they have been unable to get to their productive capacity because of the necessary delay in supplying on so short a notice the complement of men. This complement is a small industrial army of between four and five thousand. The extreme cold weather has also been a serious handicap.

Johnstown—The Valley Smokeless Coal Co. has secured from the Von Lunen estate the right of way over property skirting the Stonycreek River, for a branch railroad to connect with the Pennsylvania R.R., via the Johnstown & Stonycreek Ry. Work on the construction of the spur is to begin at as early a date as the weather will permit, and the coming spring will give the company another outlet for the transportation of its coal to market.

John F. Summerville has started the opening of new mines on the Snyder and Zimmerman tracts in Black township. These mines will furnish locomotive fuel for the Western Maryland Railroad.

Pittsburg—Following a recent meeting of the directors of the Monongahela River Consolidated Coal & Coke Co. it was stated that no steps had been taken to place the company under the operating management of the Pittsburg Coal Co., and that it is probable that the company will be operated as an independent corporation for some little time. The president's report shows that the company now owns 17,950 acres of coal lands in Pennsylvania and 2456 in Kentucky. It mined 7,632,054 tons of coal during the fiscal year under review, which ended Oct. 31, 1911, compared with 7,755,144 tons in the previous year, a decrease of 123,090 tons, out of which smaller tonnage, however, the company derived greater earnings than in the previous year.

Anthracite

Scranton—The anthracite mine workers' joint wage-scale committee will meet with the hard-coal operators at the office of the Central Railroad of New Jersey, in New York, Feb. 27.

Wilkes-Barre—The coroner's jury investigating the explosion in the Parrish mine of the Parrish Coal Co. on Jan. 9, in which six men lost their lives, returned a verdict holding the company responsible for failure to take the proper precautions to protect the lives of the victims.

The State's new anthracite law code commission, named by Governor Tener a short time ago, began work at Wilkes-Barre, Jan. 20, Senator Catlin, the chairman of the commission, presiding.

Pittston—Work has progressed so far that it is expected the plan of the Erie company to get coal from the abandoned workings of the old Schooley shaft in Exeter borough will become operative about the first of April. The Schooley mine has been idle for a number of years, having been flooded by a serious mine squeeze.

Three dwellings in the borough of Yatesville, near here, were disturbed by a mine cave, Jan. 23. The cave is thought to be due to a settling of the workings in the Yost colliery.

Mt. Carmel—Three mine workers were killed in the Alaska shaft of the Philadelphia and Reading Coal and Iron Co. while at work in the night of Jan. 24. The men were caught in a cave-in and their bodies were found after fifty tons of rock and dirt had been removed.

Shamokin—Between six and seven hundred men and boys, employees of the Enterprise colliery, operated by W. L. Connell & Co., of Scranton, went on strike Jan. 22. They claim that the price charged them for timber is excessive.

Utah

Ogden—The defunct Elk Coal Co. has quickened into life in a new corporation at Ogden, which recently filed articles of incorporation under the name of the Mammoth Coal Mining Co. The capital stock is $500,000, in $1 shares, fully paid up by a note for $125,000 signed by the organizers of the new corporation and given to secure the amount paid by J. W. F. Volker at assignee's sale for the property of the Elk Coal Company.

Salt Lake City—The Orem and Berryhill interests in the Castle Valley Coal & R.R. Co. in southern Utah have passed to James H. May for a consideration of $450,000. Mr. May and his associates now have absolute control of the company, which is capitalized at $5,000,000. The new control has arranged for a $1,000,000 bond issue with which to make extensive improvements. The present daily capacity of the mine, 1200 tons, is to be increased to 3000 tons and steps are to be taken to free the company from dependence on the Denver & Rio Grande R.R. Co. for transportation facilities by the purchase of several hundred coal cars for its own exclusive use.

Washington

Spokane—The Tanum Coal Co. has been organized at Spokane with an authorized capital stock of $500,000 to develop a tract of coal land on Tanum Creek, near Ellensburg, Wash., in the Roslyn district. Analyses of the coal, made by A. N. Cantrill, manager of the Spokane Gas Co., show it to be one of the best grades of gas and coking coals that has yet come to his attention.

West Virginia

Keyser—The suit for $10,000 damages against the Davis Coal & Coke Co. by the administrator of William Hetzel, who was killed with 22 others in an explosion of mine No. 20 at Elk Garden, Apr. 24 last, was brought to an abrupt close when Judge Reynolds sustained a demurrer to the evidence. The case will be carried to the Supreme Court. Like cases by the administrators of Harry Trenaum and John White, two other victims of the ill-fated mine, will come up later.

Berkeley Springs—The land deed of the Sleepy Mountain Coal Co., through Special Master John C. Berry to Hay Walker, has been recorded here. The land involved lies in Morgan and Berkeley Counties and includes about 15,000 acres. The consideration was $250,000.

Parkersburg—In the opinion of the Board of Army Engineers, it is not considered practicable for the government to undertake at this time the improvement of the Little Kanawha River, which flows into the Ohio at Parkersburg. There are five locks and dams at present, affording a four-foot stage from Parkersburg to Creston, 48 miles above. Coal interests wanted improvements that would insure a six-foot stage to Burnsville, 74 miles above Creston. The engineers, after making a preliminary survey and an exhaustive study of the river, report that the proposed improvements would cost not less than $5,000,000 with $54,000 annually for maintenance.

Charleston—The New River Mining Institute, organized for the purpose of instructing its members in the mining industry, has a membership of about 70, and recently met at Scarbro for the election of officers. The institute is composed of men employed in various capacities about the mines. Similar organizations will be started in every mining section of the state.

Personals

A. D. Locke, of the Bonnie-Brae Coal & Quarries, Ltd., of Calgary, Alta., recently made a business trip to New York.

F. R. Wadleigh, fuel engineer and assistant general manager of the Chesapeake & Ohio Coal & Coke Co., has recently made an extended trip through Michigan, returning East this week.

C. H. Ashen has been appointed manager of the Buffalo agency of the Pittsburg-Buffalo Coal Co. Mr. Ashen, as a coal salesman, has helped materially to build up the business for several years past. He succeeds T. J. McNamara, who has held the position some time.

James W. Barber, secretary and treasurer of the Monongahela River Consolidated Coal & Coke Co., will take charge of the docks and mills of the company at Elizabeth on Feb. 1, according to an announcement made Jan. 22. He will be succeeded by C. H. Van Dyke as secretary and treasurer.

J. F. Hannigan has resigned as superintendent of the Edgewater mine of the Tennessee Coal, Iron & R.R. Co. and will be succeeded by George W. Brymer, of Philadelphia, Penn. Mr. Brymer was, some time since, a transitman with the Lehigh Valley Coal Co., at Wilkes-Barre, Penn., and has recently been engaged with Mr. E. T. Connor at Philadelphia.

Benjamin F. Bush, president of the Denver & Rio Grande R.R. Co., recently made a thorough inspection of the Sunnyside mines operated by the Utah Fuel Co., a subsidiary organization of the Denver & Rio Grande. It is understood that it will be the policy of President Bush to encourage the independent coal companies in southern Utah by affording them better transportation facilities to their markets.

Edwin Ludlow has been appointed second vice-president and general manager of the Lehigh Coal & Navigation Co., with residence and office at Lansford, Penn. The office of general superintendent, made vacant by the resignation of Baird Snyder, Jr., has been abolished. Mr. Ludlow is a graduate of the School of Mines of Columbia College. From 1882 to 1889 he was superintendent of the Mineral Ry. & Mining Co., Shamokin, Penn., in charge of the anthracite-mining operations of the Pennsylvania R.R. Co. in that field. From 1889 to 1899 he was superintendent of mines of the Choctaw, Oklahoma & Gulf Ry., Hartshorne, Indian Territory. From 1899 to Jan. 1, 1911, he was general manager of the Mexican Coal & Coke Co., Las Esperanzas, Mexico, and from Jan. 1, 1911, to Mar. 1, 1912, vice-president and general manager of the New River Collieries Co., Eccles, W. Va. Mr. Ludlow brings to his new situation a long experience with mining problems and mine management.

Obituary

Phineas Stewart Berry, 64 years old, died recently at his home in Brooklyn, N. Y. Mr. Berry was with the Coxe Brothers Coal Co. for many years.

Adam Keil, aged 60, for many years identified with coal mining in the vicinity of Pittsburg, died recently at his home on the north side. He was born at Stonesburg, Penn., and was for a time employed as a pilot on steamboats of the local rivers. He later became interested in coal operations and was, at various times, associated with Louis Staib, the W. H. Brown Coal Co., James Jones & Sons, the Monongahela River Consolidated Coal & Coke Co., and the Pittsburg-Buffalo Co. Mr. Keil was a prominent member of the Mining Institute of America, and had always been active in mining and river affairs.

Alexander Lear Stoek, 13 years old, only son of Prof. and Mrs. H. H. Stoek, of the mining engineering department of the University of Illinois, died, Tuesday, Jan. 16, at his home in Urbana. He was in the freshman class of the Thornburn high school, Urbana, where he was greatly esteemed. About five weeks ago he was taken with a severe headache and as it did not yield to treatment, he was later taken to St. Luke's hospital, at Chicago, and was there examined by a number of specialists, who after exhaustive tests diagnosed the trouble as either a tumor or a tubercular growth at the base of the brain, where it could not be reached by an operation or by medicines.

Construction News

Charleston, S. C.—The Carolina, Clinchfield & Ohio R.R. Co. will build large coal docks at Charleston in anticipation of export trade following the opening of the Panama Canal. The docks will cost $600,000 and will be financed through the Clinchfield Coal Co.

Boston, Mass.—The Island Creek Coal Co. proposes to build a dock at the head of the Lakes, which will be one of the most modern coal-handling plants at the Twin Ports.

Belleville, Ill.—The Missouri & Illinois Coal Co. will build and equip a new tipple at the St. Clair mine, near Freeburg, Ill. A new power plant and electric haulage system are now being installed.

Salt Lake City, Utah—The United States Coal Co. is about to open a coal mine upon its land three miles west of Kemmerer, Wyo. Bids are wanted for driving two slopes 1000 ft. in the coal. C. V. Gould is engineer.

Kansas City, Mo.—The Lowe Pilgrim Mining Co., with $25,000 capital stock, has been incorporated by E. C. Gussman, W. C. Dillon and E. J. Dillon to equip and operate mining property owned by the incorporators.

New Publications

FATAL ACCIDENTS IN AND ABOUT THE MINES AND QUARRIES OF THE UNITED KINGDOM DURING THE YEAR 1911. Darling & Sons, Ltd., 34 to 40 Bacon St., London, E. 9 pages.

The report on British accidents is already on hand. Allowing seven days for it to reach our hands the report must have been published before Jan. 19. This unequaled rapidity might well be commended to the dilatory inspectorates of the various states and Nation. The report is not dated and appears without the customary letter of transmission to the Secretary of the Home Department, so anxious is the chief inspector to get his report into print in suitable time. The more detailed report will follow later, but even this advance proof contains six full-page tables.

The number of fatal accidents in such British mines as are covered by the Coal Mines Regulation Act decreased considerably in 1911, as was foreshadowed in our issue of Jan. 13, in an article entitled "Larger Coal Mining Catastrophes." Both the number of separate accidents and the deaths resulting therefrom were reduced, the former from 1242 to 1206 (2.9 per cent.) and the later from 1775 to 1259 (29.1 per cent.) The reduction in the number of accidents was so slight as to suggest that at any time, years as high in death rate as was 1910, may well recur. An explosion or mine fire is accompanied by a large or small death rate, according to the number, great or small, exposed to its violence or poisonous influence.

The report shows a reduction in deaths from explosions of gas and coal dust of 92.7 per cent. Accidents from roof falls have decreased slightly, but not enough to show the value of systematic timbering. It will be remembered that recently in British mines local regulations ("by-laws") were made requiring certain definite spacing and methods for timbering, and it was hoped that by the introduction of these new measures a great falling off in the death rate from falls of roof would be apparent. Shaft accidents appear to have increased, but miscellaneous accidents underground have materially decreased, and a slight improvement is to be noted in the number of surface accidents.

Trade Publications

Stromberg-Carlson Telephone Manufacturing Co., Rochester, N. Y. Bulletin No. 1003. Telephone supplies and telephone construction material. Illustrated, 206 pages, 7½x10 inches.

Ridgway Dynamo & Engine Co., Ridgway, Penn. Bulletin No. 22. Four Valve Engines. 22 pp., 8½x10 in., illustrated. Bulletin No. 24, Alternating-Current Generators. 12 pp., 8x10½ in., illustrated.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

Contrary to expectations the return of mild weather does not appear to be developing any surplus coal. The large tonnages which accumulated on sidetracks during the cold snap have been moved in, and together with the present heavy production, are being readily absorbed, with hardly any perceptible slackening in the demand. This would seem to indicate that the supplies were more seriously depleted than was thought, and it is generally conceded that the trade now is more active than at the same period in any previous year.

The coastwise markets in the East continue strong and active especially in anthracite, the production of which, it is thought, is not equal to the consumption. No spot anthracite is to be had, and the market will probably continue tight up to Apr. 1. Bituminous is somewhat slower but in good demand.

In the Pittsburg district the mines are working well up to capacity and prices continue hard and steady with even a slight increase in slack; railroad deliveries here are still slow. The Ohio field reports January one of the best months in the history of its coal industry. Some steam plants have been compelled to close down through lack of fuel and while transportation is still crippled to a certain extent, the mines are working well and heavy tonnages are being moved.

The market in the Middle West is softer, but prices are ruling fairly strong. Transportation troubles are still in evidence and another cold spell would probably make the situation acute, as the equipment on the railroads appears entirely inadequate. Some manufacturing plants are reported to be making arrangements for storing. Conditions in the Rocky Mountain States and on the Pacific Coast remain normal and unchanged.

Boston, Mass.

The interruptions to transportation, following closely upon the holiday suspension in mining, have materially affected the Eastern situation, and an active market has prevailed. Stocks are lighter than at any time so far, and prices of bituminous at all points are correspondingly higher. The heavy demand for contract coal shows no let-up and practically no spot coal is for sale.

Bituminous all-rail is now coming through slowly. Cars are short and the better grades from the Pennsylvania districts are practically out of the market.

In anthracite the production is apparently far behind the demand. In what is ordinarily a slow season we find orders entered six weeks ahead, and the outlook is rather complex. The companies are short of all sizes, and some of the individuals all-rail are getting prices from 25@50c. above the circular on stove and chestnut. On Jan. 22, the Boston retail dealers advanced chestnut from $7.50 to $7.75, screenings from $2.75 to $3, and soft coal, net tons delivered, from $4.50 to $4.75.

Water freights are unchanged, $1@1.10, Virginia ports to Boston. A rate of 80c. was paid this week, New York to Providence, establishing a new record on the sound.

Current prices are as follows:

Clearfields, f.o.b. mines	$1.20@1.45
Somersets, f.o.b. mines	1.30@1.50
Pocahontas, New River, Boston, on cars	4.25@4.75
Pocahontas, New River, Providence, on cars	4.15@4.50
Pocahontas, New River, for shipment, f.o.b. Hampton Roads	2.70@2.75

New York

The market here is now very firm. Reports of poor car supply are heard on all sides and the railroad movement to tidewater is unusually slow. Consequently the stocks on hand at the piers are considerably reduced and the better grades of coal are almost without exception out of the market. There is a strong demand for high-grade steam coals and shippers handling these grades have turned down considerable business offered them this week, because they have not been in a position to take care of obligations already booked and consequently are not able to take on additional business.

Inferior steam coals can be secured without much trouble and although there is not much tonnage of this grade of coal on hand at the piers, it has been possible to buy West Virginia steam coals this week at from $2.50 to $2.60 f.o.b. while ordinary Pennsylvanias have been offered at $2.65 to $2.70 f.o.b.

Loading at the piers is still slow on account of frozen coal but one warm day was experienced this week which was of great assistance to the piers in enabling them to catch up on their orders. Loaded boats have not been so much in demand but it is reported that a few have been sold on the basis of about $3 alongside for ordinary grades.

Consumers along the line are beginning to feel the effects of the slow movement on the railroads and an increase in orders is a result of this condition.

Philadelphia, Penn.

The retail trade in this vicinity still continues to be of the best. The week started in with very seasonable weather, a snow storm followed by a coating of sleet, thus adding to the dealers' troubles. There has been no apparent diminution in the demand for all sizes, and the cry of the dealers is that they cannot get the coal. Stove, chestnut and pea still continue as leaders, with a good demand for egg and the other sizes. As a matter of fact, many house holders have been compelled to use egg size, in the absence of stove or chestnut, it being impossible for them to wait until the dealer could furnish what they wanted. The ending of January is in marked contrast to that of the same month a year ago, as at that time, retail trade had commenced to lag a little.

The wholesale trade still enjoys a period of prosperity. As one large operator put it, conditions are about the same as if the strike were already on and dealers have sufficient orders booked to cover the output for February. There is no cutting of prices by the individual operators and prices are stable for all kinds, with the possible exception of the smaller sizes, for which a premium is being asked and received. Buckwheat, which has not always found a ready market at this season of the year, is moving freely, and it is necessary for some of this coal to be picked up from stock. Taking altogether, the wholesale market has an excellent outlook for a month to come, at any rate, and after that, the fear of trouble at the mines will be a controlling factor.

The bituminous trade still continues to be anything but favorable. Good coal is being offered in the market at concessions, and few takers at that.

Pittsburg

Bituminous—Wage - scale negotiations at Indianapolis, in connection with the annual convention of the United Mine Workers, are purely perfunctory, neither side having had the least expectation of

an agreement being reached. The operators have demanded a reduction and the miners an advance. The technical position is that the miners caucused last night, formally deciding there was no chance for the operators' demands to be accepted. Today the joint conference will probably turn the question over to a sub-committee, to see if a basis for negotiation can be reached, and as no such basis is likely to be found, a disagreement and adjournment will probably occur before the end of the week.

Nothing has occurred, and nothing is likely to occur, to change the original prospect, which was that there would be a suspension of mining, lasting perhaps six weeks from Apr. 1, by which time a compromise would probably be reached on substantially the present scale.

Mines have operated more steadily, the weather being better and the demand good. Consumers are about ready to begin stocking up, in anticipation of a suspension, and this should keep the mines operating nearly full for the next two months. Prices are steadier since the disturbance due to the cold snap. We quote: Nut, \$1.05@1.10; mine-run, \$1.10@1.15; ¾-in., \$1.20@1.25; 1¼-in., \$1.35@1.40; slack, 70@75c. per ton at mine, Pittsburg district.

Connellsville Coke—Despite continued expectations in some quarters that the end of the holiday period and the end of the extreme cold snap would bring a reaction in coke prices at least part way to the level which prevailed at the beginning of December, prices are as high as ever. On Friday, 1000 tons of prompt furnace coke was sold at \$1.90, and the market continues to be quotable at \$1.85 to \$2, depending on tonnage, etc., there being minor variations from day to day. Two contracts are reported in the past week, aggregating 15,000 tons a month, February to June, inclusive, at \$1.85, which is about the average of what can be done on various grades. We continue to quote: Prompt furnace, \$1.85@2; contract furnace, \$1.80@2; prompt foundry, \$2@2.25; contract foundry, \$2.10@2.25, per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Jan. 20 at 407,185 tons, an increase of 16,000 tons, and shipments at 4526 cars to Pittsburg, 5858 cars to points West and 887 cars to points East, a total of 11,271 cars, an increase of 1900 cars.

Baltimore, Md.

Notwithstanding the fact that there was a decided change in weather conditions here, there is still a rather pronounced activity in the Baltimore market. The demand for coal continued good, and prices remained firm.

Unfortunately, movements from the mines in West Virginia and Maryland are not at all satisfactory. There is also congestion at the port of Baltimore on account of the large quantity of ice which is still found in the Patapsco River and Chesapeake Bay. Fuel is still being received at the railroad piers here in a frozen state, and as before stated, this retards a quick movement. Hundreds of cars received during the past week could not be unloaded until they had been put through the steaming process, which requires time.

Buffalo, N. Y.

The bituminous situation is a little stronger, though the improvement in price is entirely confined to slack. Several shippers state that they have lost good customers within a few days by asking 5 or 10c. more on other grades. One shipper, who complains of slow service from the railroads, undertook to advance the price on the promise of quick delivery, but unless the buyer was entirely out he was uniformly refused.

This unsatisfactory condition of prices is discouraging, especially in view of the near future of the trade, with the miners clamoring for more pay and the contract season coming on. Dealers are declining to make any contracts and they may be obliged to stay out of that market for months yet.

This market is holding its own in the outlying districts, no innovations being reported for some time. There is more Canadian coal on the market in the eastern section of the St. Lawrence district than there used to be, but the consumption is still increasing quite fast. The movement through the state is good, but shippers to tidewater mostly complain both of orders and of the scarcity of ocean tonnage.

The price of bituminous continues the same for sizes, but with slack quotable 25c. higher. Pittsburg three-quarter is \$2.50; mine-run, \$2.40; slack, \$2.25, with Allegheny Valley about 25c. less. Coke continues to improve slowly, but prices are the same, on the basis of \$4.25 for best Connellsville foundry and \$3.50 for stock coke.

The anthracite trade is strong, the severe weather alone being sufficient for that. The stove size is still scarce and chestnut is short. Already stove is giving out in the West and there is complaint that since the holiday season there have been conditions to hinder full work at the mines. The weather has interfered with production of late, the Pennsylvania mines generally reporting record cold weather much of the time in January.

Cleveland, Ohio

Conditions during the past week in this market have materially changed, owing to milder weather prevailing. There has, however, been a steady demand for domestic lump, and a much better call for mine-run, with prices from 10 to 15c. per ton in advance of two weeks ago. On account of the large quantity of lump coal being mined, slack prices have decreased from 10 to 15c. per ton, and a congestion of slack in this market has been evident during the past week.

During the severe weather some three weeks ago, large orders were placed for domestic lump, as well as mine-run, for steam purposes, and also slack coal. Owing to the snow blockades, railroads were unable to deliver promptly to the different markets in this section, and when they could handle this coal, large quantities arrived at once, especially that of slack. The domestic coal and mine-run were quickly bought up, but the slack became a drug on the market, so that prices were reduced in consequence.

Operators are holding up firm on Ohio slack at 90c.; Middle district, 95c.@\$1; Pittsburg, \$1; West Virginia, from 65 to 75 cents.

In the outlying districts, large manufacturers are taking in all the slack they can conveniently handle (also the large steam users in Cleveland) in preparation for the probable strike in the bituminous and anthracite fields.

Columbus, Ohio

While the weather has moderated to a certain extent and railroads are not materially delayed, still coal shipments are in a demoralized condition and operators, jobbers and retailers are suffering as a consequence. Railroads have been unable to move large shipments of coal promptly and in some instances cars have been delayed on the road from three weeks to a month.

The greatest trouble in railroad shipments is with the connecting lines and not with the initial carriers although the latter are in pretty bad shape. On the Hocking Valley Ry. the equipment is better than on other coal roads of the state. The B. & O. and T. & O. C. appear to be in bad condition.

The Hocking Valley district is probably producing a larger tonnage in proportion than any other part of the state. In eastern Ohio the output is below normal and the same is true of the Pomeroy Bend and Crooksville districts.

Prices continue to rule strong in every variety. Fine coal is still the strongest point in the market and prices are slightly higher than a week ago. It is almost impossible to secure any quantity of nut, pea and slack and coarse slack although West Virginia is helping out the market to a certain extent.

Considerable inconvenience has been caused steam users in the delayed shipments and some manufacturing plants were compelled to close down because of lack of fuel. Consumers in the rural districts have also suffered to a large extent.

Prices prevailing in Ohio during the week were:

Domestic lump in Pomeroy Bend district	$1.60@1.75
Domestic lump in the Hocking Valley	$1.50
Three-quarter inch	1.35
Nut	1.15
Mine-run in eastern Ohio	0.95@1.05
Mine-run in the Hocking Valley	1.05@1.15
Nut, pea and slack	0.75@0.85
Coarse slack	0.65@0.75

Cincinnati, Ohio

Improved river conditions within the last few days have materially lessened the tension as to lump coal in this market. All other conditions affecting the trade have remained practically unchanged, with the result that the total change in the general coal market is not marked.

Traffic conditions—that is, as to rail transportation—are as unsatisfactory as ever. These unfavorable railroad conditions have been in evidence ever since the beginning of the year, since which time present improved market conditions, as to demand and prices, have been in effect. Probably at no time during last year was there an entire month as satisfactory as the January just closed was. Unusually severe winter weather kept the domestic demand at the top notch, and was a factor in the steam-coal demand also, since a large amount of nut and slack is used in steam-heating plants in practically all the buildings in the city.

The weather has moderated considerably, but the demand seems to keep up—from the impetus of the previous weeks, if nothing else. There is practically no spot coal to be had now, and conditions are the exact opposite of six weeks ago, when there was an immense amount of fuel on cars. Prices keep up and the indications are that with a little more of winter weather there should be no serious set-back to the market for a long time.

Charleston, W. Va.

Car supply is still the obstacle in the way of increasing the output in the West Virginia fields. This is due to the congested conditions along the railroads, both in the East and West, but there are more complaints coming from the West than in the East. The snows and bad weather have made the movement of trains difficult, and, although there has been an improvement in weather conditions, it has not been of sufficient duration to enable a resumption of work at the mines, because the empties are not yet coming back in quantities.

The output will probably be 30 per cent. under December. Tidewater shipments are reported to have been slightly improved during the past few days. The Virginian Ry. is reported to be handling matters at Sewell's Point without great difficulty, and improvement is reported from Newport News.

Memphis, Tenn.

Memphis has had a new experience in the last two weeks; it has broken the weather record as far back as the memory of the oldest citizens, inasmuch as the thermometer went below zero twice in the same week. Such weather caught the smaller dealears of this territory practically without coal. However, the larger dealers were well stocked and able to take care of the situation.

The mines which supply Memphis territory are now demanding and getting better prices than they have been able to get for the past two years. Wholesale prices at the mines are as follows:

Kentucky lump	$1.50@1.75
Nut	1.00@1.35
Mine-run	1.00@1.15
Alabama lump	2.00@2.50
Alabama nut	1.75@1.90
Jellico	2.00@2.25
Jellico block	2.25@2.50
Cahaba coals	2.50@3.00

As usual the southern cities, particularly Memphis in extremely cold periods, did not advance the price of retail coal, our prices remaining the same as prior to the extremely cold weather; that is, as follows:

Kentucky lump coal	$4.00
Kentucky nut	3.50
Alabama	4.25
Jellico	4.75
Cahaba	4.75@5.00
Screenings	2.10@2.65

Nashville, Tenn.

One week of pleasant weather has helped in a measure to relieve the situation which a week ago looked critical, although the car shortage has improved but little, and supplies are still short in the cities.

Another cold spell of weather, with an inadequate supply of cars, will place this field in nearly the same condition it was in a week or 10 days ago. It is a weather market pure and simple. The dealers are trying to place themselves in the position of not running out of coal during February in case of a protracted spell of bad weather; consequently they are ordering in large quantities.

Indianapolis

The alleged holding of coal cars by the railroads during the cold weather, made it impossible to get Indiana coal to the market. This resulted in increasing the price on an average of 25c. a ton, and the subsequent spasmodic movement, has all occasioned the markets to be well supplied, but the advance price is still maintained.

The operators and coal dealers blame the railroads for these conditions, while the railroads say they ran out of engines and could not keep the engines they had from freezing. The Duane yards, a great distributing point near Terre Haute, was jammed with coal cars which could not be moved until the railroad commission took a hand and insisted on its going forward. Nearly 800 cars were side-tracked at Clinton, and were not moved for about a week. The operators had both the orders and the miners to run full time, but now the mines are being operated only two or three days per week.

Chicago

Softened prices are prevailing in Chicago, the market having fallen about 25c. on prepared sizes of coal and from 25 to 50c. on the fine coal.

Transportation service by the railroads has been unusually poor. The Erie R.R. has had 2000 cars of coal at two junction points which it could not move and the Illinois Central has done comparatively little toward moving coal. Smokeless has been governed by the transportation situation. It would be comparatively easy to get $2.25 to $2.50 for lump at the mines if there were any for sale. The supply of screenings has been just about equal to the demand. The high-grade screenings have been selling from $1.25 to $1.50 at the mines, while medium grades command from $1.15 to $1.35. There has been an exceptionally keen demand for anthracite, and coke is strong at previously existing prices.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.62@2.87
Steam lump	2.37@2.62
Screenings	2.02@2.22
Springfield:	
Domestic lump	$2.57@2.82
Steam lump	2.32@2.57
Mine-run	2.32@2.57
Screenings	1.82@2.32
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.27@2.52
Mine-run	2.27@2.52
Screenings	1.87@2.12
Pocahontas and New River:	
Mine-run	$3.15@3.30
Lump and egg	4.20@4.30

Coke—Prices asked for coke are: Connellsville and Wise County, $4.50@4.65; byproduct, egg and stove, $4.85; byproduct, nut, $4.55@4.65; gas house, $4.85.

Minneapolis—St. Paul

Unexpected in a large measure and more or less unaccountable has been the demand in the Northwest for the month of January. Dockmen say never before has the demand been so heavy at the head of the lakes. The temperature for the month has been the lowest in history for the Northwest and many towns would have suffered coal famines if the retailer had not been loaded with supplies when the severe weather set in. As it was, small towns on the stub and branch lines have sent in urgent appeals for help and railroads have been forwarding special trains.

At this writing the exact shipments have not been announced but it is estimated that 50,000 cars of coal have been sent out from Duluth and Super-

ior this month. The retail trade is, of course, unusually busy and teams are reported scarce. No change in the retail price has been made.

St. Louis, Mo.

Conditions opened up quite favorably the early part of the week, although the closing of last week brought prices down to the level they had been before. Last week closed with Carterville egg and lump at \$1.50, nut at \$1.35, and screenings at 70@85c. Mine-run was bringing from \$1.10@1.20. The news from Indianapolis this week has caused some comment, and a great many of the manufacturing plants are arranging for storage facilities.

Standard coal got down to as low as \$0.95@1 for 2-in. lump, but, with the beginning of this week, both the Carterville and Standard coals showed an inclination to move upward. Mount Olive, while starting off at \$1.75 the early part of last week, went down to \$1.50 and started off the early part of this week at the same figure.

The smokeless market is good, but the coal is hard to get in, and prevailing prices here are \$1.50 for mine-run, and \$2.25 for egg and lump, with a \$2.50 rate. The demand for anthracite has been exceedingly good, but there is little moving in, although plenty has been ordered, and chestnut and stove sizes are rather free. Coke has been in exceedingly good demand at \$4.75 for gas house and \$4.90 for byproduct.

One mine in the Herrin district reports not having any Illinois Central cars between Jan. 5 and 26. Last week several mines in the Standard field only had a half-day's work. The Iron Mountain and Frisco have done remarkably well this winter, and prospects are that they will continue to do so, but there is absolutely no hope at all for conditions bettering on the Illinois Central. The roads in the Standard field are giving good service—have plenty of motive power and equipment, although they have restrictions on the latter.

Spokane, Wash.

The cold weather which has been prevalent in the Northwest for the last week has moderated to such an extent that the coal sales have been reduced very materially. The stocks in the yards of the local dealers are plentifully supplied, and are being increased daily with shipments from the mines.

The prices remain the same as they have for the last two months. Several towns in Southern Canada and in the mountains have had a scare about a fuel famine on account of the blockades on the roads in the mountains. However, they seem clear now and no shortage is expected in this section of the country during the balance of the winter.

Portland, Ore.

Mild weather is still prevailing here, and the demand for coal continues light. The Southern Pacific Ry. this week announced reduced rates on fuel oil to points south of Portland, and this will probably mean the consumption of larger quantities of oil to the detriment of the coal trade. The reduction ranged from 15 to 30c. per barrel, according to distance. The announcement was made that the reduction was brought about in order to stimulate manufacturing. Loggers and lumber manufacturers will draw the greatest benefit, as they have introduced oil fuel for donkeys and logging-road locomotives, because of less danger from spark fires.

Production and Transportation Statistics

Pennsylvania R.R. Co.

Statement of coal and coke carried by the P. R.R. Co.'s lines east of Pittsburg and Erie for December and year 1911.

	December	Year	Increase or Decrease
Anthracite..	1,214,805	11,[illegible],149	+360,916
Bituminous..	3,981,486	42,[illegible]19,445	+921,533
Coke.......	910,971	1[illegible],639,107	—2,183,588
Total.....	6,107,262	65,015,701	— 901,139

The Virginian Ry. Co.

The total shipments over the Virginian Ry. for December, 1911, were 258,869 tons.

The Baltimore & Ohio R.R.

The coal and coke shipments over the lines of the Baltimore & Ohio R.R. for the month of December, 1911, and for the same month of the previous year, were as follows, in short tons:

	1911	1910
Coal..............	2,468,943	2,409,710
Coke..............	313,821	314,545
Total...........	2,782,764	2,724,255

The Car Situation

On Jan. 17 the net surplus of idle cars on the lines of the United States and Canada stood at 90,285 as compared with 135,938 two weeks before, a difference of 45,653.

In the two weeks ended Jan. 17 the surplus of coal cars decreased from 64,719 to 42,770 and the surplus of box cars decreased from 36,145 to 23,111. Surplus of miscellaneous cars decreased about 5000, but the number of idle flat cars remained the same as in the last report.

Foreign Markets

Great Britain

The market is dull and several Admiralty descriptions are a little easier for prompt shipment. For forward loading most sellers prefer to hold. Quotations are approximately as follows:

Best Welsh steam coal..........	\$4.68@4.80
Seconds....................	4.50@4.62
Thirds.....................	4.20@4.44
Best dry coals..............	4.26@4.38
Best Monmouthshire..........	4.26@4.26
Seconds....................	3.96@4.02
Best Cardiff small coals........	2.52@2.64
Seconds....................	2.34@2.46

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days less 2½% discount.

Cuba

Exports of bituminous coal from the United States to Cuba for the year 1911 were valued at 2¾ million dollars as compared with 1¼ million for the year 1903.

Financial Notes

The coupons due Feb. 1, 1912, of the first mortgage sinking fund 6% gold bonds of the Central Iron & Coal Co. will be paid on and after that date.

Over 80% of the Cumberland Basin Coal Co.'s first and second mortgage bonds has been deposited with the Safe Deposit & Trust Co., of Baltimore, depositary under agreements dated Dec. 13, 1911.

The Dominion Iron & Steel and the Dominion Coal Cos., at recent meetings, each authorized the issue of \$3,500,000 of income bonds which they are authorized to exchange for the preferred stocks of the Dominion Steel Corporation. A resolution was passed confirming the previous resolution to issue 70,000 preference shares to the value of \$7,000,000.

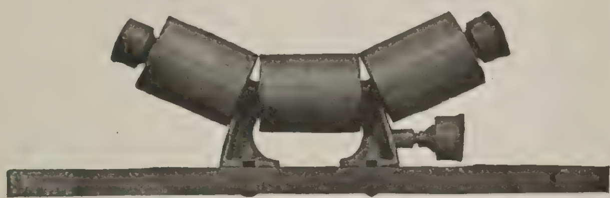
The City Fuel Co., Chicago, incorporated in Illinois as the Reliable Fuel Co., changed its name on Nov. 10 to City Fuel Co., and increased its capital stock from \$5000 to \$4,200,000, all outstanding (par of shares \$100), consisting of \$2,000,000 common, \$2,000,000 cum. 7% pref. and \$200,000 cum. 6% sinking fund pref., this last being retirable \$30,000 yearly out of earnings. No bonded debt.

With the further rise of Jersey Central to 337, a new high record, financial circles have become convinced that the time for a division of that road's coal properties is near. Jersey Central owns 97%, or \$8,491,150 of the \$9,212,500 stock which the Lehigh & Wilkes-Barre Coal Co. has outstanding. Disregarding the 3% minority interest, the Jersey Central could capitalize the assets of the coal company at \$27,436,800, and give the railroad's shareholders a dividend of 100% in stock. On such a capitalization the coal company could earn practically 8%, as its yearly income for dividends can conservatively be placed at over \$2,200,000.

Reorganization of Rhode Island Coal Co. will probably be effected by forming a new company. Present company has 500,000 shares authorized, of which 420,000 are outstanding. Holders of floating debt amounting to \$575,000 will probably take new stock at \$3.50 per share. If the plan is carried out the new company will have \$500,000 cash after payment of floating debt. In the reorganization President Henry M. Whitney, as owner of substantially all of the company's floating debt of \$575,000, virtually offers to accept in settlement a trifle less than 60c. on the dollar. On sales of several thousand shares, this stock broke recently on the Boston Curb Exchange to a new low point of 33c., off 12c. from the previous close. Fears of a heavy assessment are supposed to account for the renewed selling.

"Link-Belt" Belt Conveyors

We have manufactured and installed Belt Conveyors for purposes for which they were suitable for upwards of 20 years and are furnishing the most efficient and durable equipment to-day.



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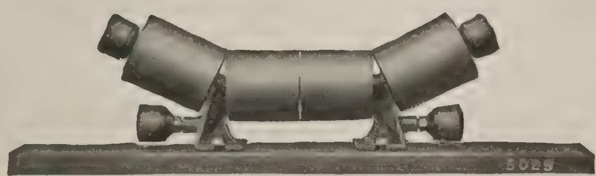

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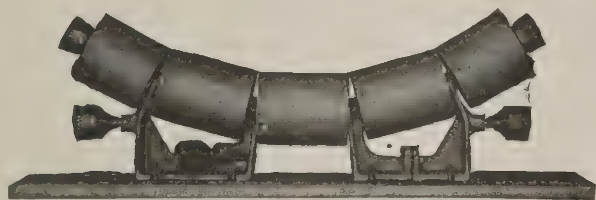

Standard. 5-Pulley Idler (Patents Pending)

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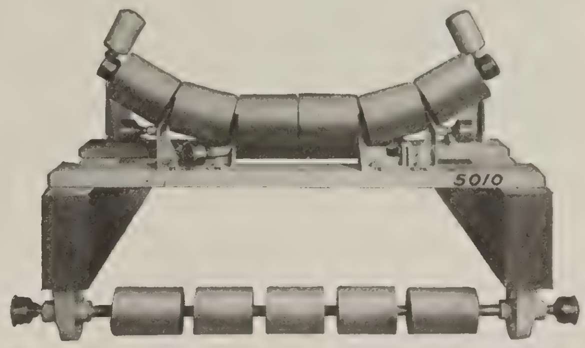

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Elevators and Conveyors for the efficient and economical handling of materials of every description.

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Classified Index to Articles Advertised

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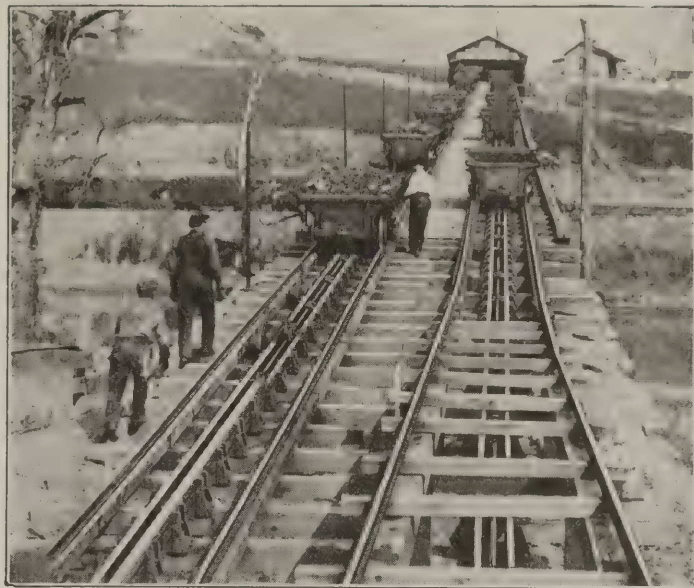

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What Lubricant will you use on your engine?

Will you buy some "just as good" lubricant, because some theory seems to prove that it ought to be a good friction reducer?

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Advertisements under this heading 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

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Advertisements under this head 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Wanted—Position as mine foreman or assistant superintendent; have had 25 years' experience in West Virginia and Ohio coal; have filled all positions from trapper boy to mine foreman; desires position in West; can give references. Address Box 10, Coal Age.

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1. No. 18.
Issued Every Saturday.
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NEW YORK, FEBRUARY 10, 1912

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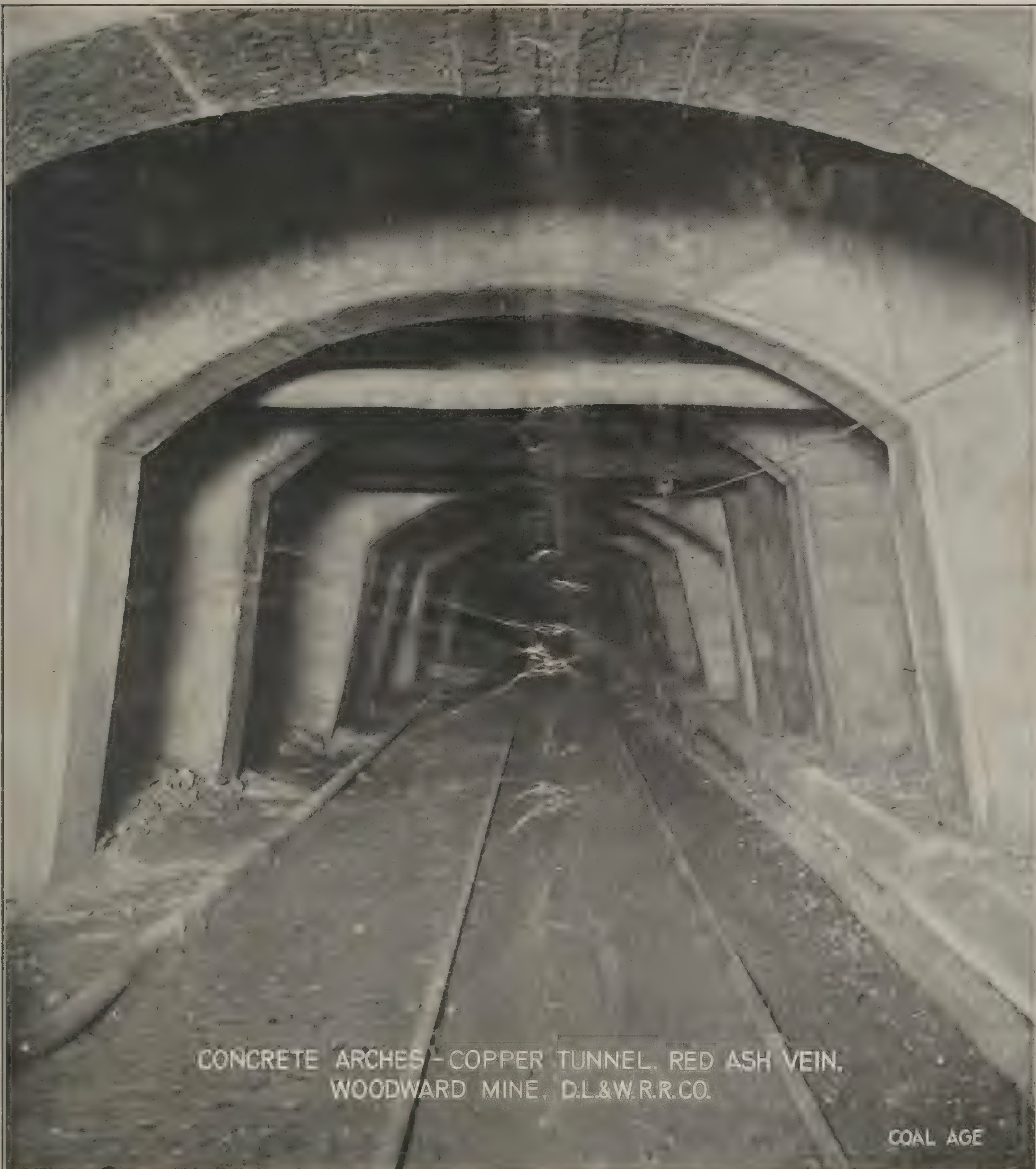

CONCRETE ARCHES—COPPER TUNNEL, RED ASH VEIN,
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COAL AGE

C A

COAL AGE

Vol. 1 NEW YORK, FEBRUARY 10, 1912 No. 18

ONE of the greatest hindrances to success in mine management is the lack of close observation on the part of officials. The original man is to be admired, and initiative should be commended, but the fellow worth while is the one who can supplement such virtues with an ability to cull the best ideas from everyone with whom he comes in contact.

And by observation, we don't mean simply a casual glance that only records the fact and fails to analyze the cause. Thousands of people had seen the cover of a tea-kettle forced up by steam, without pondering the occurrence, but to Watt the phenomenon meant something, and he was soon busy applying his ideas to perfecting the steam engine.

Perhaps a million people, before Archimedes, had observed water run over the side of a vessel when another substance was immersed in it, but no one had sufficient curiosity or ability to examine the matter in detail and give the world the laws of specific gravity.

A close observer can learn from the mistakes of the uninformed as well as from the correctness of the wise. We don't always have to visit the most modern plants to secure ideas that will help us at home. Frequently, much benefit will be derived from watching some other fellow give a demonstration of "how not to mine coal."

Success of one kind or another is what we are all striving for, and no one element is so indispensable to a prosperous outcome as attention to details. Truly! great deeds excel great thoughts, and all of us like to plan big things, but we lose enthusiasm when confronted with the drudgery of cleaning up the minor particulars. The manager of a coal mine may be brilliant, but if among his defects is included an incapacity for the small essentials, then in truth he is like the dancing master who had every qualification except that he was lame.

Recently, in COAL AGE, one of our most famous geologists called attention to the vital necessity of making a careful examination of coal measures before concluding final plans and starting development work. And few of us but know of the sorry mess some men have made in the location of a shaft or drift, when a careful analysis of the original situation would have saved the operating company thousands of dollars in pumping or haulage.

You say you are observing! Well, stop one minute and ask yourself how many steps lead up to the door of your house, or how many letters there are in your name. You've climbed your steps every day for a year, and written your name thousands of times; still your observation was entirely general. Hasn't it been just as superficial when you walked about your plant and through your mine?

Of course, you know the number of men you employ and their daily output of coal; the quantity of water to be pumped and the volume of air required—chief items that affect daily expense. But how about the lesser details—waste of timber, iron, nails, oil and other supplies; cost of steam, charges against mine-car repairs, loss of electric power through poor rail-bonding and defective insulation, resistance of cars to traction—these are a few of the leaks that drain the exchequer.

Successful men have been remarkable because of their minute attention to small things. Like the elephant, they can move colossal masses or pick up a pin. The difference of intellect in men results more from a cultivation of the habit of attention, than from any great disparity between the mental powers of one individual and another.

Furthermore, our interest in things about us always increases in direct ratio with our knowledge of them, and our knowledge results largely from close observation. No man is less brilliant in the great things of life because he pays attention to the lesser essentials. Details are the mortar which binds the great walls of our daily operations.

Determinants of Coal Thickness

By R. Dawson Hall

Structural rolls in strata may be coeval foldings. If so, they will modify thickness; if noncoeval, the coal will pass over the anticlines and synclines without change. The thickness of a peat bog under pressure decreases as the cube of its linear dimensions. Some increases in thickness are due indirectly to erosion.

As the coal thickness depends in some degree on the structure of the measures of which it forms a part, a few preliminary words on that structure may not come amiss.

The structural rolls in strata may have been existent or developing when the strata were laid down; such rolls we term "coeval." Many were developed from stresses more recently imposed on the measures; for instance, the Appalachian coalfields were slightly rolled during the time the coal was being deposited, but later a severer stressing took place, known as the "Great Uplift." The first flexures we know as "coeval" rolls and the latter as "non-coeval." The Pittsburgh bed shows the former rolls not nearly so plainly as the beds of the Allegheny series. Probability favors the idea that it was laid down during a period of profound rest, when the motion of the measures was slow and of like sign, up or down, over large areas.

Not so was the condition during the deposition of those beds we class together under the caption "Allegheny," nor even in the time immediately following the laying down of the Pittsburgh Bed, when the pre-Sewickley rock and the Sewickley coal bed were deposited. Frequent rolls and constant variations of thickness mark the Allegheny or Lower Productive coal series. The variations of thickness will make a bed like the upper Kittanning run from 14 ft. to 2 ft. in a furlong of horizontal distance.

The lower Kittanning and the Freeports give reassuring thickness in the coeval depths followed by thinnings on coeval hilltops. It is the lack of recognition that all dips and hills are not coeval (that is existent when the coal was deposited) which has caused many people to formulate the untenable theory that coal thickens in all dips and thins on all domes and ridges and to be disappointed in the showing made by coal beds in dips where the folding occurred after the coal was lignitic or even of harder structure.

The Dips of the Allegheny Series.

The directions of the folds of the Great Uplift vary from 10 to 45 deg. east of true north, whereas the folds of the Kittannings in the Lower Productive series are almost due east. There is no mistaking the existence of the latter for, where the measures are flat, they can be traced in the lower and upper Kittanning beds for miles. The basins are 30 ft. deep and over, in many places, and have side-slopes with 6 to 10 per cent. grades. The coal thins as soon as the rises are encountered. A field of coal, which ran almost uniformly 30 in. in thickness, showed 4 ft. in a long dip running across it. The basin occurred in the lower Kittanning bed and was very regular, both in line and thickness of deposition except where such dips occurred.

I am well acquainted with the bed just mentioned and it is invariably crossed by these little synclines, which, strange to say, often affect the cleat of the coal as much as 15 degrees. These dips do not

Fig. 1. Crossing of Structural Folds

appear to reproduce themselves infallibly in the Freeport measures above. The dips in those beds seem to be less continuous, and rather of the bowl-shaped order. The shrinkage of the Kittanning peat beds must have been very complete before the Freeports were laid down or the dips in the former would be immediately overlaid by those in the upper bed and would be coterminous with them, which does not appear to be the case.

The whole subject needs careful study where both beds are being worked, but unfortunately, in the region where both are operated, contouring of the coal floor and the use of superposed maps is not usual, the interval being great enough and sufficiently strong to make columnization of the pillars unnecessary, with the result that correlative mapping is not appreciated. Moreover, the beds are thin and caving is rarely complete.

Coeval Dips are Often Disguised

In view of the shrinkage of the lower beds and their failure on the whole to influence the surface on which the Freeports were laid down, we must expect to find the interval increased where the coal thickness in the lower bed is greater, if meantime other foldings do not occur to modify conditions.

It must be remembered that, when in crossfolding a minor dip is elevated to the flank of a larger fold, that minor dip may cease altogether to be a dip, as shown in the Fig. 1 at *G*, and become merely a decreased rise, but its original existence as a dip may not be gainsaid. Moreover, the effect of the coeval hill crossing the cross section at *D* is to move the apparent location of the syncline of Great Uplift at *E* to a point *F* nearer the flank of the anticline.

It is, of course, true that the Federal maps show structural contours which are, in a measure, really the composite result of all flexure and not merely of the Great Uplift, but in central and southwestern Pennsylvania, at least, the lines mainly exhibit that great convulsion and not the smaller crossing curvatures. Farther west the charted synclines are more contorted as they combine in one, the past with the remote past. There the flexures are more equal. It seems a pity that an attempt is not made to record these coeval flexures, tracing their progress from quadrangle to quadrangle. Structurally not so evident, economically they have even a larger value. And it might be not amiss here to suggest names for such coeval synclines and anticlines whether they be coeval with coal or coeval with other sediments. Such synclines might be termed "vallines," and such anticlines "collines."

The Law of Shrinkage.

The only basins which effectually modify the thickness of a coal bed are those basins the formation of which is coeval, or approximately coeval with the deposition of the seam. Where coeval, the peat probably filled the basin so that it was level with that on the undepressed portions or on the anticlines. But the peat has shrunk considerably. Still the peat residue covers the original area but its thickness has been reduced in proportion to the cube of the lateral reduction. If a cubic yard has shrunk to one-third of its former linear dimensions, the thickness of a cubic yard has become 1/27 of its former thickness for the lateral spread has in no way changed, this spread being maintained constant as a result of superincumbent pressure and friction.

Fig. 2 labors to make this fact more obvious. The cube on the left represents a cubic yard and that on the right the same cube shrunk in three directions to one-third of its former linear dimensions.

The little strip marked off on the large cube at its base shows to what diminutive proportions vertically that cube will be reduced when the vertical dimension is shrunken to such a point that the volume of the strip is equal to the volume of the cube to the right. The depth of that strip will be but 1/27 of the full height of the original cube.

This fact makes it hard to account for variations of thickness such as the middle and upper Kittanning beds exhibit, in valleys unequal to such depths of deposition as would account for such variations. Many theories might occur, either that the bogs slid into place from a distance after they had already been subject to a large amount of shrinkage, or that the time of deposition was so long that the lower layers were well contracted before the upper were deposited and that was doubtless true in almost every case, or that the deeper portions of the bog shrinking more than others, drew away portions of the shallower. We may dismiss as wild the suggestions that these peats shrank less than others because they are often of cannel and, therefore, have a pore-like structure and the amount of ash is not excessive. It appears probable that the first surmise is correct as the beds are by no means reliable consisting often partly of cannel and partly of ordinary bituminous coal.

Nevertheless, the shrinkage of the bog during deposition and the consequent fluid movement, must often have modified its depth where the floor on which it lay was uneven.

Possible Decrease of Thickness in Dips

Rolls in the strata, occurring later, folded them, but did not change their thickness, but if a heavy deposit of silted material should fill up the depressions of these rolls, then there would be more pressure in the dips, and any plasticity in the peaty coal would cause it to flow away from these synclines toward the anticlines adjacent.

The action would not be marked, because of the little plasticity remaining in the coal, its naturally fibrous condition, the friction of its contacts, and the fact that the motion is against the operation of gravity.

It is for this reason that we look for thick coal, not where the charted synclines appear on the Federal maps, for these large synclines are to be dated thousands of years later than the coal depositions, but to those uncharted synclines of even date with coal depositions, concurrently created with the growth of the coal forest.

To use the Georges Creek field as an illustration: The coal in the bottom of the basin at Consolidation No. 10, the former main pumping shaft, is not thicker than the coal which lines the slope of the syncline. But as we go southward up the southern end of the canoe-shaped fold, the coal gets thicker, and all the intervals grow larger, because the southern end of the field suffered a depression during the coal era, which was more than negatived in places by contrary and cris-cross flexure later. But the original folding, while scantily modifying the final lie of the Pittsburg coal, made a modification of 4 to 6 ft. in its thickness. This action is not peculiar to Georges Creek; in countless places it is exhibited in larger or smaller degree over the whole earth's crust, carboniferous or non-carboniferous.

Coal Thickness in Anthracite Region

This consideration is not addressed to those engaged in anthracite development. Having seen plications of great magnitude and coal, thickening and thinning without regard to them, the hard-coal geologist would entertain no such fallacy as appeals to the operator of the Allegheny series of bituminous coal-beds, to wit that "where there is a dip, there thick coal will be found." It will be recalled that it was in a bituminous field, in Elk county, that Leslie and Ashburner, of the second Geological Survey, found it necessary to declare that the anticline coal was as thick as that of the syncline.

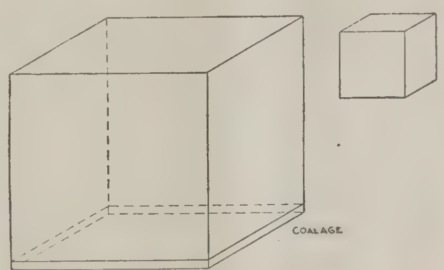


Fig. 2. Diagram Illustrating Restrained Shrinkage

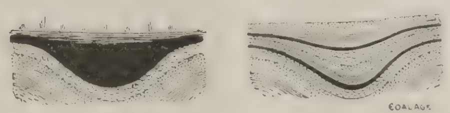


Fig. 3. Showing Peat During Formation, and After Shrinkage

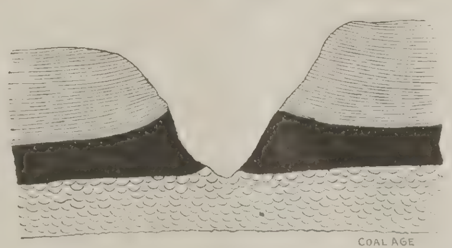


Fig. 4. Coal Beds Thickening toward Stream

The coeval and near-coeval dips probably exist in the anthracite region, but are only faintly to be discerned where such violent upheavals have occurred. In fact, an anthracite expert would be prone to say dips do not control thickness because the larger foldings, the only foldings which the present conditions permit him to identify, are not marked by a change in bed-content.

Hence we do not seek for thick coal in the more recent and major plications, but in those which date their rise to the period either prior to the deposition of the coal, or contemporaneous therewith.

Erosion and Coal Thickness.

And again there was another cause of coal thickening, not inoperative to-day, when the seams are but little subject to plastic flow, but very much more operative when the peat bog yielded freely to every inequality of pressure. To-day we often find that where recent erosion has relieved large areas from pressure, where valleys 400 or 500 ft. deep have been carved in ancient measures, there has been a flow of all plastic bodies, bituminous coal, clay, and soft shale toward the outcrop. There these beds are thickened, though often partly washed thin again, where the very edge of the measure is reached. Far more, where erosion has developed soon after the deposition of carboniferous strata, the plastic measures have moved in part toward the unstressed or less stressed areas, to pile up along the outer lines of the eroded districts. The sandstones and slate were then more feeble to resist the powerful stresses of such fluxions and lipped up freely near the edges.

And thus we find an eroded area, a fault, we term it, of erosion, lined out significantly with areas of thicker coal and clay, surmounted by weakened slate and sandstone.

Where erosion has been extensive, the peat bog may be lifted and deposited during floods at some distant point, or even over the same seam, making a very thick bed with or without a binder. When redeposition takes place, the speed with which the fibrous mass is thrown forward may cause the resulting coal to lie at a sharp angle, the rapidity of its motion thrusting the upper end far up above the level of the water conveying it.

All portable mine pumps should be used with motors which can be thrown directly on the line without the use of a starting device, and without taking an excessive current. In case the power fails temporarily, such motors start themselves when it returns. All switches for use with such motors should be properly fused.

Needless Waste of Grease and Oil

By E. L. Cole

Grease and oil can be saved if a scientific examination is made of the needs of each part lubricated, and if a proper sense of responsibility is created among oilers. A series of forms publicly posted will call general attention to the efficiency of each man's use of the oil entrusted to him.

The general manager of a large coal mining company paused as he was about to affix his signature of approval to the ever increasing oil bill of his corporation, and as he looked over the bills for the previous ten months he came to the conclusion that here was a financial leak that could possibly be stopped. He detailed a young clerk in his employ to ascertain if possible, how the worrisome oil bill could be reduced without detriment to the well being of the machinery. Early on Monday morning he started on his tour of inspection to various collieries, his first stop being made at a fan engine-house: Taking out his stop watch, he carefully counted that in one minute 110 drops of cylinder oil entered the chest of the 12x12 cylinder of an engine running at 110 r.p.m. Scattered about in various parts of the house, were divers vessels containing cylinder and engine oil, while on the door step was a powder-keg overflowing with a heavy strap oil for use in the journals of the fan shaft.

Waste in Use

The number of drops fed through the lubricator was reduced to 35 per min., and by careful experiments the exact amount required per day was ascertained. The oil for the engine bearings, which had hitherto been fed in a haphazard manner was subjected to similar methods to determine the proper amount needed to oil the bearings adequately, and two oil cans of standard size were placed in the engine room, so that in the future no excuse could be offered for placing oil in open vessels into which particles of dirt would readily fall, seriously impairing its lubricating value. Many gallons had hitherto been wasted in such slovenly methods as were in use. Experiments proved that the large shaft bearings could be lubricated by a low quality of polar grease more economically than by oil, so the use of oil was discontinued. This was ascertained by making careful experiments, which occupied three days, during which time temperature tests of all bearings were taken, with a mechanical engineer's thermometer. In a like manner the proper amount of oil for a safe operation of the entire fan equipment was precisely determined.

A blank similar to Form 1, was made out in triplicate and upon this the clerk in the oil house would enter the amount issued to the fan engineers during the month, and in case the amount was more than the printed figures, a demerit mark was entered, of which I shall have more to say further on.

One of the filled forms was kept at the oil house, one filed at the office for the foreman's and superintendent's use, and one given to the engineer. By this method, all concerned were kept posted and lapses to the careless methods of former days were easily prevented.

M. & M. COAL CO. X. COLLIERY	Aug. 1911	
Fan House	Amount Allowed	Amount Used
Cylinder Oil	3 Gal.	3 Gal.
Engine Oil	10 Gal.	8 Gal.
Polar Grease	5 lb.	4 lb.
% Merit for Balance on Hand	102 %	
% Demerit for Over Drawn %		
Oil Clerk	Engineer	
	Foreman	

Form 1

M. & M. COAL CO. X. COLLIERY	Aug. 1911	
Electric Locomotive	Amount Allowed	Amount Used
Engine Oil	5 Gal	4½ Gal.
Gear Lubricant	1 Pint	1 Pint
% Merit for Balance on Hand	101 %	
% Demerit for Over Drawn %		
Oil Clerk	Engineer	
	Foreman	

Form 2

M. & M. COAL CO. X. COLLIERY	Aug. 1911	
Power Plant	Amount Allowed	Amount Used
Engine Oil	10 Gal.	10 Gal.
Cylinder Oil	4 Gal.	4 Gal.
Polar Grease	1 lb.	¾ lb.
% Merit for Balance on Hand	102 %	
% Demerit for Over Drawn %		
Oil Clerk	Engineer	
	Foreman	

Form 3

Waste by Mixing with Impurities

The next visit was to the motor barn, wherein six 8-ton electric locomotives were housed at night. Right at the entrance was a powder keg filled with sand; and in close proximity, as though keeping company with it, was a battered powder keg containing a high grade of lubricating grease with a fair amount of sand lying on its surface. This had evidently fallen into it while some careless employee was filling the sandbox of the locomotive previous to making the initial morning trip. Investigation disclosed the fact that much expensive lubricating grease was rendered valueless by just such careless methods.

The inspector found that the armature and axle bearing were lubricated with this kind of grease, and it really seemed as if workmen whose duty it was to attend to the bearings, thought that the grease had remarkable penetrating qualities, as he did not stop when he had filled the bearing boxes to the utmost capacity but continued to apply the lubricant, the exterior of the bearings being covered with a liberal amount of the grease. But even with this he did not rest content for he had a habit of making a hole through the center of the boxes and pouring a high-grade of engine oil into the armature bearings, which would promptly run through the lodge in the lower half of the motors to the detriment of the insulation of the field coils.

The practice of filling sand boxes in the locomotive houses was strictly prohibited, so that valuable lubricants would no longer be rendered useless by the addition of sand, and the net saving obtained by correct methods of lubricating the locomotives was really amazing, as all expenditure for high-grade grease was saved. Careful experiments proved that lambs' wool used in all bearings, end journals included, was far superior to any other form of lubricant, when saturated with a small amount of engine oil. The use of a lubricant purchased on the open market for the quieting of pinion and gear wheels was found to be far more efficient and more economical than polar grease. The motor hostlers were also furnished with a blank similar to that marked Form 2. This was distributed in the same manner as the first form.

Waste of Oil by Excess Feed

The next leak the inspector discovered was in the power plant, where there were in operation four 250 kw. engines operating at a speed of 220 r.p.m. One of the engines was equipped with ordinary sight feed, hand-filled oil cups; one of the others, with an automatic oil-cup system, through which the oil was forced by a small rotary pump, which was attached to the engine; the remaining two had the inclosed splash type self-oiling systems. The engineer furnished the surprising information that the engine equipped with the hand-filled oil cups, consumed the least amount of oil, although the other engines had been purchased, partly because of the saving in oil that the manufacturers insisted would be

effected in the operation of their engines. Further investigations developed the fact that the reason why the hand-filled oil cups consumed less oil, was that the engineers had regulated the handfeed so that their periods of rest would recur at regular intervals, while the oil in the inclosed type of engine was changed when the whim of the engineer dictated without regard to the condition of the oil, which nevertheless was promptly thrown into the sewer as being unfit for further use.

Reclaiming Waste Oil

A new method of changing oil was inaugurated, determined by the number of hours the engines had operated, and the

M. & M. COAL CO. X. COLLIERY	Aug. 1911	
Car Oiling Report	Amount Allowed	Amount Used
Total No. Car Wheels Oiled 400	20 Gal.	20 Gal.
% Merit for Balance on Hand 100 %		
% Demerit for Over Drawn %		

Oil Clerk .... Oiler ....

Foreman ....

COAL AGE

Form 4

M. & M. COAL CO. X. COLLIERY	Aug. 1911	
Merit Report of Oil Used	% Merit	% Demerit
John Thomas Car Oiler	101	
Wm Brown Power House	105	
Joe Kellar Breaker Engineer	103	
Wm Brecker Fan Man	102	
John Ambrose Breaker Machinist	100	
Harry James Motor Man		1

Note: The Printed Figures on all Oil Users Forms Indicate the amount that careful Experiments furnish as entirely adequate to Lubricate Machinery and constitutes the amount Users are intitled to every Month

Those who use less are given a % of one in the merit column for each Dollars worth that they save, and those who overdraw their account will receive a demerit mark of 1% for each Dollars worth of Lubricant that they overdraw

Form G

COAL AGE

Form 5

dirty oil was placed in 5 gal. tanks equipped with sight-feed glasses and small taps, placed about 1 in. from the bottom. In about 10 or 12 days the impurities in the oil would settle to the bottom, leaving it clear. Then it was drawn off and delivered to other places as I shall show later. Fig. 3 is the form that was issued for the use of the power-house engineer.

On the way over to the breaker the inspector's shoes stuck in a mass of oil and dirt. A careless employee, whose duty it was to oil the mine-car wheels, had more concern, as a moment's observation disclosed, in oiling the exterior of the car wheels than their axles. The oil would promptly run off and soak into the ground with the result that much oil which had been purchased for lubrication merely saturated a path along the car tracks.

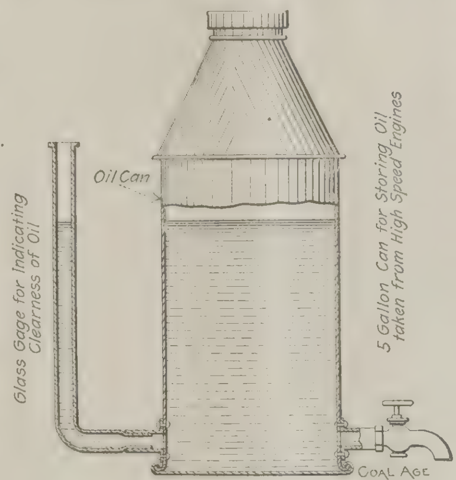
This employee was promptly furnished with a form to fill out and further waste was effectively prevented. As he was also furnished with a stencil to mark the date of oiling, his foreman could readily see whether all cars were oiled in due proportion to their needs.

Using Oil a Second Time

In the breaker were found the most lax methods of oiling and safeguarding bearings. A large number of the oil boxes contained no waste whatever, and the oiler would pour in oil, only to see it promptly run out at the bottom. As there were over 200 bearings the waste was really enormous, so a blank similar to the other was ruled and efforts made to prevent future loss. The oil saved in the power plant was now delivered to the breaker, as it was found to be equal in quality to the grade there used. Thus another item was deducted from the oil bill.

Waste of Oil in Hot and Cold Weather

At the close of the tour the inspector paid a visit to the oil house. Here he found several barrels of oil upon the



Cleansing Tank for Waste Oil

racks, where it was served to the employees, who had been in the habit of bringing all sizes of oil cans and demanding whatever amount of oil they thought necessary for their needs, and he found that a month's supply of oil was shipped from the general storehouse on the first of every month. Through the lack of room, some of the barrels remained outside until required, with the result that in the summer months, much oil was lost by evaporation. In fact, in the month of August, one entire barrel of gasoline was lost in that manner, while in the winter, much of the heavy oil was lost owing to its adhering to the interior of the barrel.

A large saving was effected by installing metal tanks, which were amply large for an entire month's supply. They were equipped with automatic measures, so that only the exact amount of oil required, would be drawn and delivered directly into the oil cans, and all guesswork was thus forever eliminated.

The Merit System

A merit system for the recognition of those men who were really interested in saving money for their employers was instituted. Form 5 was made up at the office and posted at a conspicuous place, so that all could see the standing of the various engineers, and a friendly talk was delivered to all users of oil, the speaker emphasizing the money value of the wasted oil and asking each workman to use lubricants in the same careful way in which he would use any commodity which he had to purchase out of his own pocket.

After the new system of distributing and using oil had been in operation long enough to prove its effectiveness, the bill was found to have been reduced 37½%.

Coke Notes

The coke from the lower Connellsville field is smaller than that made from the Connellsville coal in the old region, and up to about a year ago it was thought that large, bulky coke could not be made from lower Connellsville coal without pulverizing or washing. A test was recently made at one of the older plants in the old region in small ovens with coal from a lower Connellsville mine, and the coke made was of good structure, equal to the old-region coke. Whether this reversal of form was due to the small 11-ft. oven or to the peculiar character of the coal from that particular mine, is not known, but the fact remains that at the old plant large coke was made with the lower Connellsville coal.

The Mitchell oven is a modification of the Belgian type, one difference being that it provides an improved combustion chamber. The process is identical with that of the beehive oven. In this type, there is an opening at both ends; consequently, the oven can be discharged in a few minutes by a pusher extending through the oven, thus utilizing practically all the heat for the next charge. The oven is immediately charged after pushing. The dimensions are approximately as follows: Height at the center, 7 ft. 6 in.; height at end, about 4 ft.; width at pusher end, 4 ft. 10 in.; width at discharge end, 5 ft., and length, 32 feet.

While giving testimony before the Senate Committee on Interstate Commerce, Judge E. H. Gary is credited with the following remark on Illinois coke:

> If some concern like the United States Steel Corporation, which could afford to expend the necessary sums of money to make these experiments and tests had not been in existence, the country would not know today that coal mined in southern Illinois can be used for coking purposes. The steel corporation is now using 25 per cent. of southern Illinois coal in its furnaces and later on we will increase the amount to 50 per cent. As a result of our experiments with this coal we have purchased thousands of acres of it in Illinois at $30, which if located in the Connellsville, Penn.,' field would sell for $1000 per acre.

The Problem of Mine Timbering

By R. B. Woodworth*

With the growing necessity for intensive mining and the depletion of our forests, the problem of mine timbering has come prominently forward as a most important factor in the cost of coal. Four methods of dealing with the problem are discussed in this article which is the first of a series on mine timbering having special relation to the use of steel.

Success in the conduct of mining operations is only attained when the product of the mines is marketed at such rates over and above the cost of production as will insure a fair return on the capital invested. Other considerations may be brought prominently into view during periods of exploitation or at times of depression, but in the regular run of affairs, the men who operate mines do so in order to reap the rewards of their labor. To reach this desired end in the highest measure it is required that the capital invested be as small as the fundamental principles of true economy will permit, that the cost of production be as low as intelligent skill can make it, and that the rates at which the product is sold be as high as the most efficient sales organization can secure. Under modern conditions of competition this high success in the conduct of mining operations is gained by that careful attention to details which is known as scientific management.

Where the Operator Must Look for His Profit

Time was, when many features of mining could be left to unskilled workmen; today in order to insure the largest possible return on capital investment, every problem which has to do with the employment of men and expenditure of money demands serious consideration and requires solution, not by rule of thumb methods, but by the application of the rules of economic science. The timbering of the mines is one of these problems, and it is to the credit of many mine owners and operators that they have appreciated its importance and applied their intelligence to its solution.

The price paid by the consumer per unit of product is in a measure fixed by economic law and is, therefore, in a way beyond the control of the mine owner or operator. He may decide against selling in any particular market; but once he decides to sell, the price is fixed for him by the conditions of competition in that market. So far as the operator is concerned the price that he receives may be regarded as made up of four items: cost of production in the mine, cost of preparation at the mine, cost of transportation from the mine and profit or loss. The third of these items he does not control, and the magnitude of the fourth is, therefore, dependent upon the measure of success with which he deals with the first two. The smaller he can make these, the larger will be the fourth.

It is not intended, in this article, to deal with the cost of preparation, but it is purposed to point out that the cost of production in the mines is under the control of the operator and that it behooves him to pay careful attention to all the elements which enter into it. These elements are: (1) Cost of labor and tools. (2) Cost of explosives. (3) Cost of transportation and hoisting. (4) Cost of mine timbering. (5) Cost of superintendence and administration. While the cost of labor per man has increased in recent years and may continue to do so, scientific management reduces the cost per ton by the introduction of machine methods of mining. Such management also reduces the cost of explosives by the selection of the most economical forms and the regulation of their use and also by the substitution of hydraulic blasting. The cost of transportation is reduced through the displacement of mules by locomotives, wooden cars by steel cars, and poor roadways by good ones. The cost of superintendence is lowered by the employment of trained men having skill and intelligence rather than brawn, and the cost of mine timbering is reduced by that intelligent and discriminating use of the materials of construction which lies back of the structural phase of our industrial development.

Importance of the Mine Timber Problem

Once the subject of mine timbering was no problem. The mine foreman sent his timbermen into the adjoining forest to cut down what few props were needed for use at the mine entrance and in the rooms and headings and recked not what particular size of timber he used or whether, in using for mining purposes the best timber which grew on the land, he was not at the same time committing an economic crime. The mine owner who now looks back over the records of the past will note that the best timber has long since disappeared, that any kind of timber suitable for mine-timbering purposes is in some localities hard to get, and that year by year the cost per ton for the maintenance of the timbering in shafts and headings has steadily grown. True, this growth is not entirely due to the depletion of the forests but in part also to the deeper character of the workings, the larger sizes of timber required in such deeper workings and the increased lengths of headings that it is necessary to maintain.

Wood in the Mines

Wood has played a most important part in the timbering of mine excavations. In 1905, according to statistics gathered by the U. S. Department of Agriculture, 171,624,000 cu.ft. of wood were used in underground mining operations in the United States. This required, at a conservative estimate, the deforestation of 410,000 acres of land, an area more than half that of the state of Rhode Island. In the bituminous-coal fields, the cost for timber alone amounted in that year to 2.3c. per gross ton of coal mined, and in the anthracite-coal fields to 7.7c. The year 1905 was one of comparatively cheap timber, and while no statistics have been compiled since that time, the probabilities are that today with wood at a higher cost per cu.ft., and with larger sizes in use, the cost of mine timbering in wood is about 4c. per gross ton in the bituminous-coal fields as a whole, about 6c. per gross ton in the bituminous-coal regions of Pennsylvania, and about 9c. per gross ton in the anthracite-coal fields.

The cost of wooden mine timbering is not a permanent investment. The life of the timber is so short and the depreciation due to decay and breakage so great that the expense must be charged to maintenance, renewals and replacements and not to capital account. In consequence it must be considered as a fixed charge applicable to each ton of coal mined and increasing in amount for any particular mine as the working faces get farther away from the opening. The more extensively coal is mined, the greater becomes the timbering cost per ton even if the unit cost per cubic foot of timber does not increase. This would not be the case if a material were in use that possessed great durability and was subject to renewal only after long years of service or not at all during the life of the mine. In this case the timbering cost should rightly be charged to capital account with allowance for depreciation.

Satisfactory in great measure as the use of wood has been and will yet be,

*Engineer with the Carnegie Steel Co., Pittsburg, Penn.

Note—Paper read before the Kentucky Mining Institute, Lexington, Ky., Dec. 11, 1911.

these facts show the importance of the problem of mine timbering; and if a change in method can be made that will keep the cost from growing or even diminish the increase, a study of the matter will amply repay the operator. The use of steel in the mines of Warwickshire has cut the timbering cost 2c. per ton, a reduction not to be despised, but more of that later.

The importance of the mine-timbering problem is to be seen further, in the expedients which have been devised to prevent the increase in cost due to use of wood. These expedients are:

1. Methods of mining which either do not require the use of timbering at all or require a minimum amount—Mining without timbers.

2. Methods of reducing cost of wooden mine timbering by prevention of increase in price—Reforestation.

3. Methods of reducing cost of wooden mine timbering by increasing its life—Preservative treatment.

4. Methods of reducing ultimate cost of mine timbering by substitution of other materials for wood—Substitution.

Each of these expedients has its place. Indeed, modern economics require that each of them be given consideration and that no method be used in a place for which it is not in every way the best fitted.

Mining without Timbering

In iron mines operated on the caving system, where the timber is broken and crushed by the fall of the ore or even broken up by dynamite in order to secure the proper subsidence of the roof, top slicing and subslicing have been resorted to in order to get out the ore with more cleanliness and at less expense. In the case of coal, however, these methods would be applicable only to very thick seams and would be objectionable by reason of the fineness to which the product would be broken.

The filling of underground excavations by culm flushing was first tried out in 1891 by Mr. John C. Haddock at the Dodson Colliery of the Plymouth Coal Co.; and the use of culm, clay, sand, etc., for this purpose has come into extended use both at home and abroad under local conditions where the subsidence of the superincumbent strata means a damage and probable property loss which cannot be disregarded.

There are also intimations that the room and pillar system of mining will some day be displaced by the use of the long-wall system, which in the United States has had its most extensive development in Illinois and which has been prosecuted with much success, abroad. The long-wall system of mining, while it does not do away with timbering entirely, makes possible its more economical use by the removal and replacement of the mine-timber sets and, therefore, offers a field for the use of substitutes for wood that are better adapted to frequent removal and replacement.

Reforestation

The chief merits of wood as a material for mine timbers have been its wide distribution and ease of access from the place of use, its consequent cheapness and the simplicity with which it can be framed for use. Its cheapness vanishes when the mines become dependent on far-distant sources of supply. And so the mining companies do well to provide for the future, by taking steps to renew their timber supply and thus make themselves independent both as to the supply and as to its cost. Where, however, the companies do not own the surface land under which they mine, or in case this land is worth more for agriculture than as a forest, the matter is not so simple.

There is also this other consideration: a wise conservation of our timber resources means the reservation of the best timber for the more delicate and particular purposes of the arts and industries. With the gradual exhaustion of the hardwoods and the species of soft woods peculiarly adapted to architectural uses and to the manufacture of furniture, etc., the cutting of such timber for baser uses may be sheer economic waste. The coal mines, as a rule, are in the hardwood sections of our primeval forests, and their reforested lands, will grow the most valuable species of timber.

Preservative Treatment

The unbiased student of underground mine-timbering conditions is struck at

Steel Timbering at Maxwell Colliery, Lehigh & Wilkes-Barre Coal Co.

once by the economic waste involved in the use of wooden timbers in situations where the loading or temperature conditions are such that the wood cannot be expected to last for more than a limited period of time. The two most serious elements of this waste are decay and destruction by insect action. While there is some waste due to the lack of proper proportion between the sizes of the legs and collars in the three-piece gangway set of timbers as ordinarily framed, and while 10 per cent. of all the lumber going into underground operations is wasted in framing and fitting, another 10 per cent. of it is destroyed by insect action and 45 per cent. just simply rots. Insect action may, to a large extent, be eradicated by peeling the timber before it is placed in the mines, but the removal of the bark does not prevent decay, for wherever moisture and heat coexist within the mines, the bacterial agencies of decay, the spores of which are everywhere present in the atmosphere, begin their destructive work.

Proper preservative treatment may reduce disease and decay in mine timbers to a minimum, but it is probably impossible to exterminate the disease and wholly prevent the decay. There seem to be four valid objections to preservative treatment as a final solution of the underground-timber problem:

1. According to the best information at hand, properly treated timber will cost, f.o.b. cars at the mines, two and one-half to three times the cost of timber not treated, and at that will not last half as long as substitutes that can be purchased for less money.

2. If treated at the mines, the time necessary for seasoning the wood before it is ready for treatment and the interest charges on its value during the time of seasoning and treatment involve delay and expense.

3. Much of the timber cannot economically be treated, as it is not economy to apply preservative treatment to material liable to destruction under service conditions by crushing and not by decay.

4. In spite of many years of experimentation, preservative treatment is attended by many difficulties and large uncertainties. The best woods do not take kindly to treatment. It is best adapted to, and most successful with, open porous-grained woods which are of low value from a structural standpoint.

Substitution of Other Materials

Substitution of other materials in place of wood is the solution of a problem in above-ground structures similar to the problem of mine timbering, and there is no valid reason why this solution will not also apply to underground structures. True, wood has not been and will never be entirely displaced above ground; neither will it be below ground. No one material has taken its place above ground; neither will any one material take its place under ground; but it may be predicted that for each condition of mine timbering, that material of construction will eventually be used which experience and accurate study of the economic laws of design indicate to be most suitable, and as a general proposition this material will be steel, since of all other materials it is most like wood in its physical qualities.

The conclusion is reached, therefore, that for the near future at least, the use of timbering within mines will be continued, particularly within the coal mines, and that probably those methods of supporting excavations will never entirely be displaced, which by their simplicity have proved heretofore the most economical and, therefore, the best.

(To be Continued)

Steel Timbers for Roadway and Pump Room, Honey Brook Colliery, Audenried, Penn.

Turbine Driven Feed Pump

The Victor-American Fuel Company is building at Hastings, Colo., and Gallup, N. M., two thoroughly uptodate alternating-current central-station plants for furnishing power to its mines in these two districts. The first installation consists, at each plant, of one 500-kva. Curtis turbo-generator unit, this to be supplemented by a 1000-kva. unit.

One of the novel features of the installation is the use of steam-turbine driven boiler-feed pumps. These are of the Kerr-Alberger three-stage centrifugal type, of 70 gal per min. capacity against 170 lb. pressure. While more costly than others, these pumps are expected to prove economical by reason of their greater efficiency, and saving of repairs.

European Wash House Practice

This is the third and concluding article on the subject. Careful analysis of costs, both of installation and maintenance, are given, together with plan of a typical English plant.

It has been shown that a large number of the bathing equipments at Belgian collieries have been installed in the Liége district. Owing to their undoubted success, the movement has spread into other districts, such as the Central and Charleroi, where Messrs. Goehmann & Co., of Brussels, who specialize in this type of plant, have laid down a number of important installations.

The total average number of workmen employed in the 43 Belgian pits which have adopted washing installations is 21,560, of which 16,650, or a ratio of 77.3 per cent. regularly avail themselves of the shower-bath equipments. Of the remaining quarter or so of the workers who are irregular in the use of the equipments, or obstinately stand aloof, the majority of these exceptions are due to particular circumstances, such as, for example, their dwellings being close to the pits.

The figures, therefore, indicate that the working class is quite willing to make use of the sanitary accommodations placed at their disposal. The total cost of the 43 installations mentioned has amounted to $358,200. The average outlay per month for working them is $3600, and the average price of one bath is about one cent, excluding interest on capital. In these figures no account is taken of certain smaller installations erected exclusively for the inspecting or managing staff; they refer solely to the equipments for the workmen.

Miscellaneous Notes

Table 1, herewith, kindly placed at our disposal by Mr. Richard Jacobson, who has interested himself greatly in this question, gives some statistics regarding several prominent Belgian mines. It will be seen that in the poorest case, 50 per cent. of the workers make use of the baths, while in more than one instance the whole of the staff use the accommodation provided.

The cost per bath ranges from ½c. to slightly over 1c. In two cases the bathing accommodation is so much appreciated by the workers that they contribute a small amount periodically in order to assist the working expenses. In some of the collieries, canteens are provided near the bath houses, supplying hot coffee, a point of material assistance in preserving the health of the miners who have to go some distance to their homes.

Compulsory legislation on this matter in Belgium only came into force quite recently, yet for some time previous certain mine owners had found themselves compelled to install baths and dressing accommodation in order to prevent their workmen from leaving their pits in favor of those where these advantages were provided.

In some areas the question of water supply is rather a serious one, and where there is this difficulty, means are used to purify the water which has been used by the miners in order to return it to the tanks for reuse. This practice has proved most successful and, in the circumstances, economical.

Shower Baths

From the point of view of time economy, the shower bath enables a man with a minimum consumption of water (7 to 8 gal. per bath) to have a complete wash in a short time, generally ten minutes. The water is supplied at a temperature of 95 to 100 deg. F., and is immediately drained into the underground pipes. This form of washing is complete and quick, as compared with the ordinary bath system, when the cell is constantly engaged at short intervals by a number of men.

The pavement of the bath rooms and dressing rooms is of cement, asphalt, or ceramic tiles, and the cleaning of the same is effected by means of a hose. The principle which prevails in Belgium is to allow each man to have a separate

*Abstract of paper appearing in the Iron and Coal Trades Review, London, England.

TABLE I. BATH AND DRESSING ROOM INSTALLATIONS IN BELGIAN MINES AND FUEL WORKS

Name of Colliery	No. of Shower Baths	Dressing Accommodation. No. of Hoists	Accommodation for Officials, etc.	Cost, Inculding Building	Cost, Excluding Building	Cost per Bath	No. of men employed underground	No. of men using accommodation
						(cents)		
Bois du Luc: Quesnoy pit at Trivieres...	80	800	......	$15,600 (excluding cost of site)	....	0.6	420	420
Fontaine L'Eveque: Pit No. 1...	22	500	......	.....	$4,100	0.76	500	250
Pit No. 2...	21	600	3 showerbaths and slipper baths for engineers.	.....	7,000	0.76	507	330
Tamines: Ste. Barbe Pit*.....	20	384 lockers	4 shower baths, 12 lockers, 4 slipper baths	.....	3,500	1.6	334	167
Reunis de la Con orde: Grand Mahets pit..	24 (separate building)	400 (separate building)	7 shower baths, 10 ockers	11,700	....	0.8	400	280
Patience-Beaujone: Fanny pit at Ans..	50	600	3 shower baths with slipper baths	10,200	....	0.3	600	425
Bonne Fin: St. Marguerite pit at Liége..	49	208 lockers 470 hoists	4 shower baths with slipper baths	5,675	....	0.72	613	116
Abhooz et Bonne-Foi-Hareng: Abhooz pit.	30 for men, 6 forwomen	560 hoists, 6 wash-stands, 6 lockers	6 shower baths, 17 lockers, 2 slipper baths	10,700	....	0.7	449	149
Milmort pit	30 for men, 6 forwomen	524 hoists, 8 wash-stands, 8 bath tubs	2 shower baths, 2 slipper baths	11,200†	....	0.7	440	140

*Four buildings: One for men, 1 for women, 1 for superintendents and 1 for engineers.
†This inc udes three separate buildings: One for men, 1 for women, 1 for superintendents, with laundries and accommodation for meals.

cell with one or two compartments; the partitions are of plain or corrugated sheet iron, porcelain, marble, or thick glass. In general the workman only dresses partially in the cell and finishes up outside on benches fitted against the lockers and clothes hoists.

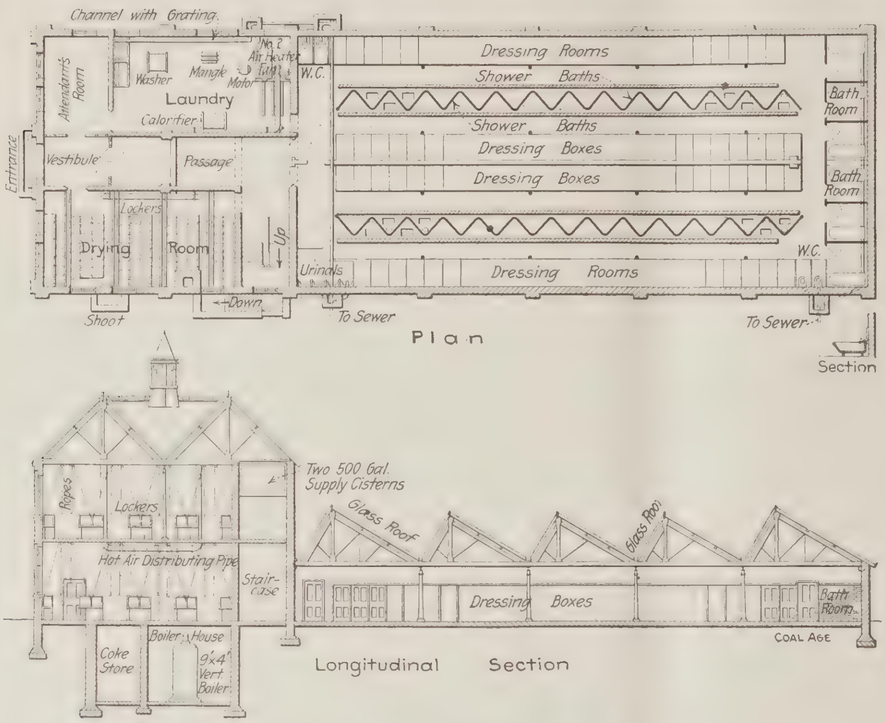
The protection, drying and ventilation of the clothes are done in two different ways: (1) In metallic lockers well ventilated for this purpose, and constructed of expanded or perforated metal; (2) on hanging apparatus provided with hooks, and working by means of pulleys, by which they are hoisted to the ceiling[1]. On the basis of Belgian experience, Mr. Jacobson has made an estimate of the cost of a shower bath, lavatory and dressing-room installation for 100 men in an industrial establishment, such as a patent-fuel works. This is shown in Table 2.

Brunner, Mond & Co.'s Installation

Up to the present the subject of industrial bath establishments has not made much progress in England, although the question is now being investigated.

Probably, however, the most complete and important British installation of this nature which has yet been made is that designed and constructed by the Leeds Fireclay Co., Ltd., of Wortley, Leeds, for the works at Winnington of Messrs. Brunner, Mond & Co., Ltd. The general arrangement of this scheme, including baths, dressing rooms, drying rooms and laundry, is shown in the accompanying drawing, and numerous differences in arrangement will be noticed as compared with the Belgian designs.

The zig-zag cubicle was designed with a view of saving not only space but a considerable expense in the length of the building. The widest part of the cubicle is 6 ft., and as 4 ft. clear is really necessary to allow an adult to scrub himself down freely, it will be seen that this innovation has effected a most important saving in space, and, moreover, there is no wall surface lost.



Miners' Baths at the Winnington Mines

The footbaths are made in fireclay, and sunk flush with the floor, the wastes discharging into an open channel covered with a galvanized-iron grating. The seat in the angle is also made in fireclay, and the floor falls all round toward the footbath, the floors in the dressing cubicles then falling toward the channel, so that the whole place can be cleaned out with a hose. The user has full control of the shower, by means of a patent valve by which the cold water must be turned on before the hot, so as to reduce the possibility of scalding as far as possible. The hot- and cold-water service runs round the cubicles, and is utilized to hang the waterproof curtains.

The dressing boxes are constructed in wood with the partitions standing well clear of the floor so that a hose can be used with freedom. At the end of the building there are six slipper baths with large outlets and quick-filling valves. The partitions in these baths are constructed in "Shepwood" brick, supported clear of the floor with girders.

The whole building is heated with steam pipes in the winter months. Sanitary accommodation is also provided in the way of four closets and four urinals. Fixed throughout the building there are also hose taps so that the place can be easily washed down, and the ventilation is arranged to rapidly get rid of steam.

General Details

The hot and cold services to the baths are supplied from a storage in the roof, and through a large heater situated in the laundry. In connection with the latter there is also a large hot-water storage, such that the maximum demand can be met continuously for some hours. The laundry is equipped with a washing machine, tubs, a set of drying horses, mangle, etc., so that the washing of towels can be accomplished with the minimum of labor. The steam for this and the heating of the building generally is furnished from a vertical boiler.

There are two drying rooms, one on the ground floor and one on the upper floor; they contain 200 cupboards supported clear of the floor, each numbered and furnished with a key. Above each cupboard there are provided quadruple hooks, the rope of which works through a pulley secured to the ceiling. The end of the rope passes through the top of the cupboard and is secured to the interior by a hook so that the clothes cannot be lowered by anyone not in possession of the cupboard key. By a suitable fan driving hot air into and across the rooms, wet clothes can be dried in an hour or two. As regards operating cost, it has been found in practice that one man is sufficient to work the whole place.

TABLE 2. ESTIMATED COST OF A SHOWER BATH, LAVATORY, AND DRESSING-ROOM INSTALLATION FOR 100 MEN FOR PATENT-FUEL WORKS

A—Installation with the Most Needed Requisites		B—Installation More Luxuriously Furnished	
Heating	$296	Heating	$296
Hot-water supply and shower baths	365	Hot-water supply and shower baths	365
Lavatory basins and wash-stands	178	Lavatory basins and wash-stands	178
Clothes hoists	197	Clothes hoists	197
Ventilation	65	Supplement 1.	18
Shower bath cells (in galv. sheet iron)	292	Supplement 2.	117
Miscellaneous	58	Ventilation	65
Steam and water from the boiler	122	Shower-bath cells (in glazed bricks)	757
Building	1703	Supplement 1.	144
	$3276	Supplement 2.	192
		Lining, shower-bath room	84
		Dressing room	214
		Miscellaneous	68
		Steam and water from the boiler	146
		Building	2433
			$5274

Cost per Annum for Maintenance (Approximate)

Attendant's salary	$350
Overalls	487
Towels	97
Soap	146
Laundrying of overalls and towels	730
Cost for water and steam	243
	$2053

$$\frac{\$2053}{100} = \$20.53 \textit{ per man}$$

[1]A recent law enacted has made the use of these hoists prohibitive because of the danger due to articles falling from the pockets of the clothes.—Editor.

United Mine Workers' Convention

After adopting a policy to be followed out in negotiating a wage-scale agreement, and after selecting Indianapolis as the place for holding the next convention in 1914, the United Mine Workers of America adjourned their convention at noon, Feb. 2.

The committee on policy reported that the method of negotiating wage contracts that has been followed for some years past, has proved entirely too expensive because of the fact that large delegations have been kept waiting for days and sometimes weeks for the scale committee to report. It was recommended that authority be given to the miners' scale committee to negotiate an agreement, with the understanding, however, that the proposed contract be submitted to a referendum vote of the union membership, or to a reconvened convention, and this action was accordingly taken.

One of the most important accomplishments of the convention was the adoption of a constitutional provision for holding their conventions and elections of national officers biennially. Edwin Perry, secretary-treasurer of the organization, has compiled figures showing the cost of the present international convention to be $180,000.

Joint Scale Conference Adjourns

The joint-scale committee reported that the demands of the miners and operators were so diametrically opposed that there was no chance of reaching an agreement at this time, and adjourned indefinitely on Feb. 1. A committee composed of President White for the miners, and an operator and a miner from each of the four states represented in the conference, was appointed to entertain any proposition that might be submitted by either side and empowered to call the conference to reassemble if an agreement seemed possible.

There was little or no talk of a strike to be called after Apr. 1 in case an agreement has not been reached before that time, and it was admitted by the miners that the organization was not in condition financially to carry on a long strike.

The operators, in the joint conference, took a most decided stand against the introduction of the unlimited "check-off" system demanded by the miners. This would require the employers to deduct from a miner's wages any sum that the organization might demand that he pay to the treasurer of the local union. The operators expressed themselves as willing to check off the regular dues of the miners, but refused to have anything to do with any other assessments levied by the organization. The continuance of the scale committee with implied orders to keep up negotiations is construed to mean that there may be a compromise.

Coal Law Needs Amending

The present coal-land law has one serious defect, which should be remedied if a leasing law is not enacted. The restriction of area that may legally be acquired to a maximum of 160 acres for an individual and 640 acres for an association is not in accord with good mining practice. The fixed charges on the cost of a modern coal mine, provided with the uptodate equipment necessary to conserve life and property and to assure maximum recovery, are too high to be assessed against the output of so small a tract, especially if the coal seam is of only moderate thickness. A law designed to promote the practical utilization of coal deposits, whether the system contemplates sale or lease, must provide for the holding of a large enough unit to permit the opening and equipment of a modern mine and to warrant its economical operation. Without such provision for commercial operation too great an advantage is given to the land-grant railroads and large coal companies already in possession of considerable areas of high-grade coal (From 32d Annual Report, Director United States Geological Survey.)

Alabama Examinations for Mine Foremen and Firebosses

The Alabama state examinations for first- and second-class mine foremen and fire bosses were held in Birmingham, Jan. 22 to 26 inclusive. C. H. Nesbit, chief mine inspector, has made public the list of applicants who have been successful in passing the examinations. The highest percentage, 89.5, was averaged by G. L. Cunningham of Dolomite; the second highest, 89, by H. G. Hubbard and T. H. Black, both of Maben, while the third highest, 88, was credited to M. F. Bell, of Blocton. All of these filed applications for the certificate of first-class mine foreman.

The following will be awarded certificates by the board of examiners and will be exempt from further examination in their respective classes:

First Class Mine Foremen—John Reynolds, Dolomite; G. L. Cunningham, Dolomite; Will Smith, Bell Sumter; Will Herring, Bell Sumter; J. O. Seigler, Margaret; J. M. Ware, Dolomite; J. B. Hunter, Altoona; S. B. Kennedy, Johns; G. L. Nesbitt, North Birmingham; T. H. Black Maben; H. H. Hubbard, Maben; G. W. Caviness, Cordova; H. C. Wood, Blocton; J. H. Lawrence, West Blocton; John Kuffner, Blocton; John Fullman, Coleanor; M. F. Bell, Blocton; J. H. Gardner, Samoset; James Kirkpatrick, Wylam; M. D. Drennen, Palos; J. L. Bryson, Margaret; C. C. Custered, Margaret.

Second Class Mine Foremen—Opie Gamble, Delmar; John Oliver, Natural Bridge; W. L. Smith, Altoona; W. R. Gibbs, Warrior; W. W. Earnest, Coal Valley; L. F. Taylor, Altoona.

Fire Bosses—Thomas Gilmore, Pratt City; Will Chatman, Blossburg; Mathew Howard, Adamsville; Gus Burkhart, Adamsville; C. G. Ellison, Bell Sumter; M. M. Barron, Dora; William Ellis, Wylam; W. D. Millstead, Dolomite; J. D. Dunlap, Margaret; Tom Ellis, Wylam; R. L. Hutton, Glen Carbon; William W. Lewis, Dolomite; James Stewart, Cardiff; Robert Hartley, Piper; J. A. Ivie, Coleanor; Marvin Henderson, Mulga; Richard Hopkins, Johns; J. M. Robinson, Blossburg; C. B. Jones, Margaret; George Smith, Abernant; J. J. Burnett, Dora; John Waine, J. W. Adams, Robert Lewis, J. A. Hartley, J. M. Townley, F. Tune and W. B. Brown.

Fuse and Squibs

Knowing that mining accidents often result from trivial causes other than the actual use of explosives themselves, the U. S. Bureau of Mines has just completed investigations of fuse and miners' squibs and the rate of burning of the former as influenced by temperature and pressure. The results are contained in Technical Paper No. 7, "Investigations of Fuse and Miners' Squibs," by Clarence Hall and Spencer P. Howell, and Technical Paper No. 6, "The Rate of Burning of Fuse," by Walter O. Snelling and Willard C. Cope.

The technical paper on investigations of fuse and miners' squibs, by Clarence Hall is one of a series of publications published for the use of miners, tunnelers and quarrymen and its purpose is to enable those in charge of blasting work to select the best devices for igniting explosives, thus aiding in the reduction of accidents.

The author says: "The rates of burning of the various kinds of fuse sold in this country vary from 18 to 40 sec. per ft. in open air. However, the miner or shotfirer seldom knows the rapidity with which different kinds of fuse will burn. It is true that some fuse is marked slow or fast and is even distinguished by the color of the paper wrapper, but this is not always the case. Without such information a miner who is accustomed to a certain brand of fuse may use another that burns faster with the result that a charge may explode prematurely and menace all connected with the work. However, it is believed that the rate approved by the Bureau of Mines—namely, 90 sec. per yd.—will meet the various mining conditions in this country.

Careful tests should be made of the rate of burning of fuse whenever there is any doubt as to its soundness. The manufacturers may produce a fuse with a regular rate of burning, but the rate may be changed by bad handling—for instance, by squeezing it so as to disturb the powder train, or by suddenly and roughly opening the coil when it is stiff from cold so as to crack it—or it may be bruised by rubbing against the rough surface of rock."

"Fuse should be carefully handled and never laid in a damp place before using. In cutting and fitting it into place, care must be taken that the powder core does not run out of the fuse, for that might cause a misfire. The fuse should be cut straight across with a sharp knife, just before placing the end in the detonator and in a humid atmosphere at least 1 in. should be removed to insure unfailing detonation. The fuse should be fitted gently into the detonator which should then be crimped on the fuse by a suitable crimper."

The conclusions reached in the investigations into the rate of burning fuse, Technical Paper No. 6, show that it is important for time fuse to have a uniform rate of burning, and in almost all blasting operations the fuse which is used is assumed to burn in a regular and uniform manner.

When fuse has been subjected to such conditions as produce acceleration or retardation in its rate of burning it becomes dangerous. Rapidity in burning increases the liability that the shot will explode before the miner has left the face; slow burning increases the possibility that the flame in the fuse will progress so slowly that the miner may be injured by a delayed shot when he returns to the working face. Any marked change in the rate of burning of time fuse is dangerous, and from a study of the list of accidents in mines and quarries each year, it would seem that injury and loss of life are often brought about by such changes.

Under ordinary conditions nearly all types of fuse show great uniformity in their rate of burning. Practically all kinds of fuse examined in connection with the preparation of this report had a total variation in their burning under normal conditions of less than 20 per cent. and all would have been passed under the requirement stipulating "no variation greater than 10 per cent. above or 10 per cent. below the average rate of burning."

Climatic conditions affect to a considerable extent the rate of burning of the less waterproof types of time fuse. Damp fuse burns more slowly than normal fuse, and fuse that has been wet and then thoroughly dried tends to burn at a rather slow rate, and may even cause delayed shots by smoldering for a considerable time. Fuses containing several wrappings of tape saturated with tar or asphalt resist moisture to a considerable extent, and may be used for firing shots under water, provided the fuse is not allowed to remain too long a time in contact with water before the shot is fired.

Copies of the technical papers may be obtained by applying to the Director of the Bureau of Mines, Washington, D. C.

Program of the Bureau of Mines

The report of the Secretary of the Interior recommends the addition of two or three more mine-safety cars to the present equipment of the Bureau of Mines. Cars are now stationed at Billings, Mont., Trinidad, Colo., Evansville, Ind., Huntingdon, W. Va., Pittsburg, Penn., and Wilkes-Barre, Penn. Besides these six cars is one dividing its time between Rock Springs, Wyo., and Salt Lake City, Utah. The six mine-rescue stations are at Pittsburg, Penn., Knoxville, Tenn., Birmingham, Ala., McAlester, Okla., Urbana, Ill., and Seattle, Wash.

The secretary urges that the Bureau of Mines be empowered to collect and publish statistical data, and in a concluding paragraph declares that "the buildings and grounds at Pittsburg now occupied by the Bureau of Mines, for its investigations, are inadequate for its needs, unsuited to its purposes, and are held subject to the wishes and needs of another department of the government.

Western Hospitality

Western hospitality is not limited by its surroundings. The accompanying photograph shows the first boarding house of the International Coal Co., of Montana. In spite of its rough appearance, it was very clean and comfortable inside, and the meals served would have done justice to any first-class café. It is needless to say that this has now been replaced by a larger and better-looking structure.

TYPE OF BOARDING HOUSE FREQUENTLY MET IN WESTERN CAMPS

British Coal in Spain

The British consul, in a report on the trade of the consular districts of Bilbas for the year 1910, says the consumption of coal in Bilbas and neighborhood during the year amounted to 778,312 metric tons, made up of 465,135 tons from the United Kingdom and 313,177 tons from Spanish mines. Covering a period of three years the consumption of coal in this district is shown in metric tons in the table herewith, including the country of origin:

	1908	1909	1910
United Kingdom...	459,360	460,761	465,135
Germany	......	411	......
Spain	291,698	268,623	313,177
Total	751,058	729,795	778,312

In this market, as will be observed, British coal more than maintained its position, chiefly due to increased imports of North Country "smalls" for coking by the iron and steel works. In recent years there has been a tendency to consume smaller quantities of Spanish fuel, but last year's figures show a notable change, resulting in an increase of 44,554 tons, as compared with 1909. This also is largely attributed to greater consumption in the local coking ovens. The patent-fuel works, recently erected at Luchana, also consume Asturian "smalls," so accounting for a portion of the increase. The British coal is chiefly imported from Newcastle and Newport. There does not appear to be a wide margin in the quoted price per ton, as in June, 1911, the quotations were: Newcastle large, $5.71; small, $4.06; Newport large, $5.99; small, $4.58; Spanish large, $5.55; small, $3.78.

From San Sebastian the vice-consul reports that last year 26,666 tons of British coal were imported and 85,070 tons of national coal from the Asturian mines. He notes with regret that the quantity of British coal delivered at this port compares so unfavorably with that of national coal. Although the former is of much superior quality and practically of equal price with the latter, the manufacturers for the most part give the preference to the Spanish coal, the probable reasons being: (1) The coal is delivered in handy quantities; (2) it is quick burning, thus giving less work to the fireman; (3) patriotic motives.

What's in a Name?

By R. W. Raymond*

When our institute was organized, the rules of the North of England Institute of Mining Engineers were adopted for temporary use, and its name was copied without debate. The rules were soon after rewritten to suit the conditions of our society; but the name remained unchanged. The North of England Institute was, in fact as in title, made up of mining engineers—mostly colliery managers—whereas the American Institute included from the beginning the representatives of metallurgy, chemistry, mechanical engineering, geology—in fact, all the arts and sciences auxiliary to mining.

That no change of name was made in the early years was due, I think, largely to the feeling that it was better to let the term mining engineers cover the whole field than to create a long and cumbrous title by attempting to state in it all the branches represented in our membership and proceedings. It was deemed unnecessary to make a complete table of contents out of a title page.

After a few years, there was another reason for conservatism in this respect, namely: the members of the institute became fond of its name, and listened with impatience to any proposal of amendment. It was, at the worst, they said, a lucky misnomer, under which the institute had prospered, and the wide range of activities covered by it was well understood throughout the world. Moreover, although an institute, strictly speaking, was not a body of men, yet this institute "of mining engineers" was just that; and the fellowship of its human members was as important and as dear as the information contained in its volumes. Finally, a good many of us remembered from our school days the old maxim that when a debating society of boys began to tinker its constitution and change its name, it was pretty sure to be moribund; and we had seen the same phenomenon in struggling periodicals, and even in the history of nations.

Having been asked from many quarters to express my opinion concerning the present proposal to change the name of the institute, I must say frankly that I have no strong opinion one way or the other, apart from the consideration of sentiment and habit, which would have weight only with the old members who, like myself, are soon to pass from activity. When the institute was organized, I do not think I would have objected to any respectable designation; but having loved it long under the name by which it happened to be baptized, I might naturally find difficulty in transferring my affections to another. And I confess that the substitution of impersonal abstractions, like "Mining and Metallurgy," for a term of personality, like "Mining Engineers," seems to me somewhat chilly, and to put us somewhat out of touch with our sister national societies of civil, mechanical and electrical engineers.

Yet the proposed title is perhaps better English than the old one; and if it will give deeper satisfaction, arouse more enthusiasm, command wider support and lead to better work, by all means let the new label be pasted over the one that has been with us round the world. It is really a small matter, unless it be made a large one by over-estimating its importance. And my advice to everybody is, to vote with the majority! Only, do not stop satisfied with a mere pedantic improvement, but go ahead with all your might to make the married as glorious as the maiden name!

The disinterested character of my advice may be inferred from the circumstance that my election as honorary member of the institute deprives me of the right to vote, and therefore I must preserve the dignified attitude of a veteran observer only.

*Secretary Emeritus of the American Institute of Mining Engineers, New York.

American Institute of Mining Engineers

On Jan. 27, a meeting was held in Washington of the members of the American Institute of Mining Engineers, who are also members of the U. S. Geological Survey, to consider the proposed amendments to the constitution of the institute. At this meeting were present, G. H. Ashley, state geologist of Tennessee; G. F. Becker; A. H. Brooks; E. F. Burchard; R. H. Chapman; Frank L. Hess; W. Lindgren; H. D. McCaskey; E. W. Parker; F. L. Ransome; C. E. Siebenthal; George Otis Smith; A. C. Spencer; D. B. Sterrett. Arnold Hague was prevented from attending, but he, as well as George P. Merrill, of the Nation Museum, and J. A. Holmes, of the Bureau of Mines, desire to express their concurrence in the action taken.

The following resolutions were passed after full discussion and without a single dissentient vote:

The members of the American Institute of Mining Engineers present do not approve of the proposed change of name of the Institute to "American Institute of Mining and Metallurgy."

The members of the American Institute of Mining Engineers present are not in favor of the change in classification of members on the basis proposed in the circular, which is not a reclassification based upon professional standing.

In the absence of a financial statement showing that an increased income is necessary, the members present are opposed to the proposed increase in dues.

A committee was also appointed to communicate the resolutions to the mining press in the hope of eliciting expressions of opinion. This committee consisted of Waldemar Lindgren, George F. Becker and A. H. Brooks.

Cause of the Wyoming Explosion

After a thorough examination by a number of the leading coal men in Wyoming, it is the consensus of opinion that the explosion at Susie, on Jan. 20, was due to a blown-out shot, as already noted in Coal Age, Vol. 1, p. 516.

The particular shots to which the cause of the explosion is attributed, were in room 8, in the second north entry. Two shots were fired in this room at about the time of the explosion, and it is possible that they were both fired simultaneously. The holes were drilled at right angles to each other, and there was evidence that one of the shots was "windy" or "blown-out." The mine has never been known to show any firedamp, which further strengthens the theory of a dust explosion. That the possibility of such an occurrence was appreciated by the management is shown by the fact that the mine was provided with a complete watering system for sprinkling; to this fact is attributed the local character of the explosion.

The coroner's jury examined a number of the leading coal men in the West, who were present shortly after the explosion, and found: "That the deceased came to their death by burns and asphyxiation, caused by the explosion, which might have been avoided by the proper placing of the shot."

According to the latest reports the fatality list totals 6 men, which includes those who died of their injuries since the explosion.

Switchboards for Small Plants

In small isolated plants and central stations it is desirable to keep the initial investment low and yet provide good service. To meet this condition, the General Electric Co. has placed on the market a line of small switchboards ranging in capacity from 1 kw. at 125 volts to 200 kw. at 250 volts.

The panels are made of dull black marine-finished slate, and are furnished with the necessary copper connections between busses, switches and circuit breakers, when the latter are supplied, together with the wiring on the back of the board.

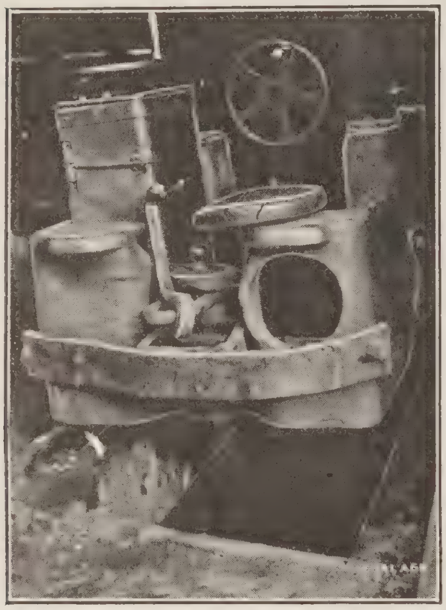
The instruments also have dull black finish and the current carrying parts on the front of the panels are polished and lacquered.

A complete supporting framework with necessary fittings is furnished with each panel, the small panels for wall mounting being provided with malleable-iron supports, while those for installation on the floor are provided with pipe supports.

Bulletin 4903 contains illustrations and descriptions of this line of panels in addition to complete information for ordering.

Good Service from a Mine Locomotive

The argument that good machinery needs proper care would seem to be denied in the locomotive shown in the accompanying cut. This locomotive has been running for five years in a Western mine. Operating on heavy grades, it has had a number of runaways, and the main frame has been repeatedly cracked.



Showing Mine Locomotive After Hard Usage

In spite of its dilapidated condition, it is still in daily operation, and is doing its work with little trouble. As an example of how much abuse mining machinery and electric locomotives in particular will stand, this locomotive is a valuable exhibit.

Twenty-first Bituminous District, Pennsylvania

By F. W. Cunningham*

The production of coal from this district, considering the depression of the industry in general, was above expectation, exceeding the tonnage from the same mines for 1909 by 17,442 tons, but falling 129,799 tons short of that produced in 1910. The drooping of the tonnage is accounted for in this district, partly by the fact that several of the mines are nearly exhausted and cannot maintain their usual output. One new mine is being opened by the Warner-Leonard Coal Co., near Fayette City, which, if its plans are carried out, will be a large producer.

There were 35 fatal accidents in the mines, being four less than in 1910. The accidents occurred from the following causes: 57.14 per cent. by falls of slate, coal and roof, being 4.40 per cent. below 1910; 28.58 per cent. by mine cars; 2.86 per cent. by blasts of dynamite; 11.42 per cent. by electricity. There were no accidents caused by explosion of gas or of coal dust.

The mines were never in better sanitary condition, or more carefully looked after by the mine officials than they are at the present time, and they are in condition to run a larger tonnage.

PRODUCTION OF COAL

Names of operators	Tons
Monongahela River Consolidated Coal & Coke Co.	3,721,742
Vesta Coal Co.	1,896,145
Pittsburg Coal Co.	652,088
Naomi Coal Co.	266,250
Warner-Leonard Coal Co.	161,671
The Harris-Smith Coal & Coke Co.	18,015
Total	6,715,911

PRODUCTION BY COUNTIES

Washington	3,445,357
Fayette	3,270,554
Total	6,715,911

GENERAL STATISTICS

Number of mines	22
Number of mines in operation	19
Number of tons of coal shipped to market	6,584,928
Number of tons used at mines for steam and heat	118,077
Number of tons sold to local trade and used by employees	12,906
Number of tons of coal produced	6,715,911
Number of tons of coal produced by pick mining	2,044,210
Number of tons produced by electrical machines	4,671,701
Number of persons employed inside of mines	6,154
Number of persons employed outside, including coke workers	800
Number of fatal accidents inside of mines	35
Number of nonfatal accidents inside of mines	37
Number of non-fatal accidents outside	1
Number of tons of coal produced per fatal accident inside	191,883

*Mine inspector, twenty-first bituminous district of Pennsylvania.

Face Guard for Mining Stock

At the present time a great deal of attention is being paid in Great Britain to the physical condition of horses and ponies employed underground, and much is now being done to remove those objections which have been made to the careless treatment which is said in some cases to have been meted out to them. One indication of this admirable movement is shown in the illustration which gives a rough drawing of an eye protector guard which is being made by George Burnside, of Shiney Row, Fence Houses, in the County of Durham. The loss of an eye is, of course, one of the most painful accidents which can happen to an animal underground. Once a pony loses an eye, probably half the value of the animal is lost.

It consists either of copper or galvanized wire woven into a suitable mesh with rims and adjustments or straps for attachment to the bridle. All the wire ends are woven round the outer rims, and the protector being shaped to suit the eye is of great strength without having any needless weight. Should the horse or pony come into collision with any obstacle, such as a wooden door, the resistance is taken by means of the plate fixed to the guard, which plate takes its bearing on a leather strap which is attached to the bridle and comes down the forehead and face. It also has adjustments in the form of buckles which are attached to the outer rim of the guard.

The buckles which engage the straps attached to the bridle on the cheeks of the animal prevent the guard from touching any part of the head, and thus the horse or pony receives the force of the blow without any pain or fear of any damage to the eyes. The guard is attached to the bridle with suitable straps which can be easily removed for repairs without removing the bridle from the pony, and are suitable for fixing to any existing bridles. As the device is well ventilated it is cool, and this is a matter of great importance. There is, moreover, no interference with the sight, as the horses or ponies have their full front and side sights. This feature is most necessary as the side sight is important to underground animals, much turning having to be done in narrow spaces.

Horse Fitted With an Eye Protector

It is often found that ponies are nervous after accidents, and a valuable provision is made so that the bridle need not be removed in case the guard needs reblocking. In order to facilitate reshaping, hard-wood blocks are provided and mounted at the stable, which are so formed as to correct the distortion of the guard and to fit it when molded to its proper shape. A common cause of tender eyes in animals employed for underground haulage, is the lashing of wet canvas doors against their eyes, and the protector shown effectively obviates this.

The mesh which is usually adopted is ⅝ in., but this can be varied to suit local circumstances, and in some cases aluminum guards have been substituted for copper or iron. This simplicity of adjustment to existing bridles is a great feature in its favor, and it can therefore be imagined that the device is a great boon to underground horses and ponies.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Ventilation in Sinking Shafts

R. A. S. Redmayne, the chief inspector of mines in Great Britain, gives an account of the accident at the Thorne colliery, Yorkshire, England, which illustrates the care which should be used in ventilating shafts during the sinking process. He says that an accident occurred, Mar. 16, 1910, at Thorne colliery, when sinking operations were being carried on to reach the Barnsley bed. The shaft was 22 ft. in diameter, and was only 120 ft. deep at the time of the accident. A round of 15 shots in the bottom of the pit had been fired by an electric battery, each shot containing 1¼ lb. of gelignite. Immediately after the firing of the shot a foreman and laborers descended the pit in a hoisting bucket ("bowk"). On reaching the bottom of the shaft, about five or six minutes after the shot had been fired, the men began to cough, and several of them became very weak and ill.

A second gang of laborers descended and reached the bottom of the shaft about 15 min. after the first gang, and one or two of them were also affected by the fumes. During the shift several of the first gang became so ill that they had to cling to the rings of the shaft; but the significance of the symptoms mentioned was not realized by either the men themselves or those in charge of the work. The men temporarily recovered, with one exception, this man going to the surface an hour before the completion of the shift; the rest worked about three hours after the firing of the charge mentioned above. Then they went home, but during the night several of them became seriously ill, and one died about the middle of the next day (Mar. 17).

All the men who went down in the first bucket, and one at least of those in the second bucket, developed similar symptoms. No mechanical means had been taken to produce a ventilating current in the shaft, and the heat of the steam pipes used therein caused a current of air, which was depended upon to ventilate the workings. The shaft was wet; the amount of water being made being about 120,000 gal. per hour.

The symptoms show that those of the men who were affected by the poisonous fumes of the shot were suffering from the effect of carbon monoxide, and nitrous oxide poisoning. Prominent among these symptoms was a confusion of thought and expression, even when the persons affected thought themselves quite well (pointing to the presence of carbon monoxide), and violent coughing (pointing to nitrous-oxide poisoning). The inferences which may be drawn from this case are the following: That carbon monoxide was responsible for the more immediate symptoms, and the nitrous fumes for the bronchitis.

In Cornish mines, where it is seldom that more than 4 or 5 lb. of gelignite are fired at one time, cases of "gassing" are rare. On the other hand, accidents of this sort are common in the Transvaal, where heavy rounds of explosives of the nitroglycerin class are fired, and carbon monoxide is as often the cause of death as nitrous fumes, the latter being dangerous when a charge has failed to detonate.

But even with the best obtainable ventilation and the best quality of explosives, the conditions characterizing the present case would be risky, and it is remarkable that with such heavy rounds of shots that there had not been trouble at this work before. Possibly the explanation lies in the fact that the shaft not being so deep, the fumes cleared away sooner than was the case at the time of the accident; but it may have been due to the fact that the men did not, on previous occasions, descend to the bottom of the shaft so soon after the firing of the rounds of shots. Perhaps, too, on the fatal occasion, the climatic conditions were such as operated against the rapid carrying away of the fumes.

Briquetting Machines

We are indebted to *The Iron and Coal Trades Review* for the following descriptions of two large coal briquetting machines for installation in a South Wales briquet manufactory. One machine is the largest double-pressure briquet machine built in England up to the present time for the manufacture of briquets from bituminous fuel. Two 25-pound briquets can be made per stroke, the edges being beveled, and the briquets being branded on both sides. The output is about 25 tons per hour, equal to some 2200 briquets per day. The machine is extremely heavy, as may be well understood when it is noted that it will exert a total pressure of 320 tons upon the briquet.

Another machine, also made by Robert Middletown, of Sheepscar Foundry, Leeds, is built for the manufacture of small nut fuel, and can be designed to make blocks weighing from one to four ounces. Its output is from 10 to 15 tons per hour, according to the weight of the block produced. As usual, the molds are sunk in tires, being so arranged that the whole face of the roller is covered by the depressions, in which the material to be compressed is allowed to run. There are four rollers, two at each end of the machine with gears between them. The roller faces are made of steel, and after having the cups or molds carefully cut and polished in them, are heavily casehardened before being pressed onto the steel centers which carry them. The gearing is cut so that the cups come together. The bearings or brackets are very heavy, and the rollers are adjusted by wedges. The machine described requires only 15 to 20 horsepower for operation.

Grounding

The discussion of a paper on "Earthing, Earth Plates and Earth Detectors," by T. W. Ellis, at a recent meeting of the South Wales Branch of the Association of Mining Electrical Engineers of Great Britain, contained some interesting facts.

Sands and gravels appear to conduct principally by the moisture and damp clay in the interstices, but clays have a true conductivity, some of them giving less resistance than the water with which they are moistened. Some rocks have a conductivity depending not only on the water they contain, but also upon the nature of the rocks themselves.

RESISTANCES OF NATURAL GROUNDS

Natural conductor	Ohms per c.c.
Fresh rainwater	12,000
Stream, well and river water	2,400
Thames water (at London Bridge)	2,130
Sea water	350
Saturated solution of lime water	750
London blue clay	870
London red clay	950
Clay with sand	1,900 or over
Plastic clay	1,900
Same clay (dry)	1,850
Silver sand	6,400
Ordinary river sand	19,000
Whiting (levigated chalk)	1,900

These figures suggest that the excellent conductivities of clays are due to the fineness of their constituents and not so much to the conductivities of the particles themselves. Temperature is also a factor; water at 60 deg. F., which had a resistance of 2400 ohms, fell to 1400 ohms at 150 deg. F.

Long continued action of electric current lowered the resistance of soils, while a rest raised the resistance.

The resistance of a ground-plate 2½ ft. square is about ¾ of an ohm, if

sunk in the sea, 3 ohms if buried in pure clays, 10 to 15 ohms if in mixtures of both gravels and clays, and as high as 40 ohms when sunk in some mixtures of sands and gravels or of porous rocks. The least resistance of an earth connection that Mr. Ellis has yet measured was 7 ohms, and the mean resistance of a large number of measurements was between 15 and 20 ohms. In sinking a ground-plate, it is necessary to put it sufficiently deep to insure its being surrounded the whole year with soil saturated with moisture. It should be sunk in a hollow, and, if possible, beside a constantly running stream, with the top of the plate below the level of the bed of the watercourse. If sunk near a drain the plate should be placed near its under surface. If there are gas and water pipes, it should, where possible, be connected to them. Of course, a connection to a gas or water main is sufficient where such pipe is not likely to be cut for repairs. The resistance of an earth connection made to a water line may be but a fraction of an ohm. A number of small plates, sunk some distance apart, are a more efficient earth connection than one large one. They are still more effectual if the conducting layer of soil is shallow.

Weldless Chains

In a paper read by A. D. Strathern, on "Weldless Steel Chains for Mining and General Purposes," before the Manchester Geological and Mining Society, he said: "It is now fully 100 years since the ordinary oval-link welded iron chain was produced commercially. Robert Flynn, an Irish blacksmith, commenced making such chains at his forge in North Shields, in the year 1808, and from that time the chain-making industry has grown steadily until it now holds an important place in the world's manufactures. Stud-link chains, as used for ships' cables, were introduced in the year 1812 by Lieut. Brown, but since then practically no improvement has taken place in the manufacture of ordinary welded iron chains. Defects which experience has shown to be most common in welded-iron chains are: first, defective welds; second, the excesive weight of the chain, as compared with its strength; third, the absence of any allowance for wear on those parts most subject to abrasion; fourth, the want of a uniform standard of quality. In most cases, chains wear at the end of the links, where they bear upon each other; consequently the correct theoretical and practical design is to make the ends of the links of greater cross-section than the sides, and so provide for wear and tear, and at the same time give a greater resistance to deformation under strain."

Weldless Chains Stronger than Welded Chains

Some years ago Mr. Strathern invented the process of making weldless steel chains from cruciform bars by stamping or segmental rolling. A machine built in accordance with his design is now working successfully at Gartsherrie, near Coatbridge, and large quantities of chains are being produced regularly on this machine. Chains made by this process have the ends of the links materially thickened where the wear usually occurs, and the proof-load applied to these chains is approximately the same as the breaking load of a welded iron chain of the same size. The ultimate strength of these chains is approximately 100% greater than that of welded iron chains acceptable for British Admiralty Service. For example, a three-quarter-in. weldless steel chain, tested at Birmingham University, broke at 28 tons, whereas a welded iron chain of the same diameter would only be required to stand a breaking load, in accordance with the Admiralty scale, of 13½ tons. It is safer to lift 3 tons with a half-inch weldless chain than it would be to lift 1½ tons with one which is welded.

During the last few years weldless steel chains have been largely adopted for mining and general purposes. In many important collieries throughout the country they are being used exclusively for car couplings, cage bridles, and other chains.

Mr. Landless said that he had seen a weldless chain over a mile in length at work. It had been working for four years and had given great satisfaction.

Collapsible Air Ducts for Mine Fires

Gustav Ryba, Royal-Imperial Chief Mine Controller at Brüx, Bohemia, Austria, gives the following notes on the fighting of mine fires in the Zeitschrift des Zentral-Verbandes der Bergbau Betriebsleiter Oesterreichs:

The usual way of coping with a fire is by the use of props, boards and brattice cloth. But where the cross-section of the heading is too narrow to permit of the erection of such a side airway, air conduits can be used. These may be made of cloth, and can be folded up like Chinese lanterns as is shown in Fig. 1. They are easily carried from place to place. These cloth conduits are made and sold in Vienna. In order to prevent the collapse of the cloth cylinders with consequent obstruction of the air, they are stiffened by steel rings within.

Fig. 2 shows the use of such a temporary air duct placed in a vertical shaft. According to the data furnished by J. Jicinsky, a mine manager, 100 yards of horizontal air conduit can be laid in 15 minutes.

The ventilation may be obtained by a split from the main air current or from a small portable fan, driven by hand or water power.

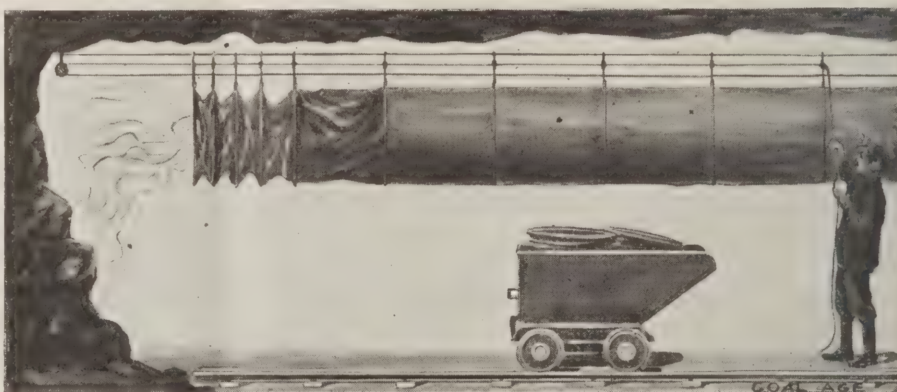


Fig. 1. Austrian Device for Approaching Fires

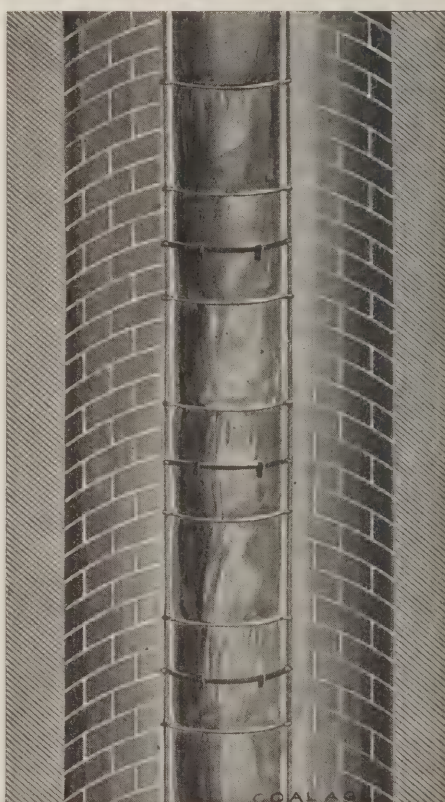


Fig. 2. Ventilating Bag for Use in Shafts

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Of this issue of Coal Age, we will print 7000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Electrical Supervision

The introduction of electrical machinery into mines has required from the personnel working therein, knowledge of an entirely new character. The result has been twofold. The mining companies have suffered from the incompetency of their men, and the men have suffered in varying degree from the lack of skill of their co-employees.

On only one ground, that of safety, is it permissible, within Constitutional restrictions, to urge the examination and licensing of any body of craftsmen. Nevertheless, as such a change might cause some additional expense to the coal companies, it would be well to supplement the consideration of safety by drawing attention to the advantage of having men of known efficiency. A shiftless way of operating, which burns out armatures, causes short circuits in coils, permits leakages along leads, leaves machinery where it is subject to moisture and corrosion, allows bonds and cross bonds to become loose, and imposes unnecessary resistance at joints, obviously is not profitable. The coal company is bound to pay the wage which will justify the acceptance of employment by competent men if it would secure economical work, and it will not cost any more to engage a competent and licensed man than one who is competent and yet unlicensed.

The licensing of the electrician should be by a special electrical inspector. The examination should cover many of the dangerous features in electrical wiring, and the operation of electrical mining apparatus. Every mine should have an electrician capable of installing simple equipment, or of supervising its installation. In small mines working 150 men the foreman could serve as electrician if duly qualified and licensed, but in larger mines, a separate man should be required. Perhaps, however, consideration might make the electric output the basis for division. There are logical considerations for either decision.

In England, the special rules, adopted in 1905 under the authorization conferred on the Home Office in the Coal Mines Regulation Act of 1887, require a competent person to be on duty above ground and another below when electricity of more than 200-hp. is being transmitted. The law is indefinite as to the meaning of competency and is made harder to understand by the further requirement that "every person appointed to work any electrical apparatus shall have been instructed in his duty and be competent for the work he is set to do." A degree of competency is therefore required which in any particular case would be hard to determine.

It may be added that any person appointed as superintending electrician should have opportunity at least four days in the week to superintend the condition of the wiring, bonding and machines, and to direct the men under his charge in the performance of their duties. If reasonably free from hampering non-supervising duties, such an electrician should be able to superintend both above and below ground.

The Minimum Wage

The situation in England is extremely interesting, the more that it shows the future trend of American unionism. If the American laboring man tends in himself to evolve on different lines from his English cousins, the force of example is almost sure to interfere with the simplicity of his evolution.

Say what we will, the American workman has in the past been willing to labor, on the whole, an eight- or ten-hour shift for an eight or ten hours' pay. But present signs indicate that he is not as willing to do it now as formerly. Ten or fifteen years ago a man was hired to help, much as on a farm, at every job that appeared.

But with schedules of wages immutably fixed by unions, a man will now do noth-

ing for which a higher rate is paid unless his pay is raised accordingly. To do so would be scabbing. Nor will the workman of today do work lower in the scale than that for which he was hired. This, he feels, would be socially lowering and besides might result in a reduction of his wages. And neither will he do another man's work, although it is paid for at a rate identical with his own. That might cause his fellow workman to be laid off and would be resented. All the union permits him to do is the work for which he is specifically employed. Otherwise he must remain idle.

It is to be regretted that we have about the mines so many different jobs with fractional differences of pay; this condition results in the establishment of so many castes, that every man awaits, albeit with no anxiety, for the approach of that particular piece of work for which he was specifically engaged. Of course, this incapacitating condition has gone further in England, still further in France, and further yet in India. But we are traveling along the same road fast enough to arouse concern, and, to prove this contention, all we need to do is to recall how business was conducted only ten years ago; how every man ran forward to give a lift, hustled the rock out of the mine cars and snow out of the gondolas for the morning start.

It is different now; the men inside wait for cars and earn a lessened wage because the employee without warms his hands while certain men hired and labelled drivers, rockmen or snowmen, have to do their work begrudgingly alone. The spirit of emulation, the spirit of "all together, boys," has gone with the passing years and a new condition faces us.

The deliberate and intentional reduction of the workman's activity has as yet scarcely invaded this country, but, as we show a great aptitude for embracing alien faults, we may anticipate its arrival. The English workman lays less brick and digs less coal, not because he is a less competent fellow. He is as efficient, physically and mentally, as the average employee in America, reckoning the native and foreign admixtures. He digs less because he wills to dig less. He lays less brick because he wishes to lay no more. The will and not the ability is lacking. He has shortened the working hours by union regulation and by act of Parliament. We wonder he has not still further shortened them—so little has he concluded to do.

The minimum wage is planned as a provision whereby the man who does not earn enough to cover the cost of necessities, may be presented with a living wage at the expense of the coal owner. There are some old men, whom this new plan will inevitably force out of the mines; also, many incompetents will be weeded out, while the lazy will have to travel the road of the weak. And so perhaps, on the whole, the operator will not suffer. But it will be a severe burden on the resources of the English nation to support the old and incompetent whose capacities are perhaps only half that of normal men in their prime, and who, by this ill-considered provision, if extended to other forms of labor, must be thrown entirely out of all work.

The minimum wage will leave the operator just about *in statu quo* and the miner just a little worse off than he was before, for he will be thrust out of his work in his old age. The principle is bad. We may overlook the disputes it will occasion, the bitter enmities and feeling of desperation which will arise, when men are discharged for the incapabilities of age. We can hear them repine that it is "a sin to grow old."

But apart from all this, the introduction of the minimum wage is a sign that the economic reasoning of the laboring classes of England is essentially wrong. We have never been absolutely sure that labor was not the source of all wealth, seeing that capital is but stored labor, and land but the body on which labor operates. But if, as the workers significantly claim, labor is wealth, then where is wealth without labor? Will the country of England, and the miners of England, an important part thereof, accumulate wealth by rest? The "idle rich" constitute a great international problem, but still greater is the problem of the "idle poor," for if no one will work, there can be no wealth.

We can see some sense in a raise in wages. In the readjustment, the capitalist may write off a little of his profits and labor thus secure a larger proportion. Moreover, if, of all trades, the workers in one industry get the earlier raise, then those workers will continue to score by greater purchasing power until the index of staples takes a new rise. But what gain is there in decreased production? It does not affect the distribution of wealth, but merely its total amount. There can be no gain to labor from a decrease of production. The bee might as well say, "I will be a wasp and store no honey," as the worker say, "By working less, I shall live better."

It is needless to say there is no advantage in overworking, and some Americans, many miners among them, are working too hard. But there is no greater truth than this: When men conserve their labor to a degree which does not aid in preserving either life or effectiveness, they do not conserve, but rather destroy the wealth which that labor represents.

Dusty Gob Headings

According to Mr. Mavor, the percentage of coal dust on floor, sides and roof of a rough heading amounted to 70, 24 and 6% respectively of the whole dust found. Where the sides of a roadway are gobbed, the accumulated dust on the sides may be a large percentage of all the dust present. The Briceville explosion may well have been made more severe by the dust on the extended gob-walls at the sides of the butt-headings.

It may be said, however, that the advocates of schistification favor a rough heading, along the sides of which large masses of stone dust may be conveniently distributed to permeate the ventilating current at the first disturbance of the air or vibration of the measures.

Coal Liming

The English gas plant owners have shown a revived interest in coal liming. The process consists in mixing ordinary limestone finely powdered, with the coal as charged into ovens or retorts. The advantages claimed for it and which have actually been obtained at the Cheltenham Gas Works, England, are: Reduction of sulphur compounds in gas, increase of gas yield and illuminating power, and the production of suitable metallurgical coke from high sulphur coals, by reason of the sulphur combining with calcium, the body thus formed in the coke, calcium sulphide, being a compound of sulphur more or less inert when used in the process of reducing iron from its ores.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Sealing off a Mine Fire

(Continued from Feb. 3)

Letter No. 18—As to the proper method to follow in stopping off a fire that is located at the face of a pair of entries, I wish to say that from my experience, (and I have been to a great many fires) I would always put my first stopping in the intake side as close to the fire as it is possible to get.

I would cut the air off from the fire even though I had to put up a temporary stopping and the permanent one later on. I should try to prevent an explosive mixture forming. I have never known a case where I would place the first stopping in the return. Other men may differ from me, but this is my opinion. I am

attaching hereto a little sketch, showing where I would put the first stopping, if it were possible to get so close to the fire.

RICHARD NEWSAM,
Pres., Illinois State Mining Board.
Peoria, Ill.

Letter No. 19—I have had some personal experiences in dealing with mine fires, and have had to play "tip and run" in at least one of these. While recognizing the fact that it is often impossible to approach the return side of a fire that has gained considerable headway, generally speaking, I should certainly make every possible endeavor and close the return airways first.

By closing the return side first, when it is possible to do so, I confine all the products of combustion to the area of the fire; and these assist greatly in deadening and finally in extinguishing it. These confined gases expanded by the heat of the fire push back the fresh air that would enter the intake end.

If, on the other hand, that end is sealed first, there is the greatest likelihood that sufficient fresh air will be pent up inside or behind the stopping to keep the fire alive and to make the gases generated highly explosive. My advice is, whenever possible, close the return end first and make it tight as wax. I would like to go more into detail in the important discussion you have started, and may do so a little later; but time will not permit me to do this at present.

JAMES ASHWORTH.
Vancouver, B. C., Canada.

Letter 20—It never occurred to me that there was any other way of sealing off a mine fire than by placing the first stopping in the intake entry, just inside a crosscut which could be quickly opened to allow the air to short-circuit, and then to build the second stopping in the return. However, there are always two sides to a question and this one was submitted to three well trained, experienced coal-mine superintendents in the Illinois field, and their answers published herewith indicate how mining men differ on problems supposedly simple and generally assumed to have been solved in the early days of mining.

This solution is from a superintendent working in a field subject to gob fires:

> If I had a fire to deal with in the face of an entry, I would undoubtedly close the return-air side first, especially if the coal was giving off marsh gas, for the reason that when you close the return side of the entry, the gases given off by the fire would drive back the fresh air on the intake and eliminate the possibility of sealing up a large amount of fresh air with the fire.

The following is from a man in active charge of gaseous mines, who has had wide experience in fighting mine fires:

> I would build the first stopping on the intake, in order to stop the air current from blowing on the fire, as quickly as possible. I do not think the smoke would be as bad to work in on the return, with the first stopping on the intake, as it would be if we attempted to build it on the return first.

This answer is from an experienced superintendent, who has had a number of fires to subdue:

> My opinion in this case, confining myself to the simple case of a mine fire, and assuming, of course, that there is no gas to contend with, would be to put the first stopping in the intake, which could be done without the workmen being greatly handicapped by smoke. When that first stopping, blocking off the air, was built, the smoke on the return entry would be reduced, and the men could erect the return-side stopping without difficulty.

The assumption that there is no gas is wrong, since any fire may generate enough carbon monoxide or other explosive gases to make an explosion imminent, and the only safe way is to assume gas to be present and act accordingly. An analysis of the case presents the following:

Fan Exhausting

Stopping placed on intake—Would involve sealing up some fresh air in that entry, and fan would draw gases and smoke down the return and into the workings, making more difficult and dangerous the work of placing the second stopping.

Stopping placed on return—Less fresh air would be sealed up on account of the gases and smoke backing up and filling the intake. This plan would prevent the dissemination of smoke and gas through the mine.

Fan Blowing

First stopping placed in intake—Some air sealed up; this method relieves intake of ventilating pressure and allows gases to issue from coal, possibly creating a dangerous condition.

First stopping placed on outlet—Less air would be sealed up with the fire on account of smoke and gases filling the entry while the stopping is being built and smoke backs up into the intake; also when the second stopping is built, the minimum amount of air would be sealed up in the fire zone.

The result of this hurried analysis seems to prove that the fire stopping should be built in the outlet, regardless of the plus or minus water gage; first, because it permits sealing up the entry with the least amount of air; second, it prevents gas and smoke filling up other parts of the mine; third, it does not involve danger of drawing gas or explosive mixtures over the fire.

It does appear, however, that these arguments are more or less theoretical and the conclusions far-fetched. About the only way a man can get to a mine fire (without a helmet) is by following the air; when he gets as close to the fire as the heat or smoke will permit, the nearest crosscut is opened, the air short-circuited and the two stoppings (generally a curtain first) should be built practically simultaneously, if the force of men is large enough. The first one to be finished, of course, will be the one easiest to get in place on account of height, roof, floor, etc.

Probably the reason the intake stopping is generally erected first is because the men can work in better air, and for the reason that material and tools are carried in along the intake airway, and it is natural to drop them at the last crosscut and build the stopping there rather than drag them through and work in the smoke. These are the actual conditions facing the men doing the work, and since there are no positive reasons for doing the job differently, you generally find the

first stopping in the intake, especially when working on a serious and dangerous fire.

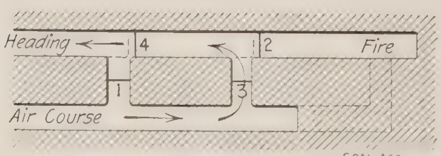
I am sure that the amount of air sealed up in building the stoppings would not make an appreciable difference in the life of the fire. The oxygen behind the stopping that aids the combustion is either from disintegration of H^2O, or is sucked through the stoppings by the contracting gases on account of the volume being reduced by cooling. I think the best thing to do is to get the stoppings in place as fast as conditions permit (regardless of which one is first) and then make them *tight*.

JOHN A. GARCIA,
Mining Engineer.

Chicago, Ill.

Letter No. 21—In answer to the question, "Which is better, in sealing off a mine-fire that has gotten beyond control; (1) to place the first stopping on the return side of the fire, or (2) build the first wall on the intake side of the trouble?" will say that I assume the fire is near the face of a heading and has assumed such proportions as to make it impossible for men to reach it, and for this reason it has been determined to seal it off. The problem is what is the best way to go about doing this.

The accompanying sketch shows the assumed location of the fire in a heading which is somewhat in advance of the air.



SHOWING LOCATION OF STOPPINGS AND DIRECTION OF AIR CURRENT

The arrows indicate the direction of the ventilating current. If I could do so, even by building a temporary brattice, as shown by the dotted line, I would build the first stopping or brattice at 2. This should temporarily be constructed of wood so that it may be put into place with great rapidity, and if thought desirable, a stone or other more permanent brattice could be built outside of the wooden one afterward. This would effectually cut out any possibility of the fire spreading, and after the brattice 2 had been built, or in fact during its construction, the air-course could be extended as indicated by the dotted lines. This, if necessary, would make it possible, after making a small opening in brattice 2, to reach the fire with water-hose or enable it to be attacked by other means.

In case the brattice 2 could not be built at the point indicated, I would build it at point 3, and, as the air-course was being closed up at this point, the brattice could be removed, after which brattice 4 could be built with the aid of the brattice or curtain shown by dotted line. After brattices 3 and 4 were put in, the air-course could be extended as shown by dotted line, and the fire attacked as indicated above.

As to which one of the brattices, 3 or 4, should be built first, the practicable way would be to follow the plan indicated above; that is, build brattice 3 first, for the reason that the air-current would keep away any smoke to interfere with its construction, and after finishing it, brattice 4 could be built with the aid of the brattice or curtain shown by dotted line. If it would help and was necessary, a part of the ventilating current could be allowed to pass through brattice 3 by making a small opening in it.

Of course, in the case of almost any mine-fire the mode of procedure is much modified by conditions and these conditions might cause a change from the plans I have outlined above.

I have not taken into consideration the presence of explosive gas as that point is not raised in the question. This point, however, might cut a considerable figure and call for special consideration and precautions.

ERSKINE RAMSAY,
VICE-PRESIDENT.

Pratt Consolidated Coal Co., Birmingham, Ala.

Letter No. 22—In my judgment, the first stopping should be placed on the intake airway, for, under the circumstances, it is essential that it be built as quickly as possible and it is evident that more rapid work can be done in the clear air of the intake than in the smoke and fumes of the return; but, even if by the use of oxygen apparatus or other device it could be constructed as readily and quickly in the return as in the intake, I would still select the latter as the right place for the first stopping.

In the case before us, two things should be kept in view; (1) the most effective means to keep the fire from gaining and to subdue it, must be applied as expeditiously as possible, and (2) the safety of the men doing the work must have the most careful consideration. The last is of paramount importance.

The fire, as stated in the question, is beyond control by ordinary means. Therefore, if the first stopping is started in the return, it is apparent that the fire, with a practically undiminished air supply reaching it by way of the intake while the work of building the stopping is going on, will continue to gain materially and the consequent increased intensity of heat, the greater volume of poisonous fumes in which the men must labor, the increased danger from roof falls and other difficult conditions, will make fast effective work almost impossible, and may even force the workmen to quit the job before it can be finished.

The conclusion that the erection of the first stopping in the return is a protection against a possible explosion is not sustained by the facts. An explosion of a mixture of combustible gases and air, or coal dust and air, may occur with explosive results on the intake side of the fire, where air is present in sufficient amount and purity to support combustion. Explosions have occurred in just this way, and that danger is not averted or reduced materially by starting the first stopping in the return airway.

If the first stopping is started in the intake, the earliest possible check of an excessive and highly dangerous draft along the floor in the intake toward the fire is provided. As work on the stopping progresses, the excess air supply through the intake is steadily reduced, resulting in a material increase in CO_2 in the return, and therefore greatly lessening the possibility of an explosion in that region. As the stopping nears completion and the air supply becomes more attenuated, the products of combustion will spread further out from the fire along the intake and the additional short time needed to close the stopping may be considered a critical period, but undoubtedly this period of danger of a possible explosion and the danger itself are much less than under the attempt to place the first stopping in the return.

It may be held that the inclosing of fairly pure air between the completed stopping and the fire still involves the danger of explosion. This contingency appears to be remote. The inclosed air supply is of fixed and limited amount, and of a rather stationary character; it cannot advance freely toward the fire and what little advance there may be is speedily checked by the rapid rise in its temperature. But, supposing that under such unfavorable conditions and in the presence of a considerable amount of CO_2 and other noncombustible gases, an explosive mixture could be produced near the stopping, there is still no imminent danger because the means of ignition are absent and the mixture cannot get to the fire without losing its explosibility.

After the completion of the first stopping in the intake the possibility of an explosion on the return is practically eliminated. It is true that the return for a considerable distance outward from the fire is filled with hot gaseous matter, but the bulk of it is unfit to support combustion, and what combustible gases may be present near the fire, cannot be ignited because of lack of sufficient air.

Naturally, after the closing of the intake stopping, an air movement in the return toward the fire will set in, but the air, now befouled more or less by CO_2 and otherwise vitiated, can only make comparatively slow progress in that direction because its advance is steadily opposed by the resistance of the stretch

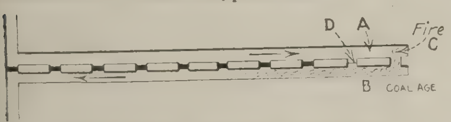
of heated gases, intervening between it and the fire, a resistance that can only be overcome by a gradual reduction in their temperature. In the meantime, the men building the stopping in the return can labor under more favorable conditions, permitting faster and better work.

I have kept the matter of the possibility of an explosion in connection with a mine fire in the foreground because it appears that the consideration of this contingency is the underlying cause for the difference of opinion regarding the selection of the right place for the first stopping. But while the matter deserves careful attention, it should be remembered that experience has shown that the danger to life and property from the direct action and smoke of a mine fire that is getting beyond control by ordinary means is vastly greater and certainly more immediate than the danger from the more remote possibility of an explosion. The exigency of the case demands that the greater danger receive first consideration; therefore, its main cause, the strong draft playing on the fire through the intake, should be removed at the earliest possible moment. In my judgment, this can be accomplished in the most effective manner and in the shortest space of time and without increased danger from any other source by erecting the first stopping in the intake.

John Verner.

Chariton, Iowa.

Letter No. 23—In reference to the treatment of a mine fire, many so-called authorities recommend sealing off the return first. I am sorry to say some textbooks advocate a like method. One I remember says in addition: "Many valuable lives have been lost and many disastrous explosions have occurred through sealing up the intake first." However, they do not give instances of these explosions.



Mine Fire at Face of Entry

The fact is, I have put out several fires, and have always been successful with them. My plan is to carry the air up as *close* to the fire as possible, which gives my men good air to work in. When I find it is impossible to extinguish the fire, I seal up the intake in *good* air to the last inch, then get a hole through the first crosscut behind me and build my last wall, forcing the warm fumes to the top by a temporary partition of cloth or board, which I arrange to have handy.

Just imagine a fire at the face of a pair of entries giving off CH_4, the gas burning in the coal at point *C* (shown in the sketch). Assume that said entries contain a pair of concrete-stopped crosscuts 2000 ft. from the main entries. Do you suppose a fireboss, foreman, or underground manager would lead his men up the return to *B* in all these fumes? Would he not rather go to *A* in good air and seal the intake there; then have other men open the crosscut *D*, and seal up *B*? Furthermore, how could an explosion occur at *A* when the gas was already ignited?

After putting out the flames by smothering, I would open up the return to see personally whether the fire was out before I would turn on the fresh air.

Joseph Virgin.

Plymouth, W. Va.

Mr. Garcia Replies to Mr. Norris

Please enter my protest against the assumptions and recommendations in letter No. 16 on mine fires by R. V. Norris, published in your issue of Feb. 3, 1912. Mr. Norris advises that we build the first stopping in the intake entry in order to reduce the amount of gas given off by the fire, etc., and I thoroughly agree with him as to location of first stopping, but strenuously object to the statement following, i.e., "this procedure would be reversed in case the workings gave off a large amount of explosive gas."

There are always explosive gases given off by mine fires; at least there are gases, the composition of which we do not know at the moment, and the only safe procedure is to assume them explosive and direct the work accordingly. Men who "assume there is no gas" belong in the category of those who "didn't know it was loaded" and should be kept on top whenever there is a fire in a mine and help needed below.

Mr. Norris also states that it would be a good plan to reverse the air after placing the first stopping in the intake in order that the second stopping might be built in fresh air. What a fatal mistake that would be! Suppose we were at work building a stopping in the intake near an open crosscut, and the fan was blowing air; what would happen if someone reversed the fan so it would exhaust? All the smoke and gas in the return would at once be pulled out on us, and the suction would draw the thick smoke and heavy gases and possibly the fire through the crosscut and force a hasty retreat and perhaps cause an explosion.

Reversing a fan is a dangerous and questionable proceeding at best, and under circumstances such as outlined above, would not only lose the fight, but endanger the lives of the men, unless it is assumed that the men all leave the mine when the air is reversed, and then what happens to the fire while all this is going on? Reminds one of the fellow hanging to the bridge above the rapids, and who, growing tired, said to a companion dangling at his heels, "Wait a bit, till I spit on my hands."

J. A. Garcia,
Mining Engineer.

Chicago, Ill.

[*In our issue next week, we will publish letters from Carl Scholz, president of the Consolidated Indiana Coal Co.; J. T. Beard, associate editor of* Coal Age, *and other well known engineers.*—Editor.]

Textbooks at Examinations

I was interested in the letter by Iago, appearing in Coal Age of Jan. 20, and wish to respond to his request for opinions as to the use of textbooks at fireboss and mine-foreman examinations. I feel that I am entitled to speak on this subject, as I shall never forget the nights that I struggled with a problem in square root or a formula in ventilation, when my physical weariness was positively painful, and it is a well known fact that at a time like this the brain is in no condition for such strenuous work as technical mine problems. Although I believe a certain amount of technical proficiency is necessary in a foreman or fireboss, yet there are good men who have given up the struggle for a certificate because of the conditions under which they have had to prepare for the usual examinations.

While, of course, it is absolutely necessary that a mine official should have a general understanding of the principles of mining, yet many of the rules and formulas which some of us have wrestled with for hours are of less actual value to us in our everyday work than we ourselves would probably care to admit. After all, the real test of a mine foreman or fireboss is his judgment as a practical man, rather than his ability to memorize rules and formulas, and I know of a number of men, of more than usual ability, who have failed under this latter superficial test. In fact, I have in mind at this moment, two mine foremen, one in Ohio and one in West Virginia, who were the best mine officials I ever knew, and yet could not memorize any particular rule of mathematics or any particular clause of the mine law.

It seems to me that one of the chief duties of an examination board should be to draw out the character and personality of the applicant, ascertaining as far as possible his knowledge as to the general operation of mines, and his views regarding the common dangers, safety measures, appliances and like matters.

In my opinion the oral examination of mine foremen and firebosses should play a much larger part than it does at present. Given 15 or 20 min. conversation with a man, a board of examiners should be able to tell whether or not he is qualified to manage a mine, just as any other man of experience could determine this fact under like circumstances.

Marianna, Penn. Sim Reynolds.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Thawing a Frozen Pipe Line by Electricity

A neighbor has 600 ft. of a 2-inch iron pipe, used as a supply line, frozen. He has ample electric power at command. Is it possible to use this power to thaw out the pipe line and what arrangement is necessary for this purpose?

C. B.

Shaw, W. Va.

Electric power has frequently been used with great success and economy in thawing out a frozen pipe line. Success, however, in any particular case, will depend on at least two essential conditions; namely, (1) a sufficient electric power transformed into a current of high amperage and relatively low voltage, depending on the size, length and conductivity of the pipe, which can only be definitely determined by experiment; (2) a sufficient insulation of the pipe line throughout the length of the frozen section to confine the electric current to the pipe without undue loss of power.

The principle involved is that if a current of sufficient strength is passed through the pipe the resistance developed may be such that the pipe will heat and the ice be melted. The resistance and consequent heating of the pipe will depend on its electrical conductivity, for any given current. The metal cross-section and its relative conductivity and insulation, in a way, determine the necessary amperage of the current, while the length of the frozen section suggests the voltage required. These data must be ascertained by an electrician, on the ground. A special transformer is generally required as the ordinary type will hardly be capable of giving the required voltage and amperage. This must be ordered to suit the conditions, which should be submitted in detail to an electrical supply company.

Authority to Act as Mine Foreman

Suppose, at a mine employing both a mine foreman and assistant mine foreman, the assistant foreman leaves. The mine foreman at once appoints one of his regularly employed firebosses to take the place of assistant mine foreman.

But, suppose the mine foreman suddenly resigns his position as foreman and goes away, whom could he leave in charge of the mine until another mine foreman can be secured to take his place?

Subscriber.

Newcomer, Penn.

The bituminous mine law (1911) of Pennsylvania, Art. 24, Sec. 9, makes it "unlawful for any operator, manager, or superintendent to employ as mine foreman in any mine, or as assistant mine foreman in any gaseous mine" any person not holding the proper certificate of qualification or service. The same law, however (Art. 4, Sec. 1), permits the assistant foreman, in the temporary absence of the foreman, to perform all the duties of the latter.

No provision is made in the law, as far as we know, for a fireboss to assume the duties of assistant foreman in a gaseous mine. He must hold a certificate of qualification for such position before he can be legally appointed to fill the place. The requirements for the two positions, however, are quite similar; the candidate for assistant foreman in a gaseous mine being required to obtain 70% in examination, while the candidate for fireboss need secure only 65%. Each must pass an oral examination in explosive gas, in addition to the usual written examination.

No examination seems to be required, in the law, for the position of assistant foreman at a non-gaseous mine.

Pumping At a Slope Mine

We have a slope dipping about 11% for 2400 ft. At the slope bottom we have a borehole that is 320 ft. deep. About 1000 ft. from the top of the slope we have another borehole that is about 208 ft. deep. The drainage above the upper hole is about 400 gal. per min., while that between the upper and lower holes is practically 200 gal. per min.

Before arranging the system of pumping in this slope we would like to have your opinion as to what would be the most economical system to adopt—to establish a pumping station at each borehole; or to run all the water to the lower station and have but one pump, which would save the expense of a pump runner.

Borehole.

Dunlo, Penn.

Two pumping stations would practically double the cost for attendance, supplies and repairs, while it would save the power and consequently the fuel required to raise 400 gal. of water per min. a vertical height of 320 − 208 = 112 ft. The saving in fuel would amount to

$$\frac{400 \times 112}{600 \times 320} \times 100 = 23.3\%$$

According to figures based on a careful estimate of the cost of pumping, at the Short Mountain Colliery of the Lykens Valley Coal Co., made by R. V. Norris, chief engineer for the Pennsylvania R.R. coal companies, during the great strike of 1902, when it was possible to obtain reliable data in this regard owing to the complete cessation of other mining operations, the cost of fuel, reckoned at 50c. per ton, may be taken as $0.0188 per 1000 gal. of water, lifted a vertical height of 1000 ft.

In the present case, the quantity of water that must be handled each 24 hours is

$$600 \times 60 \times 24 = 864{,}000 \text{ gal.}$$

With a single pumping station at the foot of the slope, this water must be lifted a vertical height of 320 ft., at a cost for fuel of

$$0.0188 \times 864 \times 0.32 = \text{say } \$5.20 \text{ a day.}$$

If a pumping station is located at the upper borehole it would effect a saving in fuel of about $0.233 \times 5.20 =$ say $1.21 a day. It would, however, require another pump runner and this, with the additional cost for supplies and repairs, would increase the expense for pumping about $2 a day. As a result of maintaining two pumping stations, therefore there would be a net loss of about 80c. per day.

[In a second letter, our correspondent suggests placing a pump at the lower sump and pumping all the water from this station. He asks if a pipe be laid to conduct the water of the upper basin to the pump, and a valve be provided at the pump to shut off the flow of water from above while pumping from the lower sump, could not the head due to the vertical height of the upper basin above the pump be made available, so that when the pump is handling the water of the upper basin it would only be working under an effective head corresponding to the vertical height of the point of discharge above the upper basin. We answer, Yes, by a proper arrangement of the pipes and two valves, one at the foot of the slope pipe and the other in the suction pipe below the entrance of the slope pipe.—Editor.]

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions for Beginners

Enlarging An Airway

Ques.—An air course is 3x3 ft. and 1050 ft. long; and it is decided to enlarge its section and make it 6x6 ft., to furnish more air for the mine. The work of enlarging the area was started at both ends of the airway and continued till but 50 ft. remained to be completed. It was then stopped. What, if any, effect will be produced in the circulation of air in this airway?

Ans.—The airway was originally 3x3 ft., 1050 ft. long; it is now divided into three sections, which are continuous or tandem to each other. Two of these sections are 6x6 ft., 500 ft. long; and the remaining or middle section is 3x3 ft., 50 ft. long. The simplest and quickest way to ascertain the effect of this enlargement on the circulation of air is to calculate the value of the potential, first, for the original airway, and then for each of the three sections into which this airway is divided. The first and last sections being alike, however, it is only necessary to calculate the potential for one of them. Thus,

Potential Values of Airways

$$\left(X^3 = \frac{a^3}{lo}\right)$$

Airway, 3′x3′, 1050 ft. long,

$$X_0^3 = \frac{9^3}{1050 \times 12} = 0.0578$$

Two sections, each, 6′x6′, 500 ft. long,

$$X_1^3 = \frac{36^3}{500 \times 24} = 3.888$$

One section, 3′x3′, 50 ft. long,

$$X_2^3 = \frac{9^3}{50 \times 12} = 1.215$$

If the power on the air remains unchanged; in other words, for a *constant power,* the quantity ratio is

$$\frac{q_2}{q_1} = \sqrt[3]{\frac{X_1^3\,X_2^3}{X_0^3\,(2X_2^3 + X_1^3)}}$$

$$= \sqrt[3]{\frac{3.888 \times 1.215}{0.0578 \times 6.318}} = 2.347$$

On the other hand, if the ventilating pressure remains unchanged; in other words, for a *constant pressure,* the quantity ratio is

$$\frac{q_2}{q_1} = \sqrt{\frac{3.888 \times 1.215}{0.0578 \times 6.318}} = 3.596$$

That is to say, if a certain power will circulate 10,000 cu.ft. of air in a 3x3-ft. airway, 1050 ft. long, the same power will circulate 23,470 cu.ft. after the airway has been enlarged to 6x6 ft. for a distance of 500 ft. from each end, leaving a section 50 ft. long, in the middle of the airway, the same size as before; namely, 3x3 ft.

Or, if a certain ventilating pressure or water gage circulates 10,000 cu.ft. in the original airway, the same *pressure* will circulate 35,960 cu.ft. after said enlargement is made.

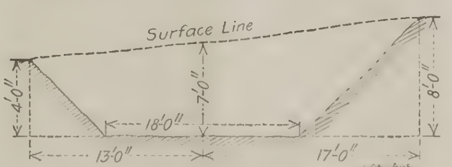
[The above question is practical and one that every mine engineer and ambitious mine foreman should be able to work out at leisure, but it is too difficult, and has not been sufficiently explained in the mining textbooks in common use to warrant its being asked in a mine foreman's examination—Editor.]

Surveying, Calculating End Areas, Excavation or Fill

Ques.—Give a practical and simple formula for the exact calculation of end areas, in excavation work, where the center and side cuts and the width of the roadbed are given, and the side slopes are 1 : 1, or at an angle of 45 deg.

Ans.—The following rule is used frequently in railroad-surveying practice:

Rule—Multiply the sum of the distances out, or the total distance between slope stakes, by one-half the center cut (or fill); again, multiply the sum of the side cuts (or fills) by one-fourth the width of the roadbed; add these products together, and their sum is the end area required.



Cross-section of Excavation

For example, Fig. 1 is a diagrammatic sketch showing the cross-section of a cut made for a siding, at a coal mine. The center cut is 7 ft. and the two side cuts 4 ft. and 8 ft., respectively; the roadbed is 18 ft. wide. The area of this section is found readily, as follows:

$$(13 + 17) \times \frac{7}{2} = 105$$

$$(4 + 8) \times \frac{18}{4} = 54$$

Total area 159 *sq.ft.*

Indiana Questions

Hoisting Engineers' Examination

Ques.—(a) Where should the brickwork close in on a boiler? Give reason. (b) What is a blister on a boiler and how is it produced?

Ans.—(a) The brickwork must meet the boiler below the low-water line, so as not to expose the plates to the fire above the water level in the boiler, which would result in overheating, burning and blistering the iron.

(b) A blister, in boiler practice, is a small nub, or a number of them together, formed on the surface of a boiler plate exposed to the fire and showing that the iron has been burned and its strength impaired. The blister is the result of the local overheating and burning of the iron, owing to a strong concentration of heat at one point, because crustation or other impediment has prevented contact of the water with the plates.

Ques.—(a) Is a gage-cock or a water-glass to be preferred, and why? (b) If the glass water gage of a boiler in your charge should be broken when the boiler is under steam, what would you do?

Ans.—(a) The gage-cock is not only more reliable as furnishing positive evidence of the true water level in a boiler, but it is less liable to accident.

(b) Close the stop-cock of the gage below the broken glass first, and after that close the upper cock. To close these cocks while steam and hot water are issuing in scalding jets and sprays is practically impossible, unless the fireman has had the foresight to provide himself with a long-handled tool by which these cocks can be turned at a safe distance, or unless he can secure a waterproof covering, under which he can approach and close the cocks. If the upper cock is closed first the steam pressure in the boiler will throw the water out in a scalding stream.

Ques.—A boiler to be run under a steam pressure of 100 lb. per sq.in. should be tested to what hydrostatic pressure to insure safety?

Ans.—The regulations in different cities and states with respect to boiler inspection require a hydrostatic pressure varying from 35% to 50% in excess of the desired working pressure, for boilers to be operated above, say 25-lb. pressure. A boiler to be run at a gage pressure of 100 lb. may be tested properly to 140 or 150 lb. hydrostatic.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Colliery Villages

By F. A. Boag

The Garden City Association of Great Britain has made the suggestion for village planning, embodied in the second design accompanying this article. While not an advocate of the spending of money in elaborate surveys of circular and parabolic curves, it seems to me that the idea has a real value. In the second plan, there are as many houses, namely 75 as in the first. There is less length of road to maintain by 425 ft. and a far more desirable appearance is presented. With a trifling change in the plans the houses might be converted into detached cottages, thus reducing the fire risk and promoting privacy.

Street Curvature

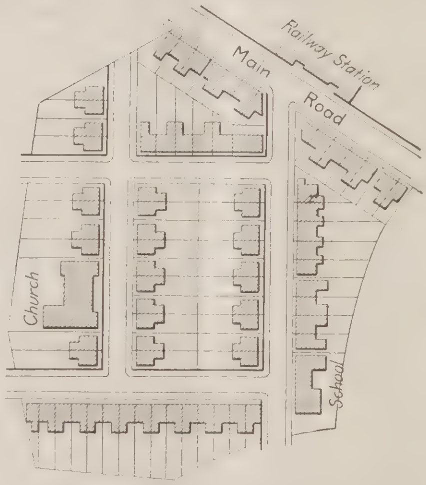
The severe straight lines by which we lay out our colliery villages makes them undesirable. These lines have been rendered necessary largely by the inefficiency of our methods of sanitation. It is evident that in the Garden City plan, some provision has been made for the care of fecal wastes, or otherwise the restriction of the back yards would be inexpedient, though with a little more land available this sewerage would not be absolutely necessary.

In the anthracite regions some of the villages have sprung up along crooked township roads and their appearance is far more inviting than are the stiff rows in those more pretentious villages where the intention is apparently to make a transplanted fac-simile of a city block.

As I have said, I would not advocate elaborate staking, but I would curve the streets to accord approximately with a rough survey previously made. Thus good grades could be obtained, trees of more than usual beauty could be preserved and the town would look more like a village and less like a slum. In many cases such grouping would enable houses already in existence to be left in position and large rocks would not have to be blasted and removed. Not infrequently such rocky masses might even be used to enhance the appearance of the village. There has been hitherto an expensive desire to fit the sites to the plan rather than the plan to the site with resultant loss of beauty, money, comfort and rapidity of construction.

Social Centers

Our mining engineers pay a fetish worship to the straight line, giving us long streets ending in vistas of smoky coke ovens, washer discharges, tumbling prop piles and unsightly rock dumps. If the surrounding country is undesirable, the village should be built so as to shut out the undesirable views; if beautiful it should be planned to utilize all the beautiful features. Centers should be established so that a few desirable tenants can together create a little world of their own, where their efforts in promoting beauty may not be marred by slovenly beer-guzzling neighbors who have no sense of the fit in rural life.



A Rectilinear Plot of a Colliery Village

A center park with tennis lawn or croquet ground could form a nucleus round which could be ranged the store, the company offices, the hospital, the churches, amusement hall and doctor's office. The foreman, clerks, storekeepers, time keepers, village parson, doctor and school teacher could have houses facing on such another center and their efforts at aesthetic gardening and tree planting would probably result in the duplication of their efforts elsewhere. In this way, children of like tastes would have a chance to play together in the gardens in front, having no temptations to stray on to the road and the railroad.

Curvature Often Cheaper Than Straight Lines

One ill kept house often spoils a whole row and it is not right that any man's effort at decency should be spoiled by his neighbor's proneness to disorder.

The attempt to give a lively appearance to a town by a mixing of houses of different plan and color fails to give the excellence of appearance which naturally results from an irregularity of plan. Of course some straight streets may be necessary for through travel and the topography may favor such rectilineal alignment but more often careful planning will receive its award in making grades and cost of building less than they would otherwise be. On a plot of ground sloping evenly, with every contour looking as if it were drawn by a straight edge the rectilinear plan has some advantages but where little ravines cut the ground into irregular contours there may be a big saving in land should a plan less stiff in appearance be adopted.

As Replotted by Garden City Association

Gardening

It may be objected that the plan cuts off the garden plots and makes the keeping of cows difficult. They can be provided for on the straight streets. It has been my experience that English speaking miners in company villages do but little gardening. I believe that this is due less to the fact that they do not want to make gardens than to the thieving propensities of their foreign neighbors. American labor is largely drawn from the farms; British labor takes naturally to gardening especially floriculture but there is little evidence of a love of gardening among either of these people in American mining towns. So the need for such garden plots is not apparent.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Representatives of the American Mining Congress, including the secretary, James A. Callbreath, appeared before the Senate Committee on Interstate Commerce, Feb. 2, for the purpose of urging the amendment of the Sherman act in such a way as to permit coal operators to unite in the establishment of trade agreements that would allow the fixing of rates and the regulation of output, subject to such control as the government may see fit to impose. It was stated that at present the bituminous industry is in an exceedingly depressed condition. The mines are idle about one-third of the year, and as about 500,000 men are engaged in the industry, the loss is manifestly great.

It was argued that at present the railroads are getting a large share of the price for coal paid by the consumer, and there is urgent need that the coal operators be permitted to unite in agreements for the establishment of satisfactory conditions in the business. By so doing, it was alleged, there would be a saving of money to the public at large, because unnecessary production would be stopped and thus the coal supply would be conserved, thereby rendering prices more stable over long periods.

Tables were submitted to show the actual condition of the industry. The witnesses depended largely upon the figures submitted by the Pittsburg Coal Operators' Association, in cases now pending before the Interstate Commerce Commission that are designed to test the equitableness of the rates between Pittsburg operating points and lake ports. The demands made by the representatives of the mining congress are similar to those made heretofore by other groups of coal operators.

Government Railroad for Alaska

President Taft, in a message read in the House on Feb. 1, recommends the appointment of a commission, including two army engineers, to report on the feasibility of building a government railroad in Alaska, and also upon the character of the Matanuska coal fields. The President recommends the adoption of the leasing system for government coal lands.

The message, after reviewing some of the relative advantages of the Bering River and Matanuska coal fields, favors the purchase by the government of the existing Alaska Central R.R. and its extension to the Matanuska field, as a most effective means of opening up a large and valuable portion of the territory. In conclusion the President says: "I am not in favor of government ownership where the same certainty and efficiency of service can be had by private enterprise, but I think the conditions presented in Alaska are of such a character as to warrant the government, for the purpose of encouraging the development of that vast and remarkable territory, to build and own a trunk-line railroad, which it can lease on terms which may be varied and changed to meet the growing prosperity and development of the territory. There is nothing in the history of the United States which affords such just reason for criticism as the failure of the federal government to extend the benefit of its fostering care to the Territory of Alaska.

Coal Rates at the Panama Canal

Prof. Emery R. Johnson, of the University of Pennsylvania, spent two days recently before the interstate commerce committee of the House of Representatives, explaining the bearing of the cost of coal in the United States upon traffic through the Panama Canal. Mr. Johnson said that he considered the coal question fully as important as the question of tolls in determining the distribution of traffic, making it essential to note the relative advantages of the Panama route, as compared with the Suez route, for the purpose of coaling. He called attention to the fact that when freight rates are high, bunker space on shipboard is exceedingly valuable, and rather than start with a great quantity of coal on board and freight capacity correspondingly reduced, owners will often take on coal later at a higher price.

This consideration means that there would be secured a great advantage in attracting freight, should we be able to supply coal cheaply and in an easily available way for vessels passing through the canal.

Mr. Johnson further said that the price of coal at the end of a ship's tackle at the Panama Canal today was about $3.80. He thought a dollar ought to be added for depreciation of coal while in storage and the cost of transportation through the canal to the western end. This would make $4.80. On the Suez Canal, last year's rates ran from $5.10 to $5.35. He concluded that coal rates could be so arranged as to direct traffic toward the Panama Canal.

Alabama

Birmingham—The state examinations for first- and second-class mine foremen and firebosses closed Jan. 26. C. H. Nesbit, chairman of the board of examiners, has made public the list of successful applicants. Twenty-two will receive certificates as first-class mine foremen; 6 as second-class foremen, and 28 as firebosses.

Birmingham has been recognized by the various railroads as an operating base for freight rates to northern Pacific Coast terminals. The new schedule of tariffs that will go into effect Mar. 11, makes sweeping reductions, and will place Birmingham on an equal shipping basis with all Mississippi River points, including Cincinnati and Memphis.

Colorado

Denver—The Union Pacific Coal Co. has filed proceedings in the district court to compel the secretary of state to extend its corporate existence. On Jan. 4, the coal company alleges, it attempted to file the usual certificate of renewal, and a second tender of the certificate and the necessary fee is said to have been made later. In both instances the secretary of state is declared to have refused to take action. The assets of the concern are shown as $616,500.

A strenuous battle between corporations and organized labor is reported to be on in the Trinidad and Walsenburg coal fields. On one side is found the Colorado Fuel & Iron Co., the Victor-American Fuel Co., the Rocky Mountain Fuel Co., and their various allied concerns; on the other is the United Mine Workers of America. Both sides are powerful and determined. The miners say they are going to organize the entire southern Colorado field. The corporations are just as determined that the men shall not join the unions, and are already financing their campaign of resistance. The Colorado Fuel & Iron Co. is said to have tacked on an additional appropriation of $20,000 for guards alone for the year 1912.

Illinois

Danville—Eight men are reported to have been injured, four seriously, by the falling of a mine cage carrying men going to work in the Electric coal mine, six miles west of Danville, on the morning of Jan. 31. The cage dropped a distance of about 200 ft. It was stated by

the mine owners that the engineer lost control of the machinery, causing one cage to drop to the bottom of the shaft, and the other, coming up empty, to be thrown from the mouth of the mine.

Girard—It is claimed that on Jan. 25 the mine of the Girard Collieries Co. broke the state hoisting record for mines having one-ton cars by raising 1827 tons of coal in an eight-hour run.

Springfield—The Citizens Coal & Mining Co. has just closed a contract for the entire output of Mine "B," which will amount to over one million dollars. This is one of the largest contracts ever let to any coal company in Sangamon County. It is made for four years with the privilege of extending it to cover six years.

Chicago—Advances proposed by the Chicago and Alton, and other railroads, of the freight rates on soft coal from Illinois mines to destinations in Missouri were suspended by the Interstate Commerce Commission from Feb. 2 to June 1, 1912. The proposed increases amounted to about 8 per cent. The matter will be investigated by the commission.

Indiana

Sullivan—Acting on a petition filed by one hundred employees of the Reliance Coal Products Co. which operates the Rood mine, east of Farmersburg, Joseph T. Akins has been appointed receiver for the company. All the miners have filed mechanics' liens against the concern. This is the third time the court has appointed a receiver for this company, which formerly operated under the name of the Hudson Coal and Mining Co.

Indianapolis—The Chicago and Wabash Valley R.R. Co. plans to make extensions to give it an air-line route from the Gary steel mills to the Indiana coal fields. At present the northern terminus of the line is 16 miles southwest of Gary, and the road has a length of 60 miles, reaching to McCoysburg.

The convention of the United Mine Workers of America adjourned Feb. 2 after adopting a policy to be followed in negotiating their wage scales and after selecting Indianapolis as the place for holding the next convention in 1914.

Kentucky

Pikeville—The Chesapeake & Ohio R.R. depot and the coal tipple, incline and other property belonging to the Marrowbone Coal & Coke Co. with main office at Uniontown, Penn., were burned Jan. 22. The loss was $15,000 in excess of the insurance. The fire is supposed to have been the work of incendiaries.

Henderson—M. V. Denton, who purchased the coal mining property and coal rights of the Southern Coal & Transportation Co. at Robards, has transferred the property to the Panama Coal & Coke Co.

Jess Strawlings, of Birmingham, and other Alabama capitalists have formed a corporation for the purpose of buying the Drury mines at Waverly and other Kentucky mining properties.

Louisville—The May Investing Co., of New York, which recently took over the 15,000 acres of coal land in Magoffin county, belonging to T. A. Spalding, is preparing to exploit this property. The sum paid was $480,000 and, while this seems large, it is in keeping with other prices being paid for similar investments in eastern Kentucky.

Minnesota

Duluth—Northwestern railroads, anticipating the possibility of labor trouble in the spring, are hoarding steam coal. The docks controlled by the various railroads entering this district are being piled high with the commodity and coal is arriving daily. Illinois coal supplies are being drawn upon, and it is predicted that the supply of railroad coal at the head of the lakes will have increased to immense proportions before April 1. It is also predicted that the commercial supply will be greatly lessened by spring.

The work of appraising the value of the mechanical apparatus at the old Philadelphia & Reading dock on St. Louis bay which has been taken over by the White Oak Coal Co., of Minneapolis, is being carried forward. The rebuilding of portions of the structure will not begin until the value of the plant has been ascertained.

Ohio

Bridgeport—It is understood that the Provident Coal Co., operating the big shaft mine at St. Clairsville, will start a new opening in the near future at Fairpoint, several miles from its present mine. The details of the plans are not yet made public, but it is certain that at least 300 men will be employed when the mine is in full operation.

Canal Dover—Surveyors employed by the Pennsylvania R.R. Co. are at work on a proposed extension of the Cleveland & Marietta branch of that railroad. The line will aid in developing a large tract of Ohio coal land.

Coshocton—Arrangements have been completed for the opening of the cannel coal field between Warsaw and Tunnel Hill, Coshocton County. Offices will be opened in Coshocton by the New York company that is developing the property. The syndicate controls something over 1500 acres of coal land in that territory.

Columbus—Early spring will see the beginning of extensive improvements by the Hocking Valley and Norfolk & Western Rys. in the way of increased yard facilities at Columbus. The plans of the former company include new tracks and shops. Deeds have lately been filed by the Norfolk & Western, covering ground that will be used for coal-storage yards. The cost of these improvements will run into the millions.

Rumors of the $30,000,000 merger of eastern Ohio coal companies have been revived, and plans are expected to be perfected within 90 days. There has been a renewal of negotiations recently and the companies included in the proposed deal have put a force of engineers and experts to work checking up their coal deposits to find out how much land is undeveloped.

Pennsylvania

Bituminous

Punxsutawney—A large deal in this section has just been completed, by the sale of the property of the Bear Run Coal & Coke Co. to the Boswell Coal Co., of Baltimore, Md. The price paid was not made public. The chief stockholders in the selling company were J. B. Phelen, H. G. Bowers and W. A. Bowers, of Punxsutawney; M. Burns, of Brisbin, and T. R. Johns, of Claridge, Penn. The property is situated at Sidney, Indiana County, on the Bellwood division of the Pennsylvania R.R., and is partially developed, two mines being opened. There are 3000 acres in the tract. The Boswell company is a large producer in the Pocahontas region. It is said the company intends to greatly enlarge the operations at Sidney.

Monongahela—The Acme mine of the Pittsburg & Westmoreland Coal Co., at Bentleyville, was closed down, Jan. 27, following differences between the management and the workmen, which culminated in a strike. The miners were paid in full and the plant closed.

West Newton—After two months of idleness, the West Newton shaft mines of the Pittsburg Coal Co. have resumed operation. Other mines which have received orders to resume work are the Waverly at Smithton, and the Summers No. 4 at Pricedale.

Uniontown—By a deal closed recently, the Superba Coal Co., at Beeson, and the Smith Coal Co., at Evans, have been merged. The merger means an increase in the output of coal which is all taken by the Baltimore & Ohio R.R. as locomotive fuel. The two companies now control about 1050 acres of coal land.

Yukon—The large electric generator at the Yukon mine of the Westmoreland Coal Co. burned out, Jan. 31, and closed down the mine, throwing about 600 men temporarily out of employment.

Waynesburg—L. T. Laidley and Eli F. Baily, of Carmichaels, have secured options on a block of about 1500 acres of coal in Cumberland township, near Carmichaels, at $600 an acre. The options

run for 30 days and it is believed a sale will result.

Charleroi—Nine days that the Monongahela River was frozen over in the upper pools, cut down the river coal trade in January to less than two-thirds the average. The month's shipments amounted to 9,881,000 bu., which is about 6,000,000 bu. below the average.

Pittsburg—Reports from various railroad centers state that the big lines are storing coal in anticipation of labor troubles in the spring. At all the large storing yards on the roads cars of coal are daily being unloaded and the amount held in storage in this manner has almost doubled in the past two weeks. The local roads also are taking precautions. The Pennsylvania, it is stated, has been storing coal for some weeks.

ANTHRACITE

Scranton—It is reported that prospectors have uncovered a vein of coal about four miles west of Laporte, in Sullivan County, and drilling operations are to be started to find out just how much coal there is. An outcropping of the seam, about 28 in. thick and getting thicker as the vein runs into the hillside, has been uncovered along Loyalsock Creek. Up to a short time ago it was not known that there was any coal in the vicinity, the nearest coal operation being ten miles away. The O'Boyle & Foy Co. have been leasing coal rights in the vicinity, and machinery is now being installed to begin boring operations.

The Pennsylvania State Mine Cave commission met in the commission's offices in Scranton, Jan. 26, for the purpose of selecting one or more attorneys to attend to the legal end of the investigation and to prepare a bill for presentation to the next session of the legislature. W. J. Richards, of Pottsville, is chairman of the commission, and George M. Davies, of Lansford, is secretary.

Pittston—Theodore Hogan of this city and James White of Wilkes-Barre, have become the owners of what has for many years been known as the Bowkley tract. In underlies that section of Upper Pittston known as Church Hill and includes the mineral rights under about sixty acres of ground. The consideration was $24,000.

August Savatino was working at the bottom of No. 2 shaft of the Erie Coal Co., Jan. 29, when a huge icicle which was clinging to one of the timbers in the cribbing broke loose and fell down the shaft. It struck Savatino on the head, and he was taken to the hospital in a dying condition.

Hazelton—The new Spring Brook washery of the Lehigh Valley Coal Co., at Yorktown, near here, has been put into operation. It is the first in this part of the coalfield to be operated entirely by electricity.

Shamokin—The strike of 700 employees at the Enterprise colliery, operated by W. L. Connell & Co., of Scranton, ended by the men returning to work. Satisfactory concessions were granted by the company.

Washington

Spokane—Part of the $500,000 improvements planned for the Tono mines in Thurston County, by the Washington Union Coal Co., of which the Harriman system is the holding company, were started recently. Erection of a rescue station, hospital and general offices was begun and as soon as these are completed numerous new dwellings for the miners will be built. A $250,000 power station is included in the list of improvements that will be made at Tono during the coming year.

Large deposits of coal of good quality have been discovered in the Olympic Mountains, and preparations for early development are underway at Olympia. M. E. Reed, of Shelton, says that there are traces of the vein covering over 2000 acres. Mr. Reed has arranged with the promoters of the scheme to open a five-foot vein.

West Virginia

Charleston—Fire of unknown origin recently destroyed the power plant of the Sunday Creek Coal Co. mine at Longacre, near here, causing a loss estimated at $60,000. In consequence, the mine has been closed down until a new power plant can be erected or power furnished from one of the other mines of the company. Work on rebuilding the plant has already been started.

One of the biggest development propositions attempted in the state for a long time is that already begun by the Pond Creek Coal Co. in Mingo County, where the company has acquired 30,000 acres of coal land. Contractors have begun work on the construction of a branch from the main line of the Norfolk & Western road. The Pond Creek Coal Co. has an authorized capital of $2,000,000, and many of its stockholders are said to be the same as those interested in the big operations at Holden, Logan County. The bridge to be constructed across Pond Creek, for which authority was recently granted by Congress, will be used by the Pond Creek company to reach the main line of the Norfolk & Western. The completion of the plans of this company will greatly increase the coal output in the Pocahontas district.

Wyoming

Rawlins—The Sampo coal mine at Hanna, with about 640 acres of coal land, was purchased recently by a Cheyenne syndicate, headed by J. D. Woodruff, the Hoffman brothers and others. The property will be developed at once.

Chronology of Coal Mining for January

Jan. 1—The Virginia Iron, Coal & Coke Co. secured a $9,000,000 contract for furnishing locomotive fuel to the Boston & Maine R.R.—A general strike of miners in Belgium was threatened, when 25,000 men in the Borinage district stopped work.—The Lehigh Valley Coal Sales Co. was incorporated in order to bring the Lehigh Valley organization into conformity with the commodities clause of the interstate commerce act.—Convict labor was abandoned at the mines of the Tennessee Coal, Iron & R.R. Co.

Jan. 4—Two shot firers were rescued from an explosion in the Girard Coal Co.'s mine, at Radley, Kan., through having telephoned their whereabouts to the surface a short time previous to the accident.

Jan. 5—Fire destroyed the shops and engine house at the drift mine of the Davis Coal & Coke Co., Thomas, W. Va. Loss, $12,000.

Jan. 7—Fire destroyed a portion of the plant of the Galloway Coal & Coke Co., Carbon Hill, Ala. Loss, $50,000.

Jan. 9—An explosion in the No. 9 slope of the Parrish colliery, at Plymouth, Penn., killed six men and seriously injured two.

Jan. 10—Gov. Tener appointed a commission to revise and codify the anthracite-mine laws of Pennsylvania.

Jan. 12—A boiler exploded at the Clarence colliery of the Hillside Coal & Iron Co., Pittston, Penn., wrecking the plant.—Six men were seriously injured by the explosion of a box of dynamite caps at the Knickerbocker colliery, Shenandoah, Penn.

Jan. 15—The United States Supreme Court rendered a decision upholding an employer's liability act as constitutional.

Jan. 16—The American Federation of Coal Operators was permanently organized at a meeting in Chicago.—The twenty-third annual convention of the United Mine Workers of America opened in Indianapolis with nearly 1400 delegates present.

Jan. 17—An explosion in a mine of the Central City Coal & Iron Co., Central City, Ky., killed five men. The day shift of 200 men had just left the mine.

Jan. 18—Delegates to the national conference of coal miners in Great Britain voted unanimously in favor of a strike, Mar. 1, unless a minimum wage scale was granted. Ballots cast by the miners were 445,801 for a strike and 115,921 against it.

Jan. 20—A dust explosion in mine No. 4 of the Kemmerer Coal Co., Kemmerer, Wyo., killed five men and injured eighteen.—An ice gorge in the Ohio River, opposite Louisville, Ky., broke and caused a loss of about $20,000 to coal boats and barges.

Personals

John A. Garcia, of the Allen & Garcia Co., consulting engineers, Chicago, was in New York for several days last week attending to some matters of business.

S. D. Warriner, vice-president and general manager of the Lehigh Valley Coal Co., Wilkes-Barre, Penn., left, Feb. 2, for a two-weeks trip to North Carolina.

E. P. Merritt, assistant to the vice-president, T. B. Davis, of the Island Creek Coal Co., is now in Williamson, W. Va., looking after the opening up of the 30,000-acre tract of coal land recently purchased by the Pond Creek Coal Co.

W. H. Cunningham, general manager, and C. R. Connor, manager of mines, of the West Kentucky Coal Co., Sturgis, Ky., have resigned their positions with the company, effective Feb. 1, and will form a business partnership as consulting and contracting engineers, with offices in Huntington, W. Va.

Col. R. A. Philips, formerly superintendent of the coal-mining department of the Delaware, Lackawanna & Western R.R., has been made general manager with headquarters at Scranton as heretofore. Charles E. Tobey, formerly assistant superintendent, has been promoted to the office of superintendent.

W. J. Houston, general sales manager for the Moreland Coke Co., in Ohio, with offices in Cleveland, has been promoted to the position of general sales manager of the Moreland company, effective Feb. 1, and will hereafter be located at Pittsburg, Penn. Mr. Houston has been in the employ of the Moreland Coke Co. for the past two years and previously was general sales agent of the Big Vein Coal Co., one of the Youghiogheny & Ohio interests.

Yes, Sir! Our old friend Everett Moore, chief engineer of the Consolidation Coal Co., Fairmont, W. Va., slipped one over on us, and is now a "lifelong member" of the Benedicts' Club. Just when we were about to pass him up as a hopeless prospect, he goes and doubles his expenses, triples his happiness and pretends that all he ever pined for was a bungalow with gas logs in the parlor. All right, Everett! Here's wishing you happiness unmeasured. May a long line of descendants add luster to your name! Now that Frank Haas has started the game and you have followed suit, we suppose the "Consolidation" will force the habit by compelling unmarried employees to contribute regularly to an orphan asylum or a spinsters' fund. However, let us say right now, that if any more of our friends try this same plan of letting us in on the secret after the "Wedding Cake" is all eaten, we'll write something about them that will read like "Why Wives Leave Home."

Obituary

W. W. Worthington, president of the Montana Coal & Iron Co., and one of the prominent coal operators in Montana, died, Jan. 30, from heart disease. His family resides in New York, where the body was sent. Mr. Worthington, who was well known throughout the Northwest, had been ill for several months.

James Collins, president and general manager of the Allburn Coal & Coke Co., of Matewan, W. Va., died at his home in Matewan, Wednesday, Jan. 31. He was born in Staffordshire, England, July 8, 1864. Mr. Collins was well known in the Pittsburg district, having been employed for a number of years by the National Mining Co.

Philip Davis, of Duquoin, Ill., a member of the executive board of the Illinois miners, died suddenly, Jan. 24, at Indianapolis, where he had gone to attend the convention of the United Mine Workers. Mr. Davis had been prominently identified with the miners' organization for a number of years and had many friends in southern Illinois.

Construction News

Punxsutawney, Penn.—The Boswell Coal Co., of Baltimore, Md., has purchased the property of the Bear Run Coal Co., in Indiana County, and intends to greatly enlarge the operations at Sidney.

Moundsville, W. Va.—Proposals for an elevator to be furnished complete at the tipple of the Panama mine will be received by the Ben Franklin Coal Co., Moundsville, W. Va. M. J. McQuade is general manager.

Birmingham, Ala.—The Pratt Consolidated Coal Co., of Birmingham, will construct facilities for coaling vessels at Mobile, Ala.

St. Clairsville, Ohio—The Big Five Coal Co. has increased its capital stock from $200,000 to $300,000 to provide for extensions and improvements at its operations. Samuel Pursglove, Sr., is president.

Columbus, Ohio—The Hocking Valley and Norfolk & Western railroads will make extensive improvements at Columbus, including storage yards, increased track facilities and shop buildings.

Spokane, Wash. — The Washington Union Coal Co., a subsidiary of the Harriman railroad interests, contemplates the erection of a $250,000 power plant at the Tono mines, Thurston County, Washington.

Recent Incorporations

Huntington, W. Va.—The Pinson Fork Coal Co., of Huntington, to mine coal and manufacture coke in Kentucky; capital, $100,000. Incorporators: A. E. Bush, E. M. Watts, I. J. Bryan and others, all of Huntington.

The Amherst Coal Co., of Red Star, W. Va., to mine and deal in coal and other minerals; capital, $50,000. Incorporators: George M. Jones and W. R. Thurmond, of Oak Hill, W. Va., and three others.

The Turkey Foot Land & Lumber Co., of Huntington, to mine coal and manufacture lumber in Jackson County, Ky.; capital, $300,000. Incorporators: C. L. Ritter, H. T. Lovett, E. E. Williams and others, all of Huntington.

Charleston, W. Va.—The Lane-Whitmer Stores, Inc., of Charleston, to mine coal and engage in a general mercantile business; capital, $500,000. Incorporators: Harry E. Moyer, L. S. Lucas and Max Stozzie, of Philadelphia, Penn., and others.

Spokane, Wash.—The Tanum Coal Co., to develop a tract of coal land on Tanum Creek, near Ellensburg, Wash.; capital, $500,000. A. N. Cantrill, of the Spokane Gas Co., is one of the incorporators.

Harrisburg, Penn.—The Keystone Coal & Coke Co.; capital, $400,000. Incorporators: Richard Coulter, Geo. F. Huff, E M. Gross, Lloyd B. Huff, Robert Pitcairn, Jr., and Robert K. Cassatt.

Pittsburg, Penn.—The Atlas Coal Co., of Pittsburg; capital, $250,000. Incorporators: G. Z. Hosack, J. A. Bell, J. B. Haines, Jr., and others.

Connellsville, Penn.—The Connellsville Coke Co., of Connellsville; capital, $33,000. Incorporators: J. Fred Kurtz, W. D. McGinnes and R. S. Matthews, Connellsville.

The Etna-Connellsville Coke Co., Connellsville; capital, $125,000. Incorporators: Cyrus Echard, G. W. Campbell and D. N. Parkhill, Connellsville.

The Superba Coal Co., of Connellsville; capital, $10,000. Incorporators: A. C. Stuckel, M. E. Brazell and J. W. Buttermore, Connellsville.

Barbourville, Ky.—The Clover Fork Coal Co., to operate mines in southeastern Kentucky; capital, $50,000. S. F. Whitfield is one of the incorporators.

Industrial Notes

The rapidly increasing demand in Pittsburg and vicinity for asbestos, magnesia and other products of the H. W. Johns-Manville Co., has necessitated a move from their former location in Liberty Ave., above Ninth St., to larger quarters. Since Jan. 24, 1912, the Pittsburg branch of the H. W. Johns-Manville Co., has, therefore, occupied the entire eight-story stone, reinforced-concrete and steel building at the northeast corner of Wood St. and First Ave., which has been leased by them for a term of years.

The McGraw-Hill Book Co. announces the completion of arrangements for the sales agency of the technical books of the Railway Age Gazette, American Engineer and Signal Engineer. This makes the McGraw-Hill Book Co. publishers and distributors of books for the three journals, but it does not affect the publication of the papers themselves in any way. With the addition of these three papers in the railroad field, the McGraw-Hill Book Co. now publishes books for the twelve leading American engineering papers in the fields of civil, mechanical and electrical engineering, electric and steam railroading, machine tools, mining, metallurgy, chemical engineering, etc. The papers now represented are American Machinist, Engineering News, Electrical World, Railway Age Gazette, Electric Railway Journal, Power, Engineering Record, Engineering and Mining Journal, Coal Age, Metallurgical and Chemical Engineering, American Engineer and Signal Engineer.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The fuel shortage continues unchanged, except possibly a further tightening of the situation, particularly in the East. Anthracite supplies are estimated to be smaller than at any time for a number of years and spot coals of all grades are commanding good prices and are eagerly sought for storage purposes. Complaints of railroad service are general, which condition is seriously affecting production at the mines.

Low temperatures in the East, causing a heavy consumption, together with the slow movement, both by rail and water, are making the situation acute at some points. Many large consumers are now anxious to store in anticipation of a possible strike Apr. 1, but are having trouble in finding any free coal.

In the Pittsburg district, bituminous is in good demand with prices hard, and coke holding firm under an unusually heavy production. An over-production of slack in the Ohio fields has caused a break in prices on this grade, although market in other sizes continues strong with the dealers in command. Poor transportation facilities are curtailing production at the mines to about 50 or 60% capacity, and, as a result, there is no spot coal to be had. The nonunion fields to the South are preparing for a heavy production in event of a shutdown at the organized mines on the expiration of the present agreement.

Prices in the Middle West are off slightly, but still above normal. Stocks are materially reduced, the movement slow and demands urgent, with only sufficient tonnage to meet the requirements for immediate consumption. Court orders have been issued governing the movement on some of the railroads and others have been compelled to confiscate fuel. The Western market remains quiet and unchanged.

Boston, Mass.

February was ushered in by three days of storm, and dealers and large consumers were caused further anxiety over slow moving cargoes. There has been no break in the seasonable weather and demand is active for coal of every kind. All over there are instances of dealers with but a few days' supply awaiting arrivals either of cars or cargoes detained by adverse weather. The situation is acute, and a partial suspension, such as that in effect at the textile mills in Lawrence, is a decided relief to some of the soft-coal shippers who have been able to supply only in a hand-to-mouth fashion.

The great difficulty in getting barges from Hampton Roads has lately diverted some tonnage to Philadelphia, and there has been a slight advance in the f.o.b. price for spot coal on that account. Coal from the Clearfield districts has been sold up to $2.60, f.o.b., and an extra demand for that grade is in prospect between now and Apr. 1.

All-rail bituminous is only changed in the way of still slower deliveries and higher prices for spot coal at the transfer points. Coal available for February has been marked up by practically all the shippers.

The supplies of anthracite in New England seem to be further and further reduced. With the storage depots maintained here at tidewater by certain of the mining companies, bare of all sizes, an increased demand is thrown on the companies that ship all-rail, a demand which the latter are unable to meet.

Current prices are as follows:

Clearfield, f.o.b. mines	$1.25@1.45
Somersets, f.o.b. mines	1.35@1.55
Pocahontas, New River, Boston, on cars	4.35@4.60
Pocahontas, New River, Providence, on cars	4.25@4.50
The same coals, for shipment, f.o.b. Hampton Roads	2.70@2.75

New York

The stocks of soft coal on hand at the New York piers are considerably below normal. Shippers are still complaining of poor car supply and of slow railroad movement. These conditions coupled with a heavy demand on contract business, tend to keep the supply here low. There is a strong demand for the better grades of steam coal, but these are scarce and purchasers of coal are obliged to substitute the cheaper grades because of the scarcity of standard steam coals.

Prices show some advance from last week, West Virginia steam coals being firm at $2.60 f.o.b., while the ordinary grades of Pennsylvanias are being held at from $2.65 to $2.70, with the standard steam coals practically out of the market.

Congestion and accumulation of freight along the railroads are retarding the delivery of coal to line consumers and causing them much uneasiness as to their supply. This has caused a sharp increase in the demand for all-rail coal. Consumers generally are endeavoring to accumulate stocks in anticipation of labor troubles in the mining regions the first of April, but are finding their supplies gradually decreasing, instead of increasing.

The winter weather so far experienced has been much more severe than any for a number of years and has not only affected transportation, but has undoubtedly caused a marked increase in consumption which should keep the market on a firm basis for some time to come.

Marine transportation in the harbor and sound is made hazardous by the ice conditions. At the piers, while not so much difficulty is being experienced in the handling of frozen coal as during the preceding two weks, there is still delay of from two to three days in loading. Under these conditions the coal shippers are experiencing great difficulty in taking care of their business.

Philadelphia, Penn.

The beginning of the week witnessed another snow flurry, with a low temperature, and, as a consequence, dealers are beseiged with requests for urgent filling of orders, and additional ones are piling up. The anthracite trade at this point could not be improved upon, as all the tonnage coming in is being taken care of, and the additional cold snap only adds discomfort to an already unpleasant condition.

The reflection of the retail trade is seen in the wholesale. The tonnage for the month of January was considerably in excess of the previous year for the corresponding period, and the operators are already planning for a successful February. Comparisons so far this month indicate that the month of February will also prove to be a better coal-burning month than the same time last year—at least the tonnage will move off, which is all that is required. All sizes still continue in demand, and it is understood that some of the companies are turning down orders for some of the large sizes, it being impossible to supply the market, as well as the quantity required for contracts.

The bituminous market shows some improvement, prices being somewhat stiffer, due in part to the fact that there is restricted mining on account of the weather, and poor movement along the railroads. There is also a slight shortage of cars, all of which has a tendency to stiffen the market on this grade of coal.

Pittsburg, Penn.

Bituminous—The annual convention of the United Mine Workers, at Indianapolis, adjourned, with no scale settlement being reached. While negotiations will still be conducted with the operators, there is practically no prospect of any agreement being reached before the termination of the scale, Mar. 31, and a suspension of mining for six weeks or so is likely before an agreement will be attained. While consumers have not begun stocking up yet on a liberal scale, there is a disposition in this direction, and odd lots offered in the market find ready acceptance, making prices steadier than for a long time.

Demand for domestic coal continues excellent, on account of the cold weather. We quote: Nut, \$1.05@1.10; mine-run, \$1.10@1.15; ¾-in., \$1.20@1.25; 1¼-in., \$1.35@1.40; slack, 70@75c. per ton at mine, Pittsburg district.

Connellsville Coke—The market for prompt furnace coke has eased off a trifle, being quotable at \$1.80 to \$1.90, against \$1.85 to \$2 a week ago. This is due to heavier production, but the market has not weakened as much as would have been expected, with production running, as reported, at fully 400,000 tons a week. Sales of prompt furnace coke within this range have been made in the past week to the extent of 150 to 175 carloads. No further contracting is reported. Furnaces are well covered, unless it is necessary to blow in additional stacks. Foundry coke has stiffened, on account of scarcity, and there has even been buying of small lots by producers. We quote: Prompt furnace, \$1.80@1.90; contract furnace, \$1.80@1.90; prompt foundry, \$2.15@2.25; contract foundry, \$2.20@2.40.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Jan. 27, at 400,597 tons, a decrease of 6000 tons, and shipments of 4220 cars to Pittsburg, 5829 cars to points West and 1064 cars to points East, a total of 11,113 cars, a decrease of 158 cars.

Baltimore, Md.

Heavy buying on the part of a large number of consumers, for stocking-up purposes, was the feature of the Baltimore market during the last week. Fear of a possible strike has caused many to reach the conclusion that it would be wise to look ahead, and some have been purchasing freely during the last few days. The large operators here predict that this rather heavy buying on the part of far-sighted consumers will continue for several weeks, or until they are reasonably sure that the operators and their employers will reach some satisfactory agreement.

The activity in the market caused prices of all grades of coal to remain firm. The low grades, according to figures obtained at several offices, are still being quoted from 80c. to \$1. Better grades can be purchased from \$1.05 to \$1.20, while big vein coal is quoted from \$1.30 to \$1.60.

At the port of Baltimore, congested conditions are no longer encountered. While there is considerable ice in the river and bay, it is not proving the hindrance to shipping operations that it did during the zero spell of weather.

Buffalo, N. Y.

There is a good demand for bituminous coal, and it appears to increase from week to week. Prices are firm, but there is little prospect of an advance. The real advantage gained over the early part of the winter is that little or no coal is selling at a sacrifice or at the terms of the consumer. In fact, the rail movements are so slow that the seller is much more in command of the situation than for some time, and keen competition is the only thing preventing an immediate advance. Dealers, however, find that they cannot safely advance their prices, as buyers usually know where to find a supply at the old prices.

There is much complaint against some of the railroads, for allowing their business to become so badly congested. The New York Central and Nickel Plate roads are especially slow in their movements and some very aggravated cases of delay are in evidence.

Bituminous prices are strong at former figures, \$2.50 for Pittsburg three-quarter, \$2.40 for mine-run and \$2.25 for slack, with coke doing better than formerly, at \$4.25 for best Connellsville foundry and \$3.50 for stock coke. Allegheny Valley prices are about 25c. lower than Pittsburg.

The anthracite situation remains unchanged, with every ton of coal that the shippers can get going at once into consumers' hands.

It is predicted that there will be a greater shortage of anthracite at the opening of spring than has ever been seen before in the trade. It is common to put a large amount of it afloat here in readiness for the opening of the lakes, but none is to be had for such purposes yet. Soft-coal dealers who can get independent anthracite readily, can sell it at a premium if they choose.

Cleveland, Ohio

The weather in the last week has been much milder, and railroads have given better service in handling coal to the markets. Domestic lump has had a good demand, with prices firm. There is a decided demand for steam grades in mine-run and ¾-in., particularly mine-run; slack has been somewhat of a drug in the market for a week, prices in consequence dropping 10 to 15c. Every available car of slack that could be secured was rushed to this market when the railroads got busy after the snow blockades, which resulted in prices breaking, as it could not be handled in time to save car demurrage. However, the situation at this moment is somewhat relieved, and the general impression is that slack will again become scarce in the next week or ten days.

Columbus, Ohio

Continued low temperatures, coupled with the congestion on all initial and connecting railroads, has had the effect of keeping the coal trade in Ohio firm during the last week. Considerable demoralization is reported on all lines, and the lack of motive power is the chief obstacle to a better movement. Thousands of loaded cars are sidetracked on all lines, and the danger of a coal famine in certain sections is growing worse.

The cold weather has shown that not one of the railroad lines has been equipped to handle traffic in a time of stress. The fault has been both with the initial lines and the connecting roads, but the latter are probably more at fault than the former.

Prices have remained steady at the circular figure, and every branch of the trade is firm. Fine coal is a little weaker, but the recession in price was only slight. The demand for steam grades is good, as there is a disposition on the part of certain large users to store, in anticipation of a suspension after Apr. 1. Some of the railroad lines have stored a large amount of fuel in case of emergency. Retailers are clamoring for shipments, and in many cases their customers are inconvenienced. No great actual suffering has been reported in central Ohio, as yet.

Operations at the mines have been irregular, some reporting from 50 to 65% capacity, while others have been fortunate enough to show a larger production. Inability to secure cars and congestion on the roads are the causes of this decreased production. Practically every mining district of the state is affected by these conditions, but the greatest loss is in the eastern Ohio district.

Reports show that there are between 4000 and 5000 loaded coal cars at Toledo waiting movement to Michigan and northern Indiana points. There is great danger of a coal famine in Detroit, and frantic efforts are being made to remedy that condition.

Prices prevailing in Ohio are as follows:

Domestic lump in Pomeroy Bend district	\$1.65@1.75
Domestic lump in the Hocking Valley	1.50
Three-quarter inch	1.35
Nut	1.15
Mine-run in eastern Ohio	1.00@1.05
Mine-run in the Hocking Valley	1.05@1.15
Nut, pea and slack	0.75@0.85
Coarse slack	0.65@0.75

Charleston, W. Va.

January has been one of the poorest months in production that this state has had for a long period. The weather conditions were such as to close, for a time, some of the mines and, when they were able to resume, the car supply was inadequate and this still continues in the Chesapeake & Ohio region, the mines working on an average of only one or two days a week. Other sections of the state are reported almost as bad. As a result the output for January will be lower than it was in January, 1911, one of the lowest months for many years, and unless the car supply soon resumes normal conditions February will be found in the same class

The car shortage, however, has had a tendency to increase prices except, of course, on contracts. Kanawha district slack has gone up to, in some instances, as high as 85c., while lump from the same district is bringing $1.50@1.60. New River mine-run is about the same as in the Kanawha district, but New River egg is bringing as much as $1.80.

Even with an early spell of warm weather it will take a considerable time before loaded cars can be sent to their destination, the empties returned to the mines and a normal condition on the rails and at the mines restored.

Louisville, Ky.

The variable weather of this winter is keeping up the brisk demand for fuel, which has made the present season one of the best, from a dealer's standpoint, for years. The retailers, however, have lived up to promises made earlier in the winter that, except in case of extraordinary conditions, the price of coal should not be boosted to unreasonable and exorbitant figures. One effect of the severe weather will be that reductions in price, which usually accompany the approach of spring, will be delayed longer than usual. Much suffering among the poorer classes has occurred, due to the low temperatures.

Owners of factories, and agents for office and store buildings, have experienced much trouble in providing sufficient motive power and heat, respectively. Relays of firemen and furnace feeders have been kept on duty constantly in many instances.

The demand for nut and slack continues to be unprecedented, due to the requirements of the steam-heating plants. The quotations by retailers continue to range as follows: Banner lump, $3.25; Jellico, $3.60; Wilton-Jellico, $3.60; Pittsburg, $3.75; Taylor, $3.25.

Nashville, Tenn.

Business continues to be excellent, although the mines here are handicapped by an insufficient supply of cars, which makes it hard for them to keep up with their orders. Prices are unchanged and the demand good. Screenings are still bringing a good price and are in big demand.

Every indication points to the west Kentucky nonunion field being extremely busy this spring provided there is a shutdown throughout the union fields of the country. St. Louis will draw very heavily from this field and the operators here are anxiously awaiting the time. The privilege of shipping coal at a good price North every two years is a welcome one.

So far there has been no demand for coal for storage purposes from this field as what little coal is being stocked is being taken from lines adjacent to the territory to which it is used, at a much cheaper freight rate. Should we have a late spring with plenty of cold weather, the chances are that the west Kentucky field will be called upon for storage coal during the month of March.

Indianapolis

Indiana coal operators report business good, due to continued cold weather. The low temperature during the entire month of January thoroughly frightened the people of the country, who were unprepared for it, and the result is that they are preparing to secure themselves against further suffering this winter.

Nearly all the mines of the state are working almost steadily, or as many days as are possible with the present car shortage. The railroads appear utterly unable to handle the business, the trouble being with the bad condition of their rolling stock. The retrenchment policy, instigated by a number of roads over a year ago, is now causing them to lose business amounting to ten times the cost of keeping the cars and locomotives in good serviceable condition. Among these railroads are great lines of coal cars out of condition and unfit for use, while the repair shops are full of engines awaiting repairs to make them serviceable. In Brazil, Terre Haute and other coal centers, all the tracks of the coal roads are full of crippled cars and locomotives.

Chicago

While prices in the Chicago market continue to decline, they are still far above a normal condition. The chief factor in the situation is the car supply. A combined movement of some delayed coal and of all that more recently shipped is caring for the current demand—and that is all. It is not expected that the market will become very soft until stocks can be replenished and old orders filled. Another cold wave also is having a strengthening effect.

Smokeless coal is variable in price, but in strong demand. What little there is of spot smokeless coal commands a price of $1.25 to $1.40 for mine-run. On shipments direct from the mines, prices range from $1.10 to $1.25. Hocking maintains a strong position. The market for screenings has been exceptionally satisfactory to dealers, holding firm at $1 to $1.10 for small-size screenings and $1.10 to $1.25 for the 2-in. variety. The anthracite market is still tight.

Prevailing prices at Chicago are as follows:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.62@2.87
Steam lump	2.22@2.37
Screenings	1.97@2.07
Springfield:	
Domestic lump	$2.57@2.67
Steam lump	2.17@2.27
Mine-run	2.07@2.17
Screenings	1.77@1.92
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.22@2.32
Mine-run	2.17@2.27
Screenings	1.77@1.92
Pocahontas and New River:	
Mine-run	$3.15@3.30
Lump and egg	4.20@4.30

Coke—Prices asked for coke are: Connellsville and Wise County, $4.50@4.65; byproduct, egg and stove, $4.85; byproduct, nut, $4.55@4.65; gas house, $4.90@5.

Minneapolis—St. Paul

The retail trade in the Twin Cities report a favorable week even though business has not been extremely rushing, which has given them time to catch up on orders taken in. Both in Minneapolis and St. Paul the retailers' stocks have been reduced materially and they are experiencing troubles in getting cars when they want them. However, a shortage in the Twin Cities is not probable, due to the short haul from the docks, unless the severe cold weather of January should be duplicated.

Wholesalers report business good in the country, but are complaining of the car shortage and of the railroads confiscating coal for their own use. Prices on all grades are selling for circular or better and some big premiums are offered for coal in transit nearby. Steam plants are asking for quotations and their buying from now on will be a factor until the strike situation is definitely settled.

Another feature of cognizance is that the railroads are buying and storing considerable coal—fearing a possible shutdown at the mines. Railroads operating in the Northwest are taking no risks of a car shortage and are not letting their cars off the initial road, except under extreme necessity.

St. Louis, Mo.

Following the snow storm of last Saturday came a cold snap similar to that in January, and with the poor motive power on the railroads, spot coal at East St. Louis commanded almost anything the shipper asked. Carterville lump and egg

opened strong, and there was but little to be had as the railroads are taking practically all of the available coal from that field. As reported previously, this is not done openly, but, nevertheless, the railroad companies are storing in large quantities, and nearly every mine in the Carterville field is being pushed for railroad coal.

The washers in the Carterville field were again put out of commission on account of the cold weather, but raw coal is bringing such a price now that it pays the operator better to omit the washing.

The Standard market has been in a somewhat unsettled condition during the past week, jumping from $1.15 last Saturday morning to $1.50 before noon, and it opened strong Monday, with everything to indicate that the Standard operators will be able to keep the market up.

The only operators in the Standard field that are getting any service from the railroads are the mines at St. Clair and Wildermann, where the operators have a court order, compelling the Illinois Central to give them cars every day that they are available, regardless of whether other mines get cars or not. The market on the inner district high-grade coals is in good condition, the demand exceeding the supply. A large tonnage of this coal is moving into the Northwest.

The anthracite movement in St. Louis has been fairly good, considering the poor service of the railroads. Coke is in good demand at $5 for byproduct and $4.75 for gas house.

The past week opened up with the following prevailing prices:

Franklin County	
Lump and egg	$2.00@2.25
No. 1 nut	2.00@2.25
No. 2 nut	1.85@2.00
No. 3 nut	1.25@1.40
2-in. screenings	0.90@1.00
Carterville	
Lump and egg	$2.00@2.25
No. 1 nut	1.85@2.00
No. 2 nut	1.50@1.60
No. 3 nut	1.25@1.40
Screenings	0.80@0.95
Mine-run	1.15@1.25
Standard	
6-in. lump	$1.75@1.85
2-in. lump	1.50@1.60
3x6-in. egg	1.25@1.40
No. 1 nut	1.00@1.10
No. 2 nut	0.90@1.00
Screenings	0.80@0.90
Mt. Olive	
6-in. lump	$1.50@1.60
3-in. lump	1.50
3x6-in. egg	1.35
No. 1 nut	1.10
No. 2 nut	1.00

Spokane, Wash.

The weather in the Inland Empire has moderated to such an extent that little coal is being used in the residence districts, other than just enough to keep the chill off of the interior. The sales from the local yards have decreased materially and the supply is slowly being replenished to prepare the dealers in case of emergency.

The prices have not changed for some time in the better grades. However, some of the cheaper coals have decreased slightly to increase the demand.

The standard values continue as follows:

	Wholesale	Retail
Rock Springs	$7.20	$9.00
Owl Creek	7.20	9.00
Kirby	7.20	9.00
Carney	6.70	8.50
Bearcreek	6.35	8.25
Roslyn steam	5.25	6.25

Portland, Ore.

The situation as to the demand for fuel in this state remains unchanged since last week, the weather continuing mild. This has been a mild winter, and the demand for coal has been light.

Business in general is fair and showing signs of improvement. There is a good deal of activity in the building line here, with every indication of a very busy season the coming summer. The forthcoming completion of the Panama Canal, everybody predicts, is going to cause a wonderful activity on this coast in all lines of commerce, and a very heavy coastwise movement is anticipated. A number of vessels are now being built in Pacific Coast yards to ply between ports on the Pacific and the Atlantic. If vessels can be engaged to bring coal here from the Atlantic Coast at considerably lower prices than are charged now, it should create a new and active demand for that class of fuel, as wood prices are high enough to admit of competition, in spite of the fact that Oregon produces immense quantities of lumber. At present Australian coal is quoted at $10. Domestic coal may be had as low as $6.50, but it does not enter very heavily into competition with Wyoming or Australian coal.

Production and Transportation Statistics

Imports and Exports

The following is a comparative statement of coal and coke imports and exports from the United States for the years 1910-11, in long tons:

EXPORTS	1910	1911
Anthracite:		
Canada	2,963,788	3,498,980
Other countries	57,839	55,019
Total	3,021,627	3,553,999
Bituminous:		
Canada	7,567,297	10,609,587
Panama	......	496,830
Mexcio	675,980	470,674
Cuba	858,776	1,053,703
West Indies	487,519	577,159
Other countries	1,194,667	670,801
	10,784,239	13,878,754
Coke	879,123	914,142
IMPORTS		
Anthracite	......	2,159
Bituminous:		
United Kingdom	13,124	9,278
Canada	1,675,692	980,174
Japan	56,278	16,031
Australia and Tasmania	240,899	232,969
Other countries	5,950	356
Total	1,991,943	1,238,808
Coke	156.417	69.515

Great Northern Ry.

Great Northern's coal movement from Duluth to Minneapolis and St. Paul in January totalled 5137 cars, breaking all records. Consumptive coal demand is heaviest on record in Northwest on account of continued cold weather.

Foreign Markets

Great Britain

Stemming is becoming increasingly difficult for February positions, and prices are firm. The outlook in regard to the labor situation is a little more hopeful. Quotations are approximately as follows:

Best Welsh steam coal	$4.68@4.80
Seconds	4.50@4.62
Thirds	4.20@4.44
Best dry coals	4.26@4.38
Best Monmouthshire	4.20@4.26
Seconds	3.96@4.02
Best Cardiff small coal	2.52@2.64
Seconds	2.34@2.46

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those for Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½% discount.

Financial Notes

The Fairmount Coal & Coke Co., of Pennsylvania, has announced that its coupon 34, due Dec. 1, 1906, on the first mortgage bonds, will be paid on presentation to the Farmers' Loan & Trust Co.

After charging operating expenses of the Railway and the Coal & Iron Co. with renewal expenditures, Reading Co. earned $4,480,688 after charges in the six months to Dec. 31, as against $4,029,076 a year ago. Deducting preferred dividends there remains for the $70,000,000 common stock a balance of $3,080,688, or 4.4% in contrast with $2,629,076, or 3.7% last year.

Solvay Process Co., Syracuse, N. Y., on Jan. 31, filed a certificate increasing the capital stock from $10,000,000 to $15,000,000, the new shares to be distributed as a stock dividend of 50%. Secretary George E. Francis is quoted as saying that the increase is made in order to place the capital stock on a basis proportionate to the volume of business done by the company.

The Delaware, Lackawanna & Western Coal Co. reports for year ended Dec. 31 last:

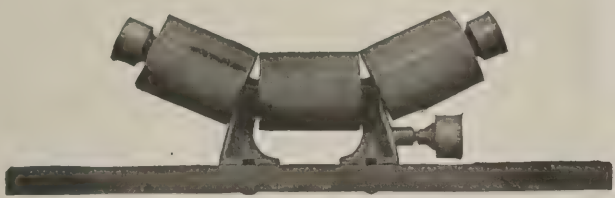
	1911	Increase
Coal sales	$39,865,493	$1,197,243
Expenses	38,235,111	1,000,114
Net income	1,630,382	197,129
Other income	165,278	55,915
Total income	1,795,660	253,043
Dividends	659,070	....
Surplus	1,136,590	253,043

The profit and loss surplus on Dec. 31 was $2,513,120.

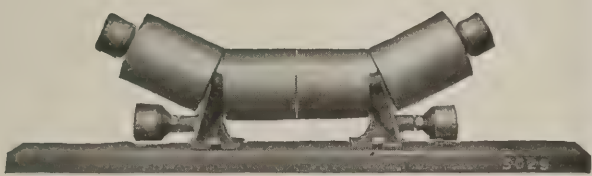
At Boston, on Feb. 2, Judge Dodge in the United States District Court appointed John T. Burnett, of Southboro, Mass., as receiver of the Rhode Island Coal Co. on application by H. M. Whitney, who stated that the company was without working capital or borrowing capacity. The following reorganization committee has been nominated: Charles B. Jopp, president, Beacon Trust Co.; Edward Page, vice-president Federal Coal & Coke Co.; Herbert A. Tucker, of Tucker, Hayes & Co.

"Link-Belt" Belt Conveyors

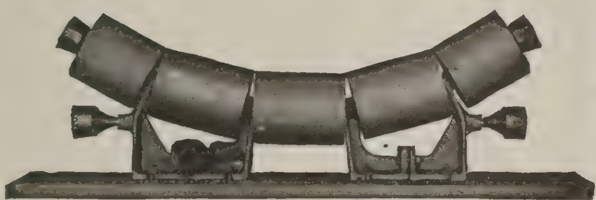
We have manufactured and installed Belt Conveyors for purposes for which they were suitable for upwards of 20 years and are furnishing the most efficient and durable equipment to-day.



Standard 3-Pulley Idler. (Patents Pending)

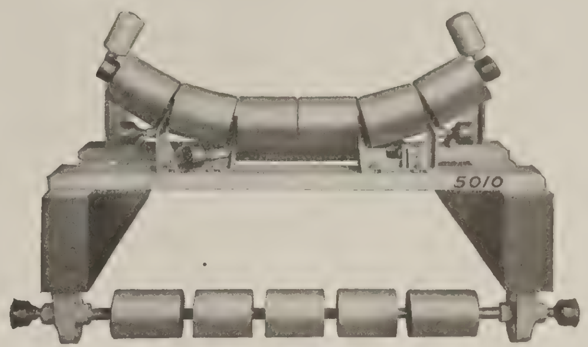


3-Pulley Idler. (Patents Pending)

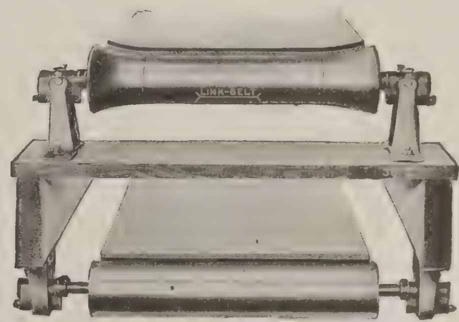


Standard 5-Pulley Idler (Patents Pending)

"Link-Belt" Conveyor handling coal in power house.



48-in. Idler with Guide and Return Rolls. (Patents Pending)



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Classified Index to Articles Advertised

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POSITIONS VACANT

Advertisements under this heading 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

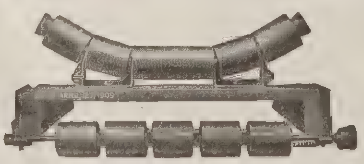
Wanted—An electrician for a coal mine in southwest Virginia; must be able to wind armatures, understand mining machines and be able to look after steam and electric plant; in answering state fully experience and salary expected. Va-Lee Company, St. Charles, Va. Feb. 24.

Wanted—An experienced man for assistant fire boss and night boss; mine on Norfolk & Western R.R., in West Virginia. Address Box 11, care Coal Age. Feb. 17.

SITUATIONS WANTED

Advertisements under this head 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Position as assistant superintendent or superintendent is desired by a man of ability and push, having two first mine foreman certificates, gaseous mines or otherwise, expert on ventilation, opening new mines and reopening old mines, by salary or contract; best of references furnished on request. Address Box 9, care Coal Age. Feb. 17.



COAL AGE

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COAL AGE

Vol. 1 NEW YORK, FEBRUARY 17, 1912 No. 19

WHERE DO WE STAND?

That's the question some are now asking us and we concede their right to know. Every advance, industrial or moral, must have its champions, and those who entrust themselves to such leadership want to know where they are going and the reason therefor.

All our promises and declarations were made before the birth of this journal, nineteen weeks ago. With the first issue, we quit talking and commenced "sawing wood," and since then have published 630 pages of the best coal literature it was possible to secure. During this time, we have studiously avoided the use of our reading pages for self-advertisement, believing that "making good" is a matter of deeds, not talk. All our time has been devoted to building a paper that would be worthy and representative of the great industry we serve.

To the few competitors who wished us ill, we extend greetings, and desire to say that our refraining from retort was through lack of sufficient cause and not from any overwhelming desire to avoid controversy. There's no use in bothering when the missiles intended for you are hurled straight up in the air. You can always feel sure, in such a case, that if one of the bombs doesn't come down and blow your adversary's head off, bad manipulation of his artillery will cause an explosion, the result of which will be equally fatal to him.

You can stand at the foot of a mountain, look up, and shout that the ground before you is level, but you'll climb all right before you get to the top. Those who are proclaiming that Coal Age is a paper for managers only, or for miners only; for theorists or for practicalists; for anthracite, or for bituminous men, do not interest us in their outcry. Any success they win through misrepresentation is temporary. We're building a journal for all, and expect it to last a thousand years, not one or two. Our conception is that we've a life's job before us; a serious, responsible task, which can result in great good or great harm to the multitude of workers we represent.

We have a clear idea of what we propose to accomplish, and entertain no fear of human coyotes who follow the scent and only pounce when your back is turned or your foot slips. Confidence in our own ability is not lacking, but what we desire above all else is the complete trust of our readers; the certain knowledge on their part that we trail no halter and that we are for the man who is in the right, whether he owns the mine or works in it.

Treading on what is supposed to be dangerous ground, we wish to assert *right now* that we are not opposed to Unionism when labor is organized on a sane basis and conducted for the good of the majority. It is also essential to fairness that such federations be endowed with moral and financial liabilities proportionate to the obligations assumed by the other party to such contracts. However, we abhor those leaders who are traitors to the cause of the men, and who grow fat on the sufferings of a misguided and trusting body of fellow-workmen.

As to the Bureau of Mines, we believe its work is beneficial and that the investigations being carried on are hastening the advance in the art of mining; however, we do not favor a further extension of the powers of the bureau, so far as coal mining is concerned, for when such a federal department crosses the line that divides the province of suggestion from that of dictation, trouble will ensue through interference in the management of private enterprise.

Furthermore, the idea somewhat prevalent outside the industry that the creation of the Bureau of Mines saved coal mining from utter destruction is erroneous. We would have continued to advance without government aid, although we welcome the valuable help they have rendered, and believe the industry is entitled to a continued careful expenditure of public money in the interest of increased safety and efficiency.

In conclusion, we will say that our chief aim is to voice the sober judgment and final opinion of the majority in our industry, to live according to new standards and not be bound by obsolete traditions. We earnestly solicit your suggestions in the interest of our common welfare. Help us make Coal Age a human document from cover to cover. It must not voice the opinion of any man or clique of men. Above all, encourage us in our ambition to be right rather than popular.

Mine Rescue Work in Illinois

By H. H. Stoek*

The State of Illinois has established three mine-rescue stations and equipped three rescue cars. Men from these cars attend all mine disasters and train mine-rescue men at the surrounding mines.

*Professor Mining Engineering, University of Illinois, Secretary Illinois Rescue Station Commission, Urbana, Ill.

Two years ago, in November, 1909, the people of this country were startled and stunned by a disaster at Cherry, Ill., which will always stand out prominently among mine casualties, not only on account of the large number of lives lost, but also because it showed that a serious calamity could be started by so simple a cause as the burning of a bale of hay. This disaster was the inciting cause for legislation, which could possibly never have been enacted but for the condition of public opinion, brought about by the disaster.

The special session of the Illinois legislature, which convened in January, 1910, passed among other laws, intended to increase safety in mining, one providing for the establishment of a mine-rescue service throughout the state. The governor was empowered to appoint a commission consisting of two coal-mine operators, two coal miners, one state mine inspector, one representative of the department of mining at the University of Illinois, and one representative of the Federal Bureau of Mines. This commission was authorized to purchase, or accept as a gift, suitably located sites for the establishment of three rescue stations, and to establish, equip and operate the same, and for these purposes the sum of $75,000 was appropriated.

After visiting a number of suggested locations, the mine rescue commission selected Lasalle, Springfield and Benton for the northern, central and southern stations, respectively. Plans for the buildings were drawn by the state architect from sketches furnished by the commission. Fig. 4 shows the Springfield station. As all three buildings were erected from the same plans and are practically identical, a description of one will suffice for all.

Buildings Provided

The foundations are of solid concrete, finished smooth on the inside wherever the surfaces are exposed. The walls of the buildings are of timber covered on the outside with metal lath, which is coated with two coats of plaster throughout. The extreme dimensions are 61 ft. 6 in. in width and 87 ft. in depth. The height to the peak of the roof is 29 ft. 6 in.

The front part of the building contains two floors, and is divided into the living apartments, office and workshop. The rear portion is one story in height, and contains the rescue chamber.

The basement contains a store, coal and furnace rooms, and has concrete floors and finished concrete walls throughout.

On the first floor, Fig. 6, at the left of the entrance, is the office of the superintendent, in which is a large closet for the storage of maps. Back of the office is a hallway leading to the dining room, which also serves as a general living room. Adjacent to this hall is a closet and toilet. In the rear of the dining room is the kitchen, off which is a commodious pantry and a rear entrance. Behind the front-entrance porch, a hallway leads to the rescue chamber, and on the right is an entrance to an equipment room, which is divided into two parts, one for the storing of appliances and the other for use as a workshop.

The rescue-training chamber and lecture hall occupy the rear of the first floor. The lecture or observation hall, Figs. 1 and 6, is a room 30 ft. by 57 ft., lighted from above by skylights, but it can be darkened when desired by curtains. The sides of the lecture hall are of glass, thus giving a full view of the training gallery, which surrounds the lecture hall on three sides. This auditorium will seat comfortably about 100 persons, is well lighted and is provided with a special lighting switch, so that a stereopticon can be used for lecture purposes. Stereopticon slides, together with notes for the same, are used by the superintendent or other lecturer at the station, and these lectures are furnished by the department of mining engineering of the University of Illinois.

Fig. 1. Lecture Room in Rescue Station

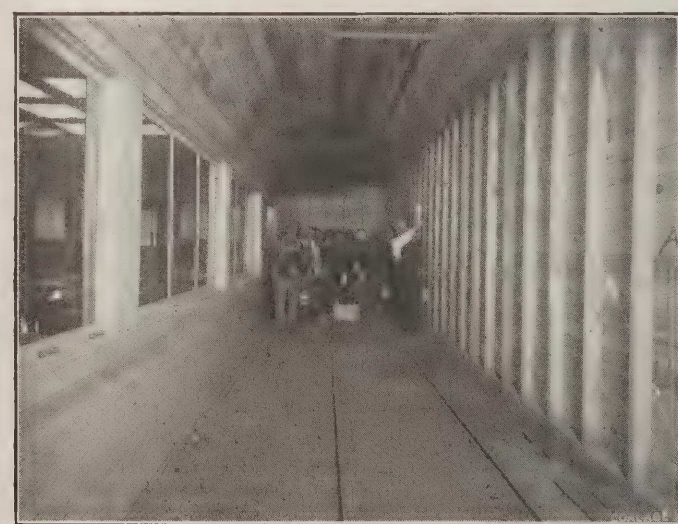


Fig. 2. Right Side of Training Gallery

The training gallery is an air-tight gas chamber, in which sulphur can be burned to produce sulphur dioxide. Other irrespirable gases may be used instead of sulphurous oxide. In this chamber training with oxygen helmets and other rescue apparatus is carried on. The right side of the gallery, Fig. 2, is 8 ft. wide and 10 ft. 4 in. high, and in this part are placed a mine track and a mine car. The left side of the gallery is only 6 ft. wide and is divided into two parts, one of which is 5 ft. 2 in. and the other 4 ft. 7 in. in height. This division allows work to be carried on in restricted quarters and the upper part also serves as an overcast. There is a toilet at one end of the left side of the rescue chamber. The

end of the gallery, Fig. 6, contains a track for a mine car and a tunnel, shown at the right, through which men crawl when equipped with rescue apparatus, in order to accustom themselves to work in restricted quarters.

The second floor, Fig. 6, contains a dormitory, in which there are twelve white-enameled iron beds. A commodious toilet room, adjoining, is fitted with lockers, shower baths, wash bowls and other toilet facilities. There is also a bathroom on the opposite side of the hall. There are three rooms which can be used by the family of the superintendent for private sleeping apartments.

The building is well lighted with electricity and thoroughly ventilated by means of numerous well placed windows. It is finished throughout in natural wood, stained a dark burnished-gray color, presenting an excellent appearance.

Rescue Cars

At each station there is a car for use in transporting the rescue appliances and the party manning the station to all disasters to the scene of an accident. The exteriors of these cars are shown in Fig. 3. Fig. 5 shows the plan of one of them and this will illustrate them all, although there are slight differences in interior arrangement. One of these cars, completely equipped, was donated by the Chicago, Milwaukee & St. Paul Ry., and another, fully outfitted, was presented by the Chicago & Northwestern Ry. The third was purchased from the Pullman Co., and refitted by the commission.

Fig. 3. Party of Rescuers Equipped with Oxygen Helmets

As shown by Fig. 5, one end of the car is occupied by the heater, coal box and the locker for linen, and on the opposite side of the aisle is the toilet room. Next come three double-compartment berths on each side of the car. There are accommodations in this section for 12 persons, sleeping singly. Next is a kitchen, fitted with stove, sink and a suitable pantry. An ice box is located beneath the car. The state room, intended as an office for the manager, or whoever is in charge of the rescue work at the mine, contains a double berth, a desk and a small toilet room. One end of the car is used for storing the rescue apparatus, and it also affords space for demonstration purposes. In one corner are three oxygen tanks connected to a pump, as shown. On the opposite side is a storage rack for seven other oxygen tanks. In one corner is a coal box and in the other a locker for pulmotor, first-aid supplies and other small articles, and for the storing of potash cartridges. The helmets are hung by hooks from the ceiling of the car or on the side, and, if necessary to prevent them from swinging, a strap is provided, which can be run to the floor and there fastened to a ring by a snap hook. The helmets are covered when not in use by a canvas bag to protect them from dirt. A work bench can be placed at one side of the car, and equipped with suitable tools needed for repair work in connection with the rescue apparatus.

Rescue Equipment

Each station is provided with an equipment of five Fleuss, five two-hour Draeger, three one-half hour Draeger and three Westphalian oxygen rescue apparatus, with two oxygen pumps and a complete outfit of electric and ordinary safety lamps, together with appliances for charging the electric lamps. There are also two complete sets of first-aid appliances, charts, etc. Some of this apparatus is kept stored in each car so that in case of an accident at a mine in the district tributary to the station, the car can be moved as soon as a locomotive can be procured.

Each station is in charge of a superintendent and an assistant. There is a manager who has charge of all the stations and cars and acts in conjunction with the commission.

The course of training consists in acquiring a knowledge of the several types of apparatus noted above and the acquirement of facility in the use of the same. Before a certificate is granted, a man must undergo the following test, completing the work within a period of two hours:

1. Make eight complete trips around gallery on ground floor.
2. Climb ten times over an overcast.
3. Carry 25 bricks over same.
4. Crawl through tunnel three times.
5. Carry four props over overcast.
6. Saw two props completely across.
7. Set five props and knock them out.
8. Hang canvas, take it down and fold it up.
9. Pull weight 60 times.
10. Carry dummy, with the assistance of another man, once around gallery, lifting it over a car.
11. Push car once around gallery with help of an assistant.
12. Make eight complete trips around gallery on ground floor.

When a man can do this a certificate is given him and also a button, showing him to be a member of the Illinois Mine Rescue Corps.

The time of training varies from one to two weeks, depending upon whether the men devote all their time to the training and live in the station during that period, or come to the station from adjacent mines and devote only such time as they can spare from their regular duties. No charge is made for instructing the men and if they desire, 12 men at a time can be lodged in the dormitory free of charge. The superintendent has the privilege of running a boarding table for which those in training pay. They can board outside the station if they prefer to do so.

The mining law passed by the legislature recently adjourned provides that a map of each mine in the state shall be filed with the manager of the rescue stations. The maps of the mines situated nearby any station will be kept in that station so that in case of an accident the rescue party can study the map while *en route*.

The same law provides that candidates for the positions of mine inspector and mine manager must pass an examination in rescue and first-aid methods.

Certification

The stations and cars were not completed and fully equipped until about June 1, 1911. The summer of last year was so intensely warm as to render it inadvisable to attempt to train men at that period of the year. The helmets on a sultry day cause considerable oppression, and the heat would be still further increased by the combustion of the sulphur. With the return of cool weather, however, a vigorous campaign has been inaugurated and the three rescue cars are now in the field, going to the various mining centers for purposes of demonstrating the use of apparatus and for giving systematic instructions in the same. A record is kept of those who take such instructions and they are given credit for having attended these demonstrations and lectures when they go to any one of the stations for final training and for the test required before a certificate and button are

granted. Up to Dec. 1, somewhat over 100 certificates had been issued to men scattered all over the state, but this number will be materially increased as the result of the active campaign now being conducted.

In each of the stations there is kept a file of the leading mining technical journals of the United States and Great Britain and there is also a mining library.

It is a source of pride to the citizens of Illinois that the state has been the first to provide a rescue service for its mines under state jurisdiction and it is believed that this is to be only part of a general educational movement that will greatly benefit the mining industry of the state.

FIG. 4. STANDARD DESIGN FOR ILLINOIS MINE-RESCUE STATIONS

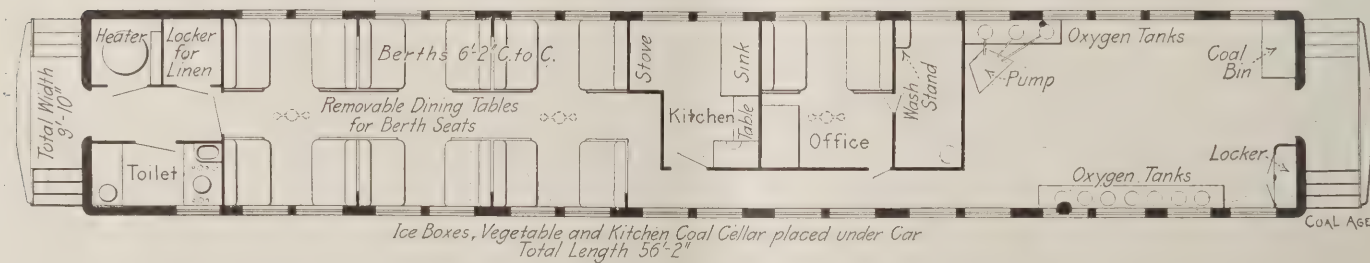


FIG. 5. STANDARD PLAN OF MINE-RESCUE CARS FOR STATE OF ILLINOIS

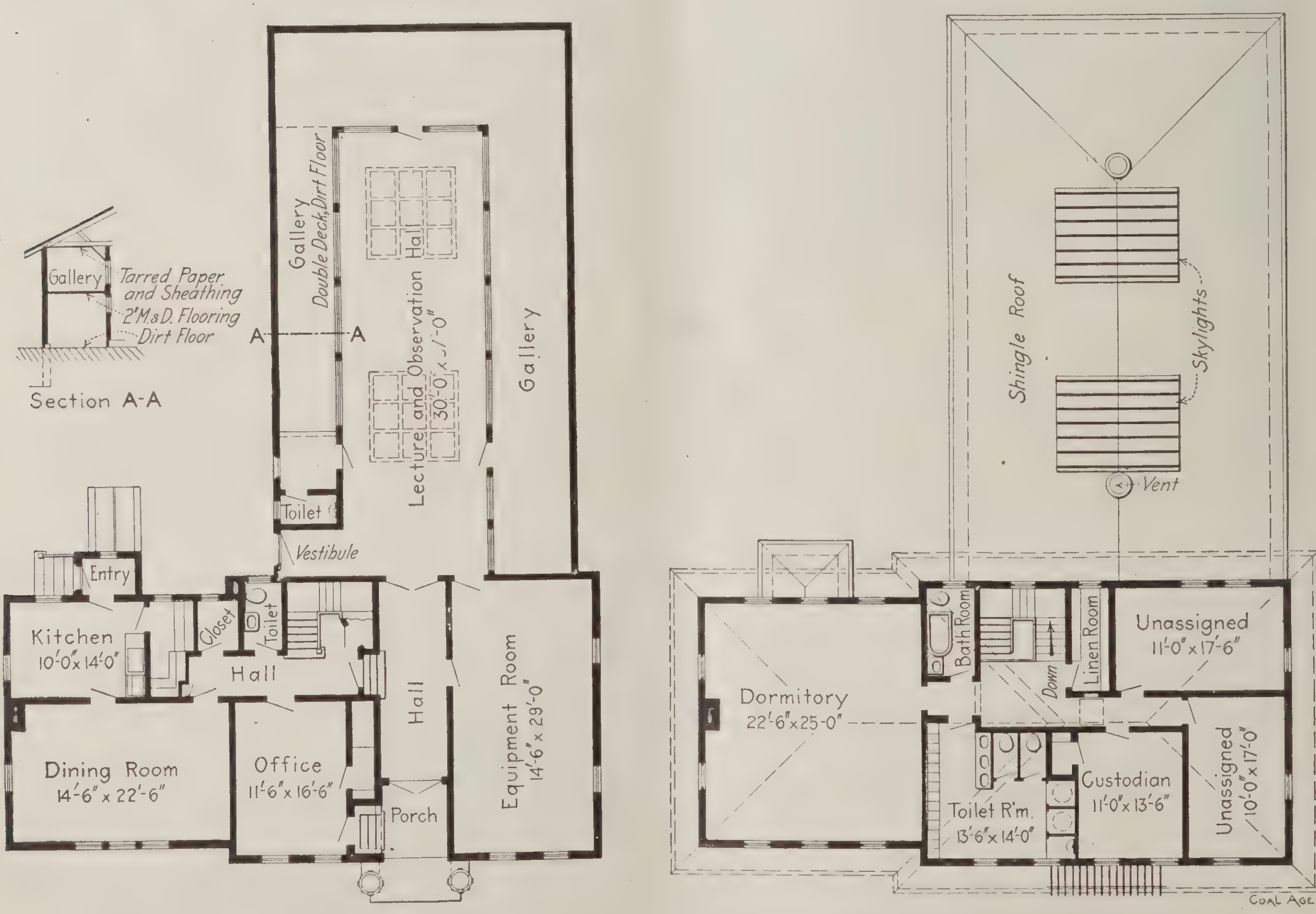


FIG. 6. PLANS OF RESCUE STATIONS AT LA SALLE, BENTON AND SPRINGFIELD, ILL.

Anthracite Coal Strike Situation

By E. L. Cole

The miners in the Union constitute a minority of the anthracite coal workers, but they will control the actions of both unionists and non-unionists. Violence will probably not effect anything in the coming strike. The washeries and stock piles are mostly away from the villages of the coal workers and the operators will be able to supply all normal demands.

Much has been said and written about the all absorbing topic for discussion which is now agitating all parties in the anthracite coal fields. The oft repeated question is, will the miners strike on April 1? The thoughtful reader is at a loss to sum up the situation for he has reluctantly formed the opinion that the average writer is biased in his views, be he a labor leader or a spokesman for one of the coal-producing companies.

The time is near at hand when an answer must be given to this momentous question which is of vital importance to the large coal-producing corporations and to the 160,000 men and boys employed by them in the production of anthracite coal for the market. It is a question of deep concern to over 1,000,000 people populating the anthracite coal fields and directly or indirectly dependent upon the unceasing production of coal for their means of livelihood and prosperity.

I shall state what I have seen and heard, so that all who have the well being of their fellow creatures at heart, will be able to draw their own conclusions with the assurance that the verdict is based on the actual conditions that confront the miner and his employer today.

The Leaders and the Led

In conversation with the more intelligent mine workers, whom it is my good fortune to know well, I have heard slip quite often from their lips the expression: *"Well! if they strike."* When I have asked them: Why do you say *"they,"* I have invariably received the reply that, "I don't belong to the miners organization, but if the United Mine Workers of America decide to strike I will strike with them."

Here it may be well to point out that while public opinion is overwhelmingly against a strike, that same public opinion will not decide the question, neither will the majority of the miners decide it, for the issue will be wholly in the hands of a small but powerful minority of coal miners, not powerful in money and numbers, but powerful in influence. What they decide to do, the vast army of mine employees will choose to do also. The miners are permitting themselves to be governed by a minority of their fellows in the economic field, while they strenuously object to any such measures being applied to them in their political activities. Surely they are not to be congratulated on the consistency of their actions.

The truth of the matter is that the majority of the mine workers have long ago severed their relations with their economic organization; they have little or no confidence in the mine leaders, and they have good reasons for that lack of confidence. They have seen their officers spending valuable time and money, jockeying for positions of influence and ease in the labor world. They have seen them conducting elections in an unscrupulous manner. They have seen their lesser officers spending their time and the money filched from the pockets of the mine workers, in the saloons of the coal fields in much the same manner as a ward politician whose whole purpose in life is to perpetuate himself in power so that he may continue to live on the sweat of his dupes.

One-half Million Men Are Required to Mine the Coal Demanded for Consumption in This Country Alone

Union Stronger in Influence than Funds

The position of the miners is rendered difficult by the fact that less than 30 per cent. are in good standing in the labor unions, so that the treasury is far from overflowing. Thus the miners' ranks do not present an unbroken front to their employers. And this is due in no small measure to the fact that race prejudice is an active factor separating the mine

workers. It is well known that nearly all the organizers receive comfortable salaries, far more than they would receive in their usual vocations at the mines. They are nearly all of the English-speaking races, although the financial support of the Union is drawn in the anthracite field from the foreign miner. It is the foreign workmen who are now the aggressors. They are believers in *direct action,* and they point with pride to their remarkable achievements in 1902 when they marched in bands 10,000 strong having base-ball bats as weapons. By threats of physical violence they succeeded in closing one colliery after another, regardless of the fact that some of the mines were manned entirely by Americans who preferred not to belong to the union and whose wish it was to continue at their work of producing coal.

The tactics which are known in the labor world as *direct action* were in no small measure responsible for the mines being tied up for nearly six months in 1902, and some of the miners have expressed the hope that they will be able to repeat their tactics and again tie up the mines until their demands are granted.

A National Coal Strike

Some profess to see a gleam of hope in the plan of ex-president Lewis who is advocating a united stand of both the bituminous and anthracite miners. He would cause the entire organized army of soft-coal workers to stand idle until the demands of the hard-coal workers were granted, regardless of the fact that the bituminous miner may have previously succeeded in reaching an amicable agreement with his employer. The futility of such a plan is evident to the student of the labor movement for there are in this country in round numbers 800,000 mine workers, less than half of them are organized and in the event of a strike, the unorganized soft-coal miners would undoubtedly continue at work, thus enabling the operators who employ them, to capture markets permanently that are now held by the employers of unorganized labor. For it is no secret that we are able today to supply coal far in excess of the actual market demand. Thus the union miner, in the soft-coal region, if he stood idle for the sake of his anthracite brother would be placed in the position of robbing himself for the sake of affording the anthracite leaders an opportunity to experiment with the system euphemistically termed *direct action* but better termed *unrestricted violence.* The fact that a large body of miners would still continue at work would be a most formidable obstacle in the path of organized labor. Its leaders see the danger that lies ahead in case of a general strike, and they are adverse to it, although they are being daily urged to promote it by those who favor the plan and who point out the gains made by the English labor men in their recent general suspension from work.

Lack of Cohesion

The miners seem to lose sight of the fact that the English labor movement is conducted by people who speak a common tongue, while here we have the most cosmopolitan body of men ever gathered together, men who differ in race, and who hold political opinions which are at variance one with another. As proof, witness the acrimonious debate which lasted more than one day at the recent convention of the U. M. W. of A. The wrangle was precipitated by the introduction of a resolution to indorse a political party, the tenets of which most of the miners do not in any way understand.

In Case of a Prolonged Strike, the West Virginia Mines Would Greatly Benefit. Above View Shows Sun Colliery No. 1, in the New River Field of Southern West Virginia

Furthermore, a general strike to be successful would necessitate the aid of the railroad men engaged in transporting coal to market. These men would be unable to aid the miners unless they first would repudiate the contracts they have entered into with their employers, and it is worthy of note that no body of railroad men in this country has yet dishonored itself and the calling by repudiating its contracts. These have been secured only after years of earnest effort. By them railroad employees have practically eliminated the use of that crude weapon—the strike—in their efforts to improve the condition under which they labor.

It would undoubtedly prove a most arduous task for the miners to convince their fellows who are engaged in the transportation world to desist from hauling coal from either storage yards or washeries for the purpose of enabling the miner to defeat his employer.

The hope of the miners that they can inaugurate a general strike and carry it to a successful conclusion is but an iridescent dream into which they have been hypnotized by a western labor leader. He is now in charge of the general strike of the New England mill workers; but recently he toured the coal fields rousing his audiences to a high pitch of enthusiasm by his glowing word-pictures of the possible fruits of a general strike. I have been advised that it is his intention to return to the coal fields if the strike ensues, for the purpose of promoting that general strike, of which he is such a strenuous advocate.

Temporary Vocations

Some of the miners profess to believe that they can repeat their migrations of 1902 when thousands of them entered the industrial centers and readily secured employment at wages that enabled them to support themselves and assisted them in supporting their families at home. Those who hold such an opinion should be disillusioned, for the student of industrial conditions is aware of the fact that large employers of labor are not in need of additional hands today. Few, if any, of our large industries are being operated to their full capacity, and in no quarter is the demand for material greater than the supply.

The strike of a decade ago was but six weeks old when the public was asked for financial assistance and most liberally did it respond, but today an appeal for a sustenance fund would fall unheard, not because of the unwillingness of the toilers in other fields, but because the head of the average family has little or no money to bestow upon others, due to the world wide increase in the cost of living. Moreover the large body of men who are unsteadily employed will be unable to assist their fellows should they so desire.

Public Not Anxious to Pay More for Coal

The aid received from the public was in no small measure responsible for the fact that the miners were able to win their strike of 1902. The coal-producing companies were not engaged in producing coal for pleasure, so they added the increased cost of labor to the selling price of coal, which action the public immediately resented. The consumer was placed in the position of the innocent bystander who attempts to interfere in a family disagreement. The reconciliation was indeed effected but at the public cost. The coal buyer will be loath to aid the miner again for he will be aware that the inevitable result will be to increase the cost of an article which forms one of his daily needs. The managers of the vast anthracite coal operations must decide to raise the price of coal if they would hope to continue to realize an equitable return on the extra hazardous investment that they have made.

There is another factor that will militate against the miners, and that is the great increase in the machinery used in the washeries. This replaces unskilled men by mechanics, who being fewer in number and less sympathetic with the miners, are more likely to continue at work. In fact, a few years ago when the U. M. W. of A. ordered a stoppage of work pending negotiations, General Manager Richards of the Philadelphia & Reading Coal & Iron Co. was able to ship 40 cars of coal per day from Rausch Creek washery, without the use of any regular employees with the exception of the foremen, due to the fact that the work is almost entirely done by automatic machinery. The total tonnage of all the washeries, together with the coal in the storage yards, would enable the operators to prevent the repetition of the famine of 1902.

Direct Action Fore-Warded

Should the miners in the event of a strike attempt to repeat their tactics of ten years ago and march to the washeries in an effort to stop their operation, they would undoubtedly be met by the highly efficient Pennsylvania State Constabulary. The force has been in existence long enough to demonstrate that it is equal to any emergency which may arise. It may be added that the present force of state police may be insufficient to cover the entire zone of labor troubles, but it is well to remember that as there is a community of interest between the coal, railroad, manufacturing and commercial men, it would not be an insurmountable task for them to unitedly invoke the aid of the state legislature of Pennsylvania to increase the numbers of the state police, provided that they produce data to substantiate their claims for additional protection. To those of my readers who may doubt the foregoing, I need but point out that only the united action of the Pennsylvania business men prevented the disintegration of the state police. In the last session of the legislature, efforts were made to prevent an increase in the salaries of the members of the force, which was only an indirect attempt to cause a depletion in the ranks of the state police. It may be well to further note that the fight against them was led by one of the state leaders of the American Federation of Labor, who recently toured the coal fields at a salary almost double that which he receives as a pipe cutter. The burden of his lecture was a recital of his efforts to legislate the state police out of existence, and he proudly acclaimed that he would abolish the most expensive but effective preventative of mob rule that the State of Pennsylvania ever possessed.

Typical Mining Town in an Unorganized West Virginia Field

Storage Yards Largely Away from Coal Field

Turning to the operators, we find that the struggle of 1902 taught them the necessity of building storage yards so that they would not be entirely unprepared to meet their employees in future struggles in the economic field, and wisely they have chosen the locations of most of the yards within the reach of the consumer, out of the zone of possible labor troubles. It has been estimated that the operators will have sufficient coal on hand, together with the possible ouptut of their washeries, to supply the normal demand for coal.

It is this strategic position of the operators that has given rise to a fear of a lock-out of the miners on Apr. 1, but the student of economic conditions quickly sees that a lock-out is not without its perils to the mine owners. For instance, every summer all the progressive gas companies inaugurate strenuous campaigns for the substitution of gas ranges for anthracite-coal consuming stoves. In the fall of the year the central stations, who quite frequently are large users of bituminous coal, endeavor to supply customers for their winter heating from their central stations, and this phase of the problem is one fraught with the danger of no slight economic loss to the coal-producing companies, and one that could hardly be avoided if a protracted struggle should ensue.

Higher Costs for Miner and Operator

Though the operator occupies an excellent strategic position, his path is not an easy one, and the question for him to decide is what course shall he pursue so that he may continue to keep his property on its present dividend-paying basis. While it is true that the miner has suffered an increased cost of living, the operator has also suffered from progressive increase in the cost of mine supplies during the past nine years, in addition to which he has been compelled to make heavy expenditures for the purpose of mining seams of coal which lie deeper than he has formerly worked, and that hitherto have remained untouched, due to the enormous cost of reaching them.

It has been said that the miners and mine owners might agree to a slight increase in the compensation of labor, the operators to add to that increase a sum of money to compensate them for the higher wages and heavy expenditures heretofore mentioned, but a student of the situation realizes that competition is liable to make the problem more difficult, for, though the increase be only 10 per cent., the additional cost would be sufficient to cause many large consumers of anthracite to substitute bituminous coal, so that both miner and owner would, by such measures, receive no permanent gain. There is the further danger that harassing legislation may be invoked by the politicians who wish to make a play to the gallery, hoping thereby to further their personal political ambitions. Undoubtedly an increase in the cost of coal will bode ill for the operators if the political agitator should seize the opportunity and succeed in further inflaming the public mind against industrial corporations.

British Coal Trade Crisis

Special Correspondence

Having regard to the world-wide interest in the negotiations between the coal owners and the representatives of the workers to establish the principle of the minimum wage in British coal mines, it may be opportune to append a diary of the crisis as follows:

Oct. 7, 1911—Annual conference of Miners' Federation. Conference met at Southport and resolved to "take immediate steps to secure the individual district minimum wage." In the event of the employers refusing, Rule 21 to be put in operation.

Oct. 14-30—Minimum-wage demands were refused by the employers in all districts except Warwickshire.

Nov. 10—The minimum-wage demand was considered by the Conciliation Board for the federated districts of England and North Wales (Lancashire, Cheshire, Yorkshire, Midlands, Somerset and North Wales). The coal owners' representatives stated they *could* recommend the adoption of the principle of the minimum wage; but as the matter was beyond their power to decide, they proposed to take it to their districts. The meeting was, therefore, adjourned.

Nov. 14 and 15—As arranged, on Oct. 7, a special conference of the Miners' Federation was held in London. In view of the acceptance of the principle of the minimum wage by the coal owners' representatives in the English area, it was decided to adjourn the conference, pending further efforts to promote a settlement. The executive was instructed to invite the coal owners generally to a national conference.

Dec. 18—On this date the English Conciliation Board again postponed decision on the question at issue.

Dec. 21—The adjourned conference of the Miners' Federation decided to take a ballot of the men as per Rule 21. Each county or district was instructed to prepare a schedule of demands. Decision made to continue negotiations.

Jan. 10-12, 1912—Ballot of workmen taken.

Jan. 13—The country realized that the strike majority would be more than the two-thirds required by the Federation rules, and there was a sharp rise in coal prices.

Jan. 16—A meeting was held of the miners' representatives on the English Conciliation Board to frame proposals for the practical application of the minimum wage to coal mining.

Jan. 17-19—The Miners' Federation held a conference at Birmingham. The ballot result was announced, showing 445,801 in favor and 115,919 against a strike—majority, 329,882. In view of these figures it was decided to issue strike notices. At the same time the employers were invited to continue negotiations.

Jan. 23-27—The negotiations were continued by the English Conciliation Board conference. The task of finding a basis of settlement was delegated to a joint subcommittee. This joint committee exchanged views upon the demands of the miners, with reference to abnormal places and the minimum wage. It was decided to submit a report to the owners and miners in the different districts within the federated area.

Feb. 1—Notices handed in at collieries in South Wales coal field to stop work at the end of February, a month's notice being necessary under the South Wales wage agreement. On behalf of the members of the Enginemen, Stokers and Surface Craftsmen's Society, who demand an eight-hour day and better wages, notices were tendered. The number of workers affected by the notices is about 200,000.

Feb. 1-2—Delegates of Miners' Federation, representing over 650,000 men, passed resolutions upon the minimum wage to furnish basis upon which negotiations may be conducted in the national conference of coal owners and workmen, on Feb. 7. Agreed that the following claims be formulated for an individual minimum wage in each district for piece-workers at the face of coal:

Yorkshire	7s. 6d.[1]
Lancashire	7s.
Midland Federation	6s.@7s.
Derby	7s. 1d.@7s. 6d.
Nottinghamshire	7s. 6d.
North Wales	6s.
Leicestershire	7s. 2d.
South Derby	6s. 6d.
Somerset	4s. 11d.
Bristol	4s. 11d.
(While this is fixed as a minimum, it is understood that it will not effect in any way a higher rate than 5s. and 5s. 3d. already prevailing in the coal field).	
Cumberland	6s. 6d.
Scotland	6s.
South Wales	7s. 3d.@7s. 6d.
Northumberland	6s.@7s. 2d.
Durham	6s. 1¼d.
Forest of Dean	5s. 10d.
Cleveland	5s. 10d.

[[1]For the information of those who are not familiar with English money, we desire to say the English shilling (s.) equals 24.3c. and the pence (d) equals 2c.—Editor.]

No underground adult worker shall receive a rate of wages less than 5s. per shift (but this resolution is not to apply to Somerset, Forest of Dean, or Bristol).

Individual minimum wages for all piece-workers, other than those working at the face of coal, to be arranged by the districts themselves, and to be as near as possible to the rates paid at the present time in each district.

The rates paid to the underground workers who are paid by day wage left to the districts to arrange.

List of boys' wages also left to the various districts, but they are not to be less than present wages nor in any case less than 2s. per day for any boy.

Conference of the Federation to be called to meet in London, on Feb. 13.

New Test for Firedamp

A simple contrivance which is capable of being attached to any safety lamp has been designed by Henry Briggs, of the Heriot-Watt College, Edinburgh. By means of his device he claims that a remarkably small percentage of firedamp can be detected in mine air, that indeed, it is one of the most accurate and delicate ways of detecting gas.

The attachment, he explains, consists merely of a loop of copper wire supported on a vertical brass stalk, which extends through the oil vessel of the lamp. When it is required to make a test for gas, the loop is moved into the flame, which then becomes nonluminous, allowing the gas cap to be clearly seen if firedamp be present. The loop obviates the necessity of drawing the flame down when looking for gas; hence there is no risk of losing the light.

Changing from a working to a testing flame, or *vice versa,* is practically an instantaneous operation. Any kind of oil or spirit and any shape of wick may be used. The loop does not interfere with the lighting power of the lamp, nor does it curtail the height of the flame when testing.

On John Bull's Toes?

The following editorial excerpt from the *Iron and Coal Trades Review* (London, England) is a graceful—though apparently unwilling—acknowledgment of our growing importance in the export trade:

A generation ago, British coals were thought to be practically beyond the reach of competition, and the only preoccupation of collieries and shippers was to anticipate the requirements of a trade which seemed capable of indefinite expansion, and which, indeed, is still expanding. It is true that exporters had been made to realize the existence of coal in America by the loss of the West Indian trade, but this was soon all but forgotten in view of the rapid increase in the quantities taken in other directions. The knowledge of the existence of coal deposits in other countries was of the vaguest character, and the subject was casually dismissed by an emphatic declaration that they were of no account in a competitive sense, and developments on the Continent, as in the United States, were treated with indifference until British shippers were startled some 10 or 12 years ago by the invasion of European markets by American coal in small quantities.

Coal Production of Austria

The total production of both coal and lignite in Austria for the year 1911 was 40,116,743 metric tons, as compared with 38,006,840 tons for the year of 1910. The coke production for 1911 was 2,076,978 metric tons, as compared with 1,999,106 tons for the year of 1910, the production of briquettes in 1911 was 347,597 metric tons, an increase of 13,379 tons for the year. Two-thirds of the briquettes were made from lignite.

A Self Dumping Car Haul System

Special Correspondence

A description of the Greene car-haul and automatic-dumping system as installed at the Burnside colliery in Pennsylvania. The apparatus includes a novel arrangement for recording the work of the tipple and is an important labor-saver.

The Philadelphia & Reading is the first company to install the Greene self-dumping car haul in the anthracite regions and C. O. Bartlett & Snow Co. have but recently finished one of the finest jobs of engineering in Pennsylvania, in adapting the patented idea to local conditions found at the Burnside colliery. The accompanying illustration conveys an idea of the old plant, which was displaced, and shows two loaded cars being elevated while two empties are being lowered on the parallel track.

This is the simple plan of cable haulage found in so many mines everywhere. It will take up enough cars and does a service quite adequate in most instances, but a much greater economy can be effected by the use of the installation to be described.

INSTALLATION AT THE PHILADELPHIA & READING COAL & IRON CO.'S BURNSIDE COLLIERY

Method of Operating

The Burnside breaker receivers coal from three openings namely Burnside shaft, Burnside drift and Stirling slope. Tracks approach the breaker from three directions around curves and limited space for track storage of waiting cars demands speedy handling of the loads and empties to keep the several workings clear at all times. The new self-dumping car haul will do this and more. Variable speed motors furnish the power to run the haul from 44 to 88 ft. per minute, hence a shut-down in the breaker can be compensated quickly by speeding up the haul and quickly reducing the accumulation of loaded cars.

To describe the principle of the Greene self-dumping car haul in the simplest manner, it might be likened to a common type of bucket conveyor, as it has the same endless chain, though lacking buckets of the stationary character, which are supplied by cars as they are taken up at the bottom on the lower track and released at the base of the upper track. Illustrations are given herewith to help understand the general makeup of the machine, which is simple enough despite the wonderful results that it will accomplish.

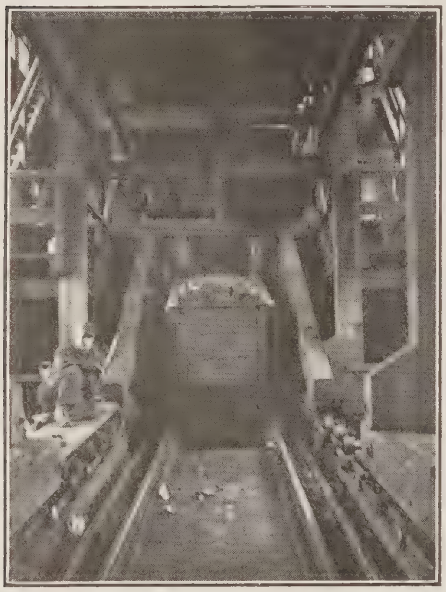
It is simply an endless chain revolving about a sprocketed wheel at either end of two tracks placed one above another, the chain having protruding cross bars that engage a loaded car behind its rear wheels and after having slightly elevated it to accommodate the 30° grade and avoid spilling coal in the ascent, it goes to the breaker. Then a swinging lift, which is not such a simple matter and requiring description later, elevates the car, as it is discharging its load of about four tons of coal, and placing it on the upper track leaves it to the cross bar to return again to the tracks leading back to the mines. Beside the swinging lift there is another auxiliary device at the base that prevents choking, called the feeder haul, and one other mechanism just above it, known as the cross bar and empty car release that operate automatically also and are worthy of description.

Feeder Haul

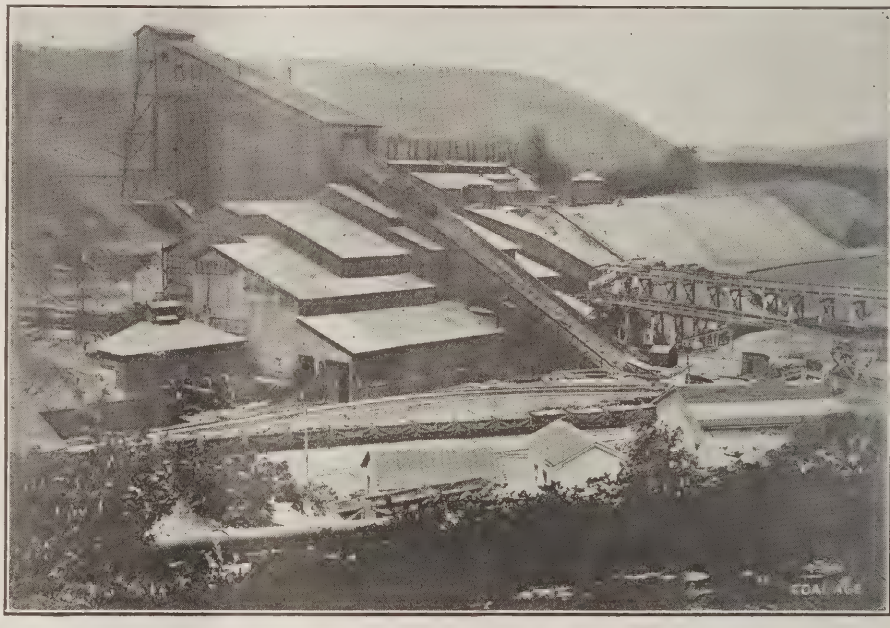
The feeder haul is a machine in itself consisting of an endless chain on two sprocketed wheels geared to the larger

sprockets that operate the main haul. The chain has two swinging catches or dogs that perform the functions of feeding cars into the main haul when coming in contact with three pieces of cam track that raises behind the car axle and pushes it forward at the proper interval and releases it again to wait for the next cross bar.

To be exact, we will follow the process of cars going over the feeder haul. As the train approaches, the head car is caught by a dog standing erect and passed forward to where a man pulls the coupling pin. At this point, let us note that this is the first man to have anything to do with the machine and remember that there is just one other man about the entire haul. This latter man has little to do but stand guard at the top, but that is necessary and when compared with the number of men used on the former car haul, a great saving is represented in wages alone.



Automatic Tipple



The Old Installation with Parallel Tracks

After advancing the car to about the center of the feeder the dog is dropped to be raised again a few feet ahead to advance the car left in mid track last trip, till it is taken up by the cross bar and sent up the incline. This cross bar is a tubular axle extending beyond the car wheels, and having wheels which run on a track of their own. It is impossible for the cross bar to miss its hold or for cars on the feeder track to interfere with its functions because of the simplicity of the accessory parts and by reason of a bumper that automatically checks waiting cars. Nor is the feeder haul a necessity as the cars can be fed by hand.

Dumping Arrangement

At the head of the haul the swinging arm lift comes into play by throwing the catch on the car door so that discharging begins with the door partly opened and continues as the car moves up the curved elevation until empty. The several types of cars have been taken into consideration, a cam track being furnished for lift end cars (though this is not the type at Burnside) so a projection on either side of the car trips the catches and the door swings open. At the same time the car notifies the swinging arm lift that it is coming and by the same automatic devices the lift, which really consists of two parallel arms is thrown in gear and receiving the emptied car, raises and places it on the upper track and the cross arm, now in front, checks its descent by gravity down the incline to the mine tracks.

Here again the entire process is automatic and the man shown in the illustration is doing what he does most of his time except in case of emergency resulting from interference in some part of the breaker or about the mines. An intelligent boy may do as well, as all that is required of him is to throw the switch that starts the electric motors when they may have been cut off by safety switches at the bottom or other places in the system since this provision has been made for fool protection and in case of unforeseen emergencies. The power can be thrown off anywhere but can only be turned on at the head and only there when all other switches are closed indicating that everything is allright along the entire line. The man at the head therefore is merely the watchman and acts cautiously and only on authoratative instructions.

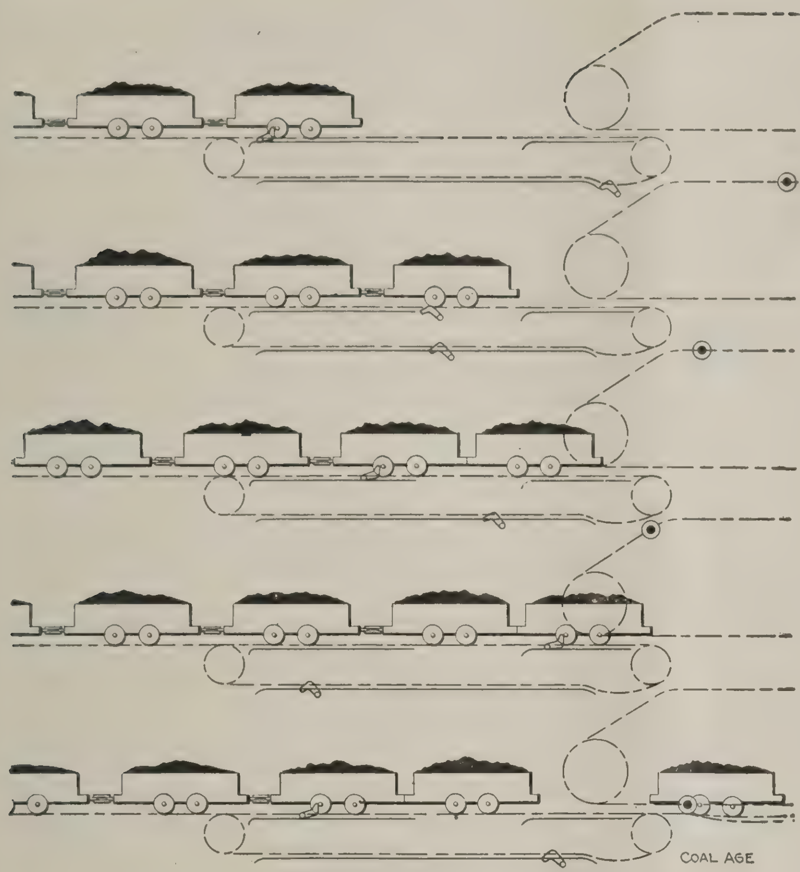
In the Greene method the car must pass through one more important process before getting out of the system at the base of the incline, where the cross bar must be removed from under the wheels and the break in the track closed for the car's passage.

The important principle in this operation is that of a balanced track and a corresponding cam release device. Remembering that the car track is within the track traversed by the cross arm wheels, we have the upper end of the balanced track elevated as the car descends hence it stops the car and the cross arm being free, slips beneath the balanced track to catch the release that trips the balance downward and cars pass on to tracks as desired. The cross arm has now made its trip and proceeds to repeat the process, while the balanced track is thrown back into position by the weight of the car passsing over it.

The Automatic Recording System

These are the main features, but there is more and to the operator the remainder is of even greater importance than the rapid despatch of 120 to 130 four-ton cars per hour, employing the services of two men, with safety provided for both men and equipment, and the assurance that the machine on the job is equal to all emergencies without extraordinary exertion.

The most valuable part about this invention is its reliability in recording its own work and affording means of detecting the responsibility for its shortcomings. If the average of its performances is not lived up to there has been a way provided for telling who is to blame and somebody has to account for it. Electrically operated Bristol recording dials tell the tale. In the morning the red finger on the clock dial tells the hour and minute of first movement and the "carpet" awaits an explanation for



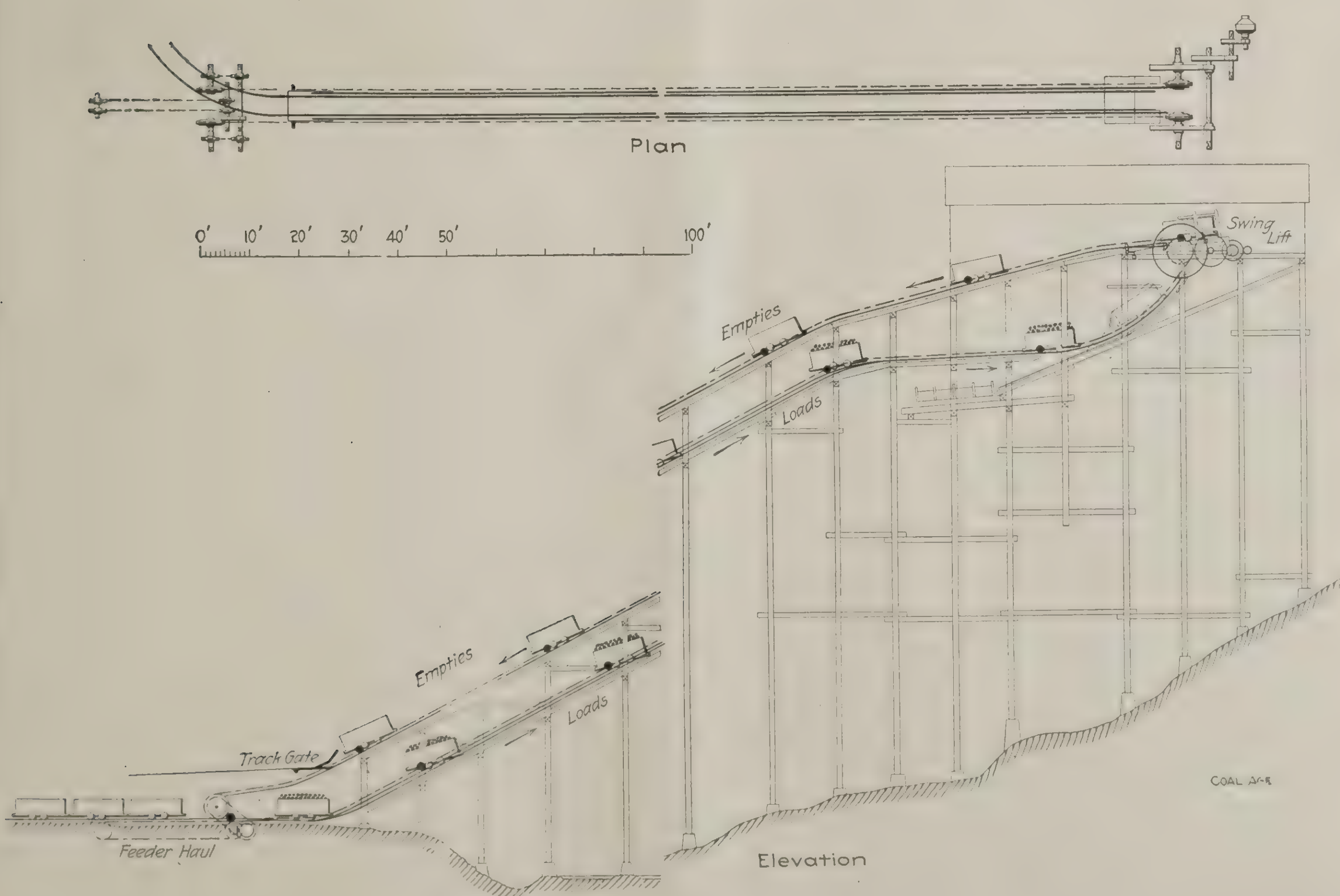
SKETCH SHOWING *Modus Operandi* OF FEEDER HAUL

tardiness if it exists. The superintendent can sit in his office, too, and look up to see that a stop has been made and if prolonged he can hurry to the scene or use his telephone to find the cause and speed its remedy.

Then at night he knows the number and length of stops that were made and the responsible party may be asked to explain these for the dial tells the tale truer than some men on the job care to disclose it. He is also furnished in the same manner the true record of all the cross bars that passed the feeder without cars, as well as the number that took cars, and that tells him more of the story of the day's work.

The Burnside colliery is fed by the openings as named above which have the following capacity per day; Burnside shaft, 400 cars; Burnside drift, 200 cars; Stirling slope, 250 cars; making the total, 850 cars each day. A day at the breaker for handling coal consists of eight and a half hours, not allowing for stops that occur at nearly every breaker each day on account of a slip somewhere or because of a breakdown due to a worn-out part.

Electricity is the motive power employed throughout which adds further efficiency by reason of the time saved in starts and stops.



PLAN AND ELEVATION OF CAR HAUL AND DUMPING ARRANGEMENT

Methane in Coal Dust Explosions

By F. I. Wilbur*

A concise restatement of ascertained facts relative to the action of methane in promoting coal dust explosions, drawn from publications on the subject, domestic and foreign. The opinion of Mr. Wilbur is that coal dust is merely a contributory factor in mine explosions, contrary to recent reliable investigation.

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In 1845 Faraday and Lyell in England endeavored to call the attention of the coal mining world to the action and effect of coal dust in aggravating and extending the injurious effects of fire-damp explosions. Later, in 1867, M. Verpilleux of France also announced his conclusion that coal dust was an important factor in mine explosions. Since then many workers have investigated the subject and its importance as a factor in aggravating mine explosions is generally conceded. Of late there has seemed to be a tendency among writers on mine explosions to overestimate its importance and to assign it a place as a primary cause of mine explosions instead of giving it its proper place as a secondary or contributing factor.

The British Royal Commission appointed to investigate the causes of accidents in mines reported with regard to coal dust (See II Report of the Royal Commission, 1894, p. 24) that:—

1—Coal dust from many seams is as sensitive to explosion as gunpowder itself.

2—Coal dust is sensitive to explosion in proportion to its freedom from impurities.

3—A supply of oxygen, such as is furnished by brisk ventilation makes a coal dust explosion more probable and severe.

4—A gas explosion in a fiery mine may be carried on indefinitely by coal dust raised by the explosion itself.

Factors in the Susceptibility of Coal Dust

Most investigators consider that the explosibility of coal dust depends on:—

1—Its fineness. It is the very fine particles of dust which readily ignite.

2—Its dryness. Damp or wet roads are seldom involved in an explosion, which the dust on dry roads propagates.

3—Its purity. If the coal dust be largely mixed with an incombustible material such as stone dust, it becomes so diluted and its particles become so separated one from another that they can not propagate the flame and carry on the explosion.

4—The thorough mixing with air. Coal dust explosions cannot take place unless the cloud of dust is blown up or stirred up with the air and thoroughly mixed with it. The same is true of gas explosions which are impossible unless the combustible gas be intimately and thoroughly mixed with air. It has been noted as a curious fact in many recent so-called coal dust explosions that the face of the coal has not been affected, the force of the explosions being almost entirely confined to the main intake airways. (See Engineering and Mining Journal, Vol. 89, p. 1030). A further curious fact is that an excess of dust will prevent or extinguish an explosion.

L. T. O'Shea says (See "Elementary Chemistry for Coal Mining students," 1911, p. 272) that the great difficulty in the case of colliery explosions is to prove, without any possibility of contradiction, the absence of any trace of firedamp at the moment of ignition. Nevertheless he cites several instances where coal dust seems to have been the chief factor in a mine explosion.

The Absence of Gas in Explosions

It seems, however, impossible to eliminate the possibility of the presence of more or less methane in all of the so-called dust explosions. The Report of the British Commission on Accidents in Mines, 1886, (See p. 113) after giving some interesting facts about the effects of blown-out powder shots in the presence of coal dust, state that wherever a coal is worked which contains inflammable gas, the atmosphere in the vicinity of the workings, however efficient the ventilating arrangements, will at one time or another, and it may even be said generally, contain some small proportion of fire damp. If the atmosphere contains less than from 2 to 2.5 per cent. of its volume of marsh gas it cannot be detected by the elongation of a lamp flame or the appearance of a cap upon it.

Rollin T. Chamberlin found (See "Notes on Explosive Mine Gases and Dusts" Bull. 383, U. S. Geol. Survey) that analysis of gas obtained from crushing samples of coal showed that it consisted equally of methane and nitrogen each yielding nearly 40% of the total. This fact explains why the sensitiveness of marsh gas to explosion is increased by the presence of coal dust in the atmosphere, and also why air which seems free from gas when tested by a lamp flame may become explosive when laden with fine dry coal dust.

Galloway found that the presence of coal dust made even 0.892 per cent. of gas in the air explosive. Similarly Abel found that when marsh gas to the amount of only 2 to 2.75 per cent. was present in a coal-dust laden atmosphere travelling at 600 feet per second it would readily explode, and that some dusts were so sensitive that even 1.5 per cent. of methane became explosive in currents of low velocity

The Crevice Gas in Coal Measures.

Methane variously known as carburetted hydrogen, CH_4, marsh gas, fire-damp, "fire" or "gas" exists pent up in the coal itself where it has developed from the progressive formation of the coal beds. In some shallow mines it is rarely if ever detected as it seems able to escape from such mines to the surface through the intervening permeable strata. Other seams give it off in large quantities, especially if they have been long worked and have thus afforded an outlet to drain off the gas from the other seams. It is generally most abundant in seams of much depth where it is given off from the strata and also from the face of the coal and cracks in the floor and roof. If the gas be given off in very large amounts from these cracks it may cause a heaving up of the floor or a falling of the roof.

Sometimes the pressure of the enclosed gas is as low as 30 lb. per square inch, but in many cases the measured pressure of the pent-up gas has been found to be from 460 to 900 lb. per square inch. Under such enormous pressure there is always a liability to sudden outbursts of the gas, which even in the absence of flame sufficient to cause an explosion, are very dangerous as they make the air currents foul and dislodge material. Where the pressure is great the issue of gas from the coal is accompanied with a hissing noise like escaping steam. Such outlets of the gas are called "blowers."

When a coal seam is aproached in sinking shafts sudden outbursts of fire-damp may occur, especially after a number of shots have been fired and have thus opened crevices for the escape of the gas. In all such cases the atmosphere should be tested with a safety lamp before proceeding with the work.

Explosive Mixtures of Methane

The proportions in which mixtures of marsh gas or methane without coal dust explode on ignition appear to range between 7.14% and 16.67% of methane. Beyond these limits the mixture of pure methane and air is inflammable but not explosive. Less than 5% of methane is not even inflammable though under certain conditions the Royal British Com-

mission on mine accidents found that even 4% was dangerous. With from 5% to 5.5% of methane, or one part of methane to 19.17 parts of air they found that an atmosphere became explosive. Coquillon found that in his investigations one part of methane to 16 of air or 5.9% of methane became explosive and Wullner and Lohmann in their experiments in connection with the Prussian Firedamp Commission between 1881 and 1887 reached the same conclusion.

From these proportions the violence of a methane explosion continues to increase in direct ration to its proportion of methane until it reaches 10.3% of methane or one part of methane to 8.3 parts of air. Mallard and Le Chatelier found that this proportion gave the maximum of explosive violence. From this point each increase in the amount of methane correspondingly diminished the violence of the explosion and when the methane proportion reached 16% its mixture with the air ceased to be explosive.

Red hot wires can ignite mixtures of methane and air, those having 6.6% of methane being most easily ignited, but all mixtures having 5.9% of methane can be fired. Methane itself although inflammable is a non-supporter of combustion.

Phenomena of Diffusion

Methane is only half as heavy as air and therefore has a tendency to seek the highest point and, if sufficient ventilation shafts were provided, a mine would doubtless be able to keep itself free from dangerous proportions of methane by natural ventilation. It always has a tendency to accumulate wherever there are crevices in the coal, especially in the holes and fissures in the highest point it can reach, such as the mine roof. If these crevices are suddenly opened by the miner's pick or any other cause the gas rushes out and seeks again to rise. If it cannot escape it necessarily becomes mixed with the atmospheric air, especially where there is a brisk ventilating current which increases its attenuation and intimate mixture to a dangerous degree. After being mixed with from 6 to 12 times its volume of atmospheric air it is in a highly explosible condition and if by chance it then comes in contact with a miner's naked light or anything that will ignite it, a fearful explosion almost like that of gunpowder follows.

After the explosion it is found that the methane has combined with the oxygen contained in the air of the mine in such a way as to resolve the CH_4 and air into (1) carbonic dioxide (CO_2), popularly known as blackdamp in the mines, (2) H_2O in the form of water or steam, and (3) free nitrogen. Unlike methane the CO_2 does not rise but settles in the lowest parts of the mine.

It is rare that methane is found pure in mines as it is usually mixed with other gases chiefly carbon dioxide and sulphuretted hydrogen which tend to reduce the force with which it tends to explode. It is found that when an explosive mixture of methane is diluted with one-seventh of its volume of carbon dioxide, it ceases to be explosive.

Some interesting facts with regard to methane are given by Robert Wabner, (See "Ventilation in Mines", p. 22). He says that once mixed with air, methane (CH_4) will not separate again. When an explosion of this gas occurs two shocks—the shock and counter shock are produced in quick succession. The ignition temperature of CH_4, is 650° C according to Demanet (see his "Traité d'Exploitation des Mines de Houille," 2d Ed. Vol. II, p. 61), or 780° C. according to Kohler.

Ignition of Methane

CH_4 is said to have been ignited by the friction of a drill working in hard sandstone. In a petroleum shaft of Galicia where a miner worked without light because of the shallow depth of the pit, an explosion is said to have been caused by the stroke of the pick.

According to Dr. Brookman of Bochum, the product of the imperfect combustion of methane is ethylene or olefiant gas (C_2H_4) and not carbon monoxide (CO), hence Wabner thinks, coal dust must be the sole cause of the formation of CO and of the poisonous and dangerous character of the afterdamp.

The stronger the ventilating current the greater will be the quantity of dust that it carries with it and the farther will it be transported from the center of production by the ventilating current as it traverses the mine. This fact should be considered in the adoption of any artificial ventilating systems. Strong currents also increase the dryness of the transported dust, and consequently increase the liability to explosion.

Wabner says that certain sintering (clod) coals and non-caking coals in many districts especially when present in thick seams have long been known to possess the dangerous property of occluding and condensing oxygen. This gradually enters into combination with the carbon to form carbon dioxide, the heat thus generated producing spontaneous ignition and disastrous pit fires. The dusty state of coal favors the absorption of oxygen and spontaneous heating.

Pressure of Coal Gas

Towards the interior of coal the pressure of methane materially increases and often reaches a considerable amount, Behrends found a pressure of 14.6 atmospheres at the bottom of a borehole, 4 metres in depth, in the newly-opened section of the No. 13 seam at the Hibernia Colliery in Gelsenkirchen, Westphalia. In some very deep Belgian pits, pressures of 20 to 23 atmospheres have been recorded and as high as 42.5 atmospheres in a borehole in unworked coal.

Wabner says that the rule seems to be that the greater the depth of a seam below the surface, and the more effectively it is shut off by impenetrable cover rock, the higher will be the pressure of the imprisoned gas, and consequently the more violent the outrush of gas when the seam is tapped, but the longer it is worked and the greater the number of galleries and other openings made therein, the more will the initial pressure and outflow diminish in the course of time until finally the latter ceases altogether or diminishes to an imperceptible quantity.

It follows naturally, therefore, that more gas is thus encountered in opening out a new section of a coal mine than when the same has been worked and has long been traversed by headings. Wabner thinks that there is thus evidently an analogy between the occurrence of fire damp and pit water, for in both cases the initial outflow is the greatest, diminishing in a short time as the drying progresses.

It should be remembered that when CH_4 combines with oxygen it is decomposed into CO_2 (carbon dioxide) and H_2O (water). Thus the progressive absorption of the oxygen by this CH_4 either within or outside of the coal structure would tend to a progressive increase in the amount of water formed.

Gas as a Comminuter of Coal

According to Wabner (p. 27) the volume of gas can be reduced (1) by the ventilating current, (2) by limiting the output of coal, and (3) more especially by regulating the preliminary work of opening up new sections of the pit. In connection with the last precaution he mentions the following facts:—

"Since under ordinary conditions the gas intimately permeates the coal and fills its pores at a higher or lower pressure, the gas also influences the coherence and firmness of the seam, and under certain circumstances may make the coal friable and brittle. For this reason fiery bituminous coal beds frequently yield nothing but small coal; and occasionally this factor becomes so prominent as to make coal-getting dangerous, especially in sloping seams. This evil can be counteracted by tapping the bed with bore-holes before commencing to win coal from the face: in this way the coal is rendered more solid and resistant. More especially has this contingency to be taken into consideration when two

gassy seams are united in close juxtaposition. In such event the coal could undoubtedly be more easily won by working both seams simultaneously, and only small coal would be obtained; whereas by working one seam before the other, an opportunity is afforded for the gas in the second one to escape, and the coal from this will then be more solid and furnish a larger proportion of lumps."

In the Report of the British Royal Commission in 1886 on Accidents in Mines, it is said (p. 112) that "The experiments we have made on the pressure of firedamp in plugged bore holes, in coal, a pressure amounting to upwards of 400 pounds on the square inch, have thrown much light upon the occurrence of sudden outbursts of gas. The boring of holes upward or downward has been successfully tried as a means of avoiding such outbursts.

"It is almost impossible to account for many of the accidents which have occurred in well-managed mines, some of which have originated in the main-intake airways, except upon the supposition that gas has suddenly invaded the workings from the adjacent strata. Sudden outbursts of large quantities of gas, accompanied by violent disruption of the floor, roof or coal, are fortunately rare, but smaller incursions of gas, accompanied by falls of roof, or even without any apparent displacement of strata, are comparatively frequent."

The Commission believed that these abnormal discharges of gas might be successfully met by ample ventilation, good discipline and efficient lamps. While they recognized that variations of atmospheric pressure exert an influence for the escape of gases which have accumulated in cavities, and possibly to a slight extent on that of gases emitted directly from the coal, they questioned the wisdom of placing entire reliance on meteorological warnings such as the fall of the barometer. In their opinion, safety must also be ensured by unceasing vigilance on the part of the officials and workmen in the mine, irrespective of such warnings.

Emission of Methane

The experiments of Rollin T. Chamberlin and others* have shown amongst other facts that methane is given off by all coal and is quantitatively by far the most important gas which it evolves usually amounting to from 80 to 95 per cent. of all the gas which is emitted but in some cases it reached 98 per cent. It is significant that it was found that anthracite coal yielded the highest per cent. of methane in the gas liberated, but that low atmospheric pressure which aided the escape of gas from bituminous coal had less effect on the liberation of gas from anthracite.

Other facts established by experiments are that finely powdered fresh coal gives off more methane in a vacuum than the same amount of lump coal subjected to the same conditions and that the finer the coal the more rapidly and completely was the gas liberated in a given time.

These facts seem to indicate clearly that the increased facilities for the elimination of methane that are acquired by coal with each increase in the fineness of pulverization, must also increase the liability to and destructiveness of a mine explosion after ignition and in direct proportion to the degree of the comminution of the combustible coal. That methane and other gases are constantly exhaled by the coal is shown by the fact established by experiment that fresh dust yields five times as much combustible gas as old dust and only one-third as much noncombustible gas. Age apparently tends to lessen the explosive tendencies of coal dust. In its last analysis, therefore, coal dust must be regarded as a secondary predisposing cause to mine explosions, the primary predisposing cause being the methane the undue accumulation of which is favored by the dusty form of coal. Proper ventilation to give a constant outlet to this gas, and the application of lime or rock dust to offset the uplifting and gas-extracting effects of low pressure on the comminuted coal would seem to be the easiest and least dangerous methods of dealing with the dust problem. The material thus treated might be later collected and converted into some kind of building material. It would seem better still if after condensation the dust could be conveyed to some reservoir where pressure or chemicals could be applied to condense the dust into combustible briquets of coal.

*See notes on "Explosive Mine Gases and Dusts," Bul. 383, U. S. Geol. Survey.

Coal Mine Ventilating Equipment

By W. M. Weigel *

The distinguishing features of several forms of modern steel-plate fans are discussed, as are also two types of high-speed fans, a comparatively recent development in the line of mine ventilating equipment. This is the fifth article of a series dealing with mechanical ventilators.

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As far as the construction of the wheel and position of the blades are concerned the simplest form of centrifugal mine fan is that made by the Buffalo Forge Co. Fig. 6 shows an elevation and plan of an installation of one of these fans for the Madoc Coal & Mining Co., Glouster, Ohio. This is arranged to operate either blowing or exhausting. The blades of this make of fan, usually 8 or 10 in number, are of heavy steel plate and are placed in a radial position with a slight backward curve at the tips only. Conical side plates inclose the sides of the wheel from the periphery of the inlet to the tips of the blades.

The blades extend inward from the periphery of the inlet for a distance equal to about one-fifth of their length, the outside corners being cut off as shown in the illustration. They are supported by the tee-iron arms of the spiders of which there are two and sometimes three. These arms are cast into the hubs of the spiders, making a particularly rigid form of construction. The shaft is supported in bearings hung on trunnions to prevent heating or wear from any deflection of the shaft. This, as well as other types of fans, often have the bearings water jacketed on the lower side to prevent undue heating.

The diameter of the inlet is about ⅔ the diameter of the fan wheel. Distinguishing features of this form of fan are: the large clearance between the fan and casing, especially at the cutoff, and the slight rate of increase in the radius of the spiral until the discharge opening is reached. The fan shown in Fig. 6 has an inlet on one side only, but these fans are built with two inlets if necessary.

Jeffrey Fan

Like other modern mine fans, the Jeffrey type is constructed entirely of steel plate except for that portion of the housing included within the foundation. These fans are built with either a single or double inlet. As illustrated in Fig. 4, the double-inlet form has a central disk of the same diameter as the wheel. The outer sides of the blades are fastened to annular side plates or cheeks, the inner diameters of which are the same as the diameter of the inlet openings in the casing. These annular plates are braced and held rigid by round iron rods which spring from a small hub on the shaft and offer practically no obstruction to the inflow of air. In the single-inlet type of fan, the solid driving disk forms the side plate of the wheel on the side opposite to the inlet.

TABLE 1. TEST OF 14 FT. by 4 FT. 6 IN. JEFFREY FAN, FOR NEW PITTSBURG COAL CO.

INDICATED HORSEPOWER OF ENGINE.

Rev. per Min.	Travel of Piston in Ft. per Min.	Mean Eff. Pressure	Area of Cylinder	Indicated Hp.
75	225	7.05	283	13.6
100	300	12.85	283	33.2
125	375	19.35	283	62.4
150	450	30.45	283	117.8

QUANTITY OF AIR DELIVERED

Rev. per Min.	Average Velocity of Air	Net Area of Drift	Cu.Ft. Air Delivered per Min.	Volume of Fan, Cu.Ft.	Volumetric Capacity of Fan
75	1600	50 sq.ft.	80,000	692	154%
100	2100	50 sq.ft.	105,000	692	151%
125	2500	50 sq.ft.	125,000	692	145%
150	3200	50 sq.ft.	160,000	692	154%

WATER GAGE AND MANOMETRIC EFFICIENCY

Rev. per Min.	Water Gage in Inches	Peripheral Speed of Fan	Theoretical Water Gage	Manometric Efficiency
75	0.9	3300	1.4	64%
100	1.6	4400	2.4	66%
125	2.4	5500	4.0	60%
150	3 4	6600	5.7	60%

HORSEPOWER IN AIR AND MECHANICAL EFFICIENCY

Rev. per Min. of Fan	Water Gage	Cu.Ft. Air per Min.	Hp. in Air Delivered	Indicated Horsepower	Mechanical Efficiency
75	0.9	80,000	11.36	13.6	83.5%
100	1.6	105,000	26.5	33.2	80.0%
125	2.4	125,000	47.35	62.4	75.8%
150	3.4	160,000	85.95	117.8	73.0%

The distinctive feature of these fans is the number and shape of the blades. Referring to Fig. 5, it is seen that there are eight main wings or blades extending from the periphery of the wheel into the inlet space for about ⅓ of the distance from the circumference of the inlet to the center. Starting at the inner end, these blades slope backward from the direction of rotation to a point just within the circumference of the inlet and then curve forward in a circular arc to the periphery; so that at the tips, their course is forward from a radial line, in the direction of rotation.

Half way between the main wings, is another set of a length equal to that of the curved portion of the main blades and curved to the same radius. Between these and the main blades is still another set with a length about one-half that of the second set and curved to a shorter radius. In the angle between the inner ends of the main blades and the circumference of the inlet are located conical sheet-steel scoops projecting into the inlet beyond the side line of the fan wheel. It is claimed that these strengthen the action of the fan and prevent gushing of air back into the inlet.

The diameter of the inlet is about 4/7 of the diameter of the wheel. The clear-

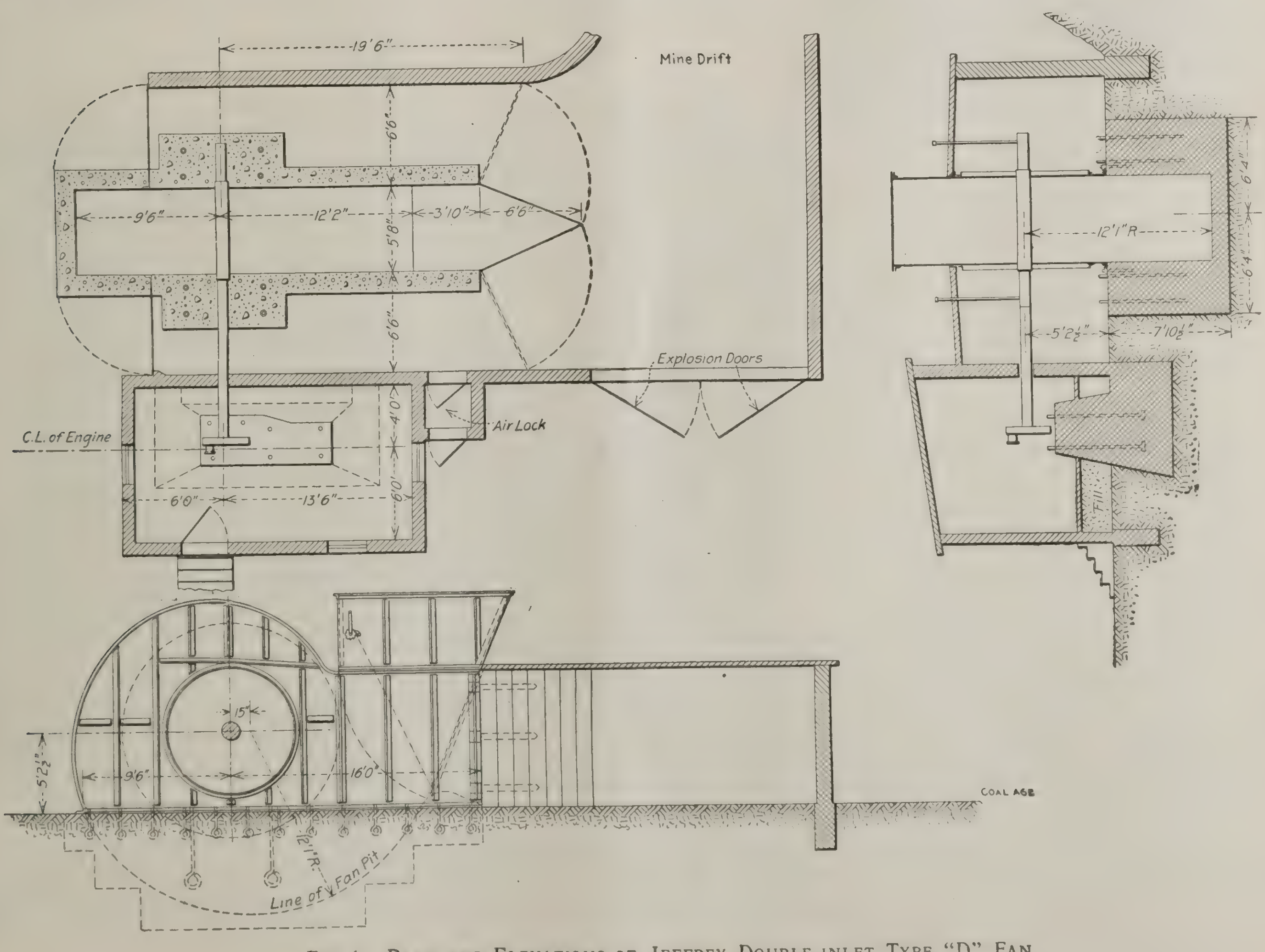

FIG. 1. PLAN AND ELEVATIONS OF JEFFREY DOUBLE-INLET TYPE "D" FAN

ance at the cutoff is small and the spiral casing has a rapidly increasing radius. Disregarding the long main blades and scoops, this form of fan closely resembles the multivane fans in the number and forward curvature of its blades.

Fig. 1 shows the setting for a double-inlet Jeffrey fan, arranged primarily for exhausting but so designed that it may be converted into a blower.

In Table 1 are given the results of a test, of a 14-ft. diameter by 4 ft. 6 in. wide, single-inlet fan, installed for the New Pittsburg Coal Co., at Murray City, Ohio.

High-speed Fans

The term "high-speed fan" refers to fans operating at relatively high rotative speed rather than at high peripheral speed, and is used to distinguish a class of fans which has been developed within

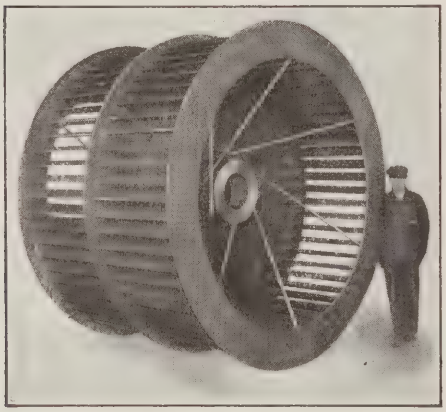

Fig. 2. "Sirocco" Fan Wheel

the past few years and only recently has been applied to mine ventilation to any extent. High-speed fans have many excellent features to recommend them and a number of successful installations have been made in various sections of the country, although some mining engineers still hold them in disfavor.

These fans are distinguished by the large diameter of the inlet as compared with the diameter of wheel, the radial length of the vanes or blades being only from $\frac{1}{8}$ to $\frac{1}{16}$ of the wheel diameter. A great number of vanes are employed, usually from 42 to 64. The fans are further distinguished by having their blades curved concavely toward the direction of rotation. The casing expands rapidly and gives a large discharge area at the point of cutoff.

The main points of advantage of this type of fan are low first cost of fan and installation, small space requirement, good mechanical efficiency and volumetric capacity, suitability to developing high-water gages, and, on account of the high rotative speeds, facility of direct connection to electric motors.

Sirocco Fan

One of the first high-speed types to be developed was the Sirocco fan. Fig. 2 shows the general construction of the wheel or runner of a double-inlet fan of this variety. A single-inlet type is also made. The central or driving disk is of heavy steel plate, springing from a cast hub, which in the double-inlet form is made in halves. The outer surface of this central disk is conoidal in form in order to prevent eddying of the air as it enters the wheel. The 64 blades are of pressed steel and are supported between the central disk and the front plates, or inlet circles, which are also made of heavy steel plate. The inlet faces of the wheel are stayed by tie-rods from the hub. This arrangement leaves the inlet practically unobstructed. Fig. 3 shows a Sirocco fan in service at Shaft No. 35 of the Berwind-White Coal Mining Co., Windber, Penn., and illustrates the adaptability of this type of fan to direct electric drive. This installation

Fig. 3. "Sirocco" Fan at Shaft 35, Berwind-White Mining Company, Windber, Penn.

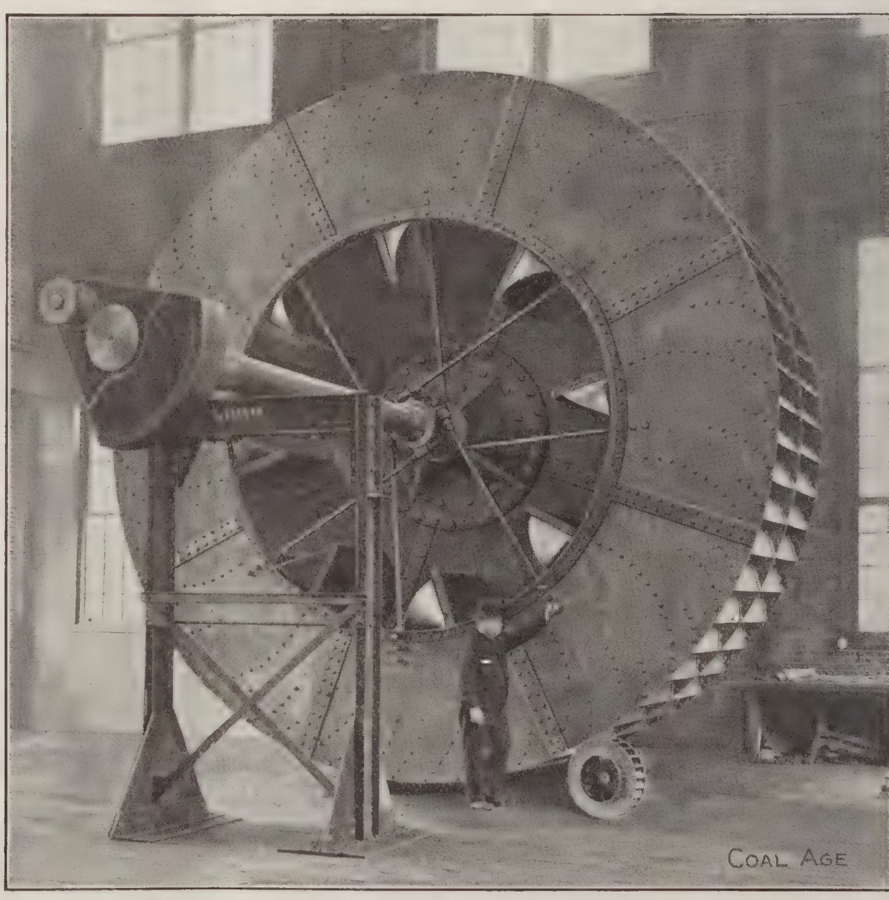

Fig. 4. Jeffrey Double-inlet Fan Wheel

delivered 315,000 cu.ft. of air per minute at 5.6 in. water gage while running at 252 r.p.m. The wheel is 108 in. diameter by 72 in. wide. The small size of the fan house is at once noticeable.

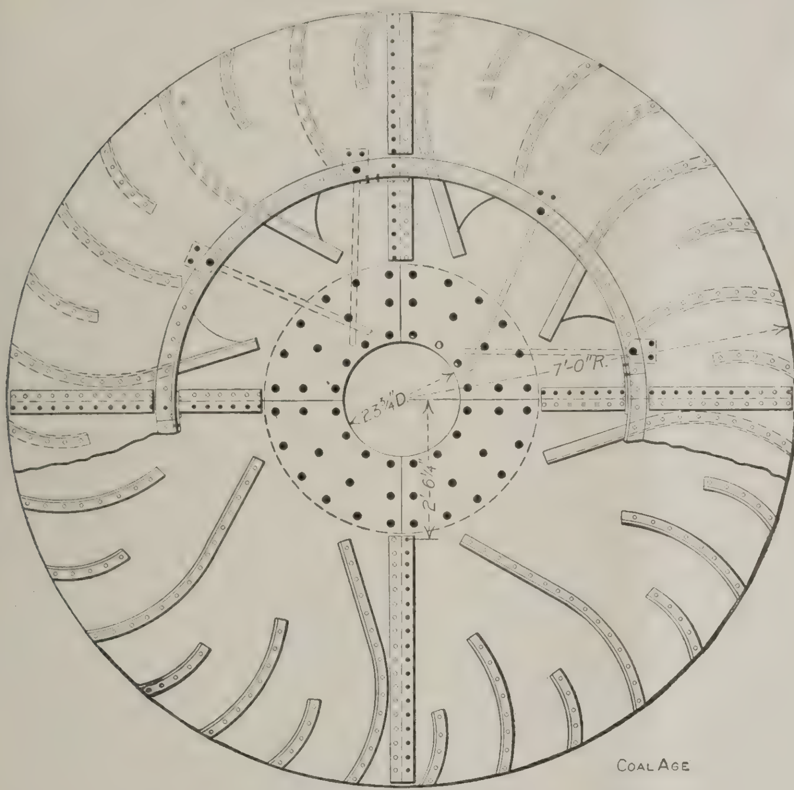

Fig. 5. Details of Jeffry 14-ft. Fan Wheel

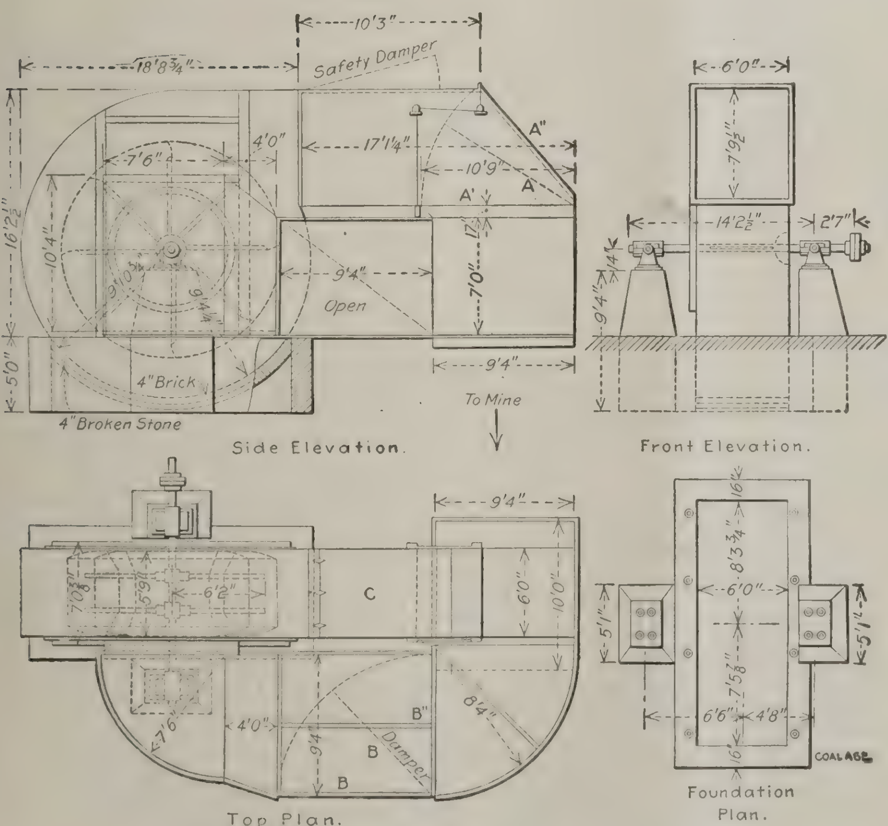

Fig. 6. Buffalo Forge Co. Fan for Modoc Coal Co.

The Sturtevant Multi-vane Fan

The Sturtevant multi-vane fan is quite similar to the Sirocco fan in construction and general details, the main difference being that the vanes, in addition to being curved concavely in the direction of rotation, are also corrugated or spooned across the face in a radial direction. This form of vane is claimed by the manufacturers to prevent the air from slipping along the blades in a direction parallel to the axis of the wheel and thus increases the volumetric efficiency of the fan.

Cost of Anthracite Co

Anthracite coal was at one time an important factor in blast-furnace practice, but for this purpose it has been almost entirely supplanted by coke made from bituminous coal, according to E. W. Parker, coal statistician of the U. S. Geological Survey, in an advance chapter from "Mineral Resources for 1910," lately issued. The principal future demand for anthracite will be restricted largely to domestic trade, for which the sizes known as furnace, egg, stove, chestnut and pea are required.

The breaking down of the lump coal, which was formerly a marketable product, for the preparation of the domestic sizes, results in an increased proportion of the small or undesirable sizes, all of which are sold at less than the cost of production. The proportion of these small sizes has increased from 23.1 per cent. in 1890 to 41.6 per cent. in 1910, while the proportion of sizes larger than pea coal, or what may be termed the profitable sizes, has decreased from 77 to 58.4 per cent.

The price of anthracite coal at the mines in 1910 averaged $2.13 per long ton. All the profits on the mining operations must be obtained from the prepared domestic sizes, for the revenue obtained from the smaller sizes, which are sold largely in competition with bituminous coal for steaming purposes, serves only to reduce the cost of the domestic sizes. The conditions under which the anthracite mines are operated, says Mr. Parker, the greater depths to which the workings are carried, the consequent increased expense of mining, and the increasing cost of labor all contribute to make anthracite fuel more and more a luxury. No hope is held out to the consumer that anthracite will, in the future, be sold at lower prices than those which prevail today; on the other hand, there is every reason to believe that prices must advance in accordance with the increasing cost of production. It is only by reason of economical administration that prices are not higher than they are.

During recent years the anthracite operators have adopted the policy of making an allowance of 50c. per ton from circular prices for domestic coal purchased in April of each year, with an advance of 10c. for each succeeding month until the schedule prices are restored in September. This has had a salutary effect in steadying the trade and permits the mines to be operated more regularly.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Gob Fires in Yorkshire, England

The following is an abstract of a statement made by W. H. Pickering, one of the English mining inspectors, in the course of an inquiry of the British Home Office into the gas explosion at the Jammage Pit, North Staffordshire. Mr. Pickering was asked to present an account of mine fires in the neighboring South Yorkshire coal field.

It appears that the more fiery coal seams in Yorkshire, that is, those which give out the greater amount of gas, are not those which are most actively troubled with mine fires. However, the Barnsley seam, in the Doncaster neighborhood, is an exception to that general rule. The coal lies deep, the deepest shaft reaching the bed at a depth of 2715 ft. A typical section shows a seam 9 ft. 2 in. thick, including a parting of dirt 6 in. thick. In this one seam are contained five distinct beds; one of these is a hard coal suitable for steam, 2 ft. 2 in. thick, and the rest is soft house coal. The seam is very gaseous; outbursts of firedamp are common, and the gas can always be found. A recent analysis showed nearly 2½ per cent., in air currents of 88,000 cu.ft. per minute.

The men have to be withdrawn from time to time, owing to the presence of gas in dangerous quantities. An inferior fireclay underlies the seam, and the roof is, as a rule, a tender shale. The seam is worked on the advancing longwall system, the gate roads of which are from 40 to 50 yd. apart. For commercial reasons, a large percentage of the coal is not sent out of the pit; the harder coal, being very valuable, is carefully extracted, and the bottom, or soft coal, is systematically worked with it. Most of the top soft coal is lost. In some cases no attempt is made to work it, the only part recovered being any large lumps produced when the gate roads are ripped. At these pits, the slack made in the face is also thrown into the waste, and the total loss in some of the new mines is over 40 per cent. of the seam. The roadways are troublesome to keep in order, and large quantities of dirt are moved during each repairing shift. As much as possible is stowed in the gob, but frequently such stowage is impracticable. Every effort is made to withdraw the timber from the gob and from the abandoned roadways.

Fighting Gob Fires

As a rule symptoms of heating are detected in the early stages, but at times the fires reach the burning point before they are suspected. Fires occur in the gob and die out without the management knowing anything about them. Their ashes are sometimes found when roads are being driven through old wastes. It will be readily understood that in the advancing longwall system of working, the difficulty of isolating fires by dams is almost insuperable. The strata are so broken up that gas-tight dams could not be built. The fires are dug out at all cost, even in cases where stoppings might be practicable. The operation of digging out a gob fire consists of driving headings into the fire area and extracting the burning or heated material, and sometimes packing the space with sand. Water jets under great pressure are used to quench the fire or cool the heated strata. It is quite simple on paper, but in practice is very difficult and dangerous. The heat is often so great that the men can only work for a few minutes at a time, and the ventilation must be arranged so no firedamp will pass over the fire. The work is costly.

Nevertheless, digging out is far safer and more economical in the long run than stopping. When a fire area has been dug out and the spaces packed with sand or otherwise effectively treated, it usually gives no more trouble. If a fire is stopped off it may annoy the management for years, and noxious gases from it may find their way into the mine workings.

English Ventilation Laws

In an address on "Duties and Qualifications of the Deputy and Fireman as Defined by the new Regulations," delivered at Ashby-de-la-Zouch on Jan. 6, G. H. Winstanley remarked as follows:

A ventilating current may have a volume of as much as 250,000 cu.ft. per minute. This is quite an ordinary quantity in the Lancashire field. In the course of 24 hours, the total weight of air passed through such a mine would amount to no less than 12,000 tons. Such a volume of air is capable of diluting, within the limits provided for in the Act, a volume of gas which would suffice for the needs of a large town.

The moisture present in the mine air should not be permitted to become excessive. The limit of wet-bulb temperature should certainly not be higher than 75, and 70 would be a better limit to adopt. That circumstance virtually disposes of the watering of deep mines as a safeguard against the dangers of coal dust. It is important that deputies and firemen should understand those points, because I have found, in more than one instance, that miners regarded high temperature as a definite and unmistakable proof of the presence of gas.

OXYGEN CONTENT NOT TO FALL BELOW 19 PER CENT.

I feel sure that the new standard of 19 per cent. of oxygen as a minimum presence of that constituent in mine air is by no means difficult to attain. In 1907, in connection with the investigations of the Royal Commission, Dr. Cadman and Mr. Whalley made careful inspections of some 40 selected collieries where either abnormal difficulties were met with, or where the ventilation was considered as capable of improvement. In 11 of these cases only was the ventilation found to be below the standard now established, and all of those, I believe, were cases where there should have been no difficulty in securing better ventilation. It is a curious but easily explained circumstance that those collieries which are easiest to ventilate have usually the impurest air.

In many cases there is an impression that ventilation only becomes important where inflammable gas has to be considered; consequently, in mines which are supposed to be free from methane the ventilation is often neglected.

On the other hand, mines in which inflammable gas is given off somewhat freely must be ventilated with such a volume of air as insures the oxygen percentage being kept well above the lower limit now permitted. For example, it is easy to show that to lower the oxygen percentage to 19 by the mere admixture of inflammable gas would require the latter to be in the proportion of nearly 10 per cent. Similarly, except perhaps in very rare cases of mines which give off carbon dioxide, the new standard of 1¼ per cent. of that gas (the maximum now, by law, permissible) cannot be regarded as one difficult of attainment. A lamp, however, affords no reliable guide either to the oxygen or the carbon dioxide standard. If the lamp is extinguished, it is certain the percentage of oxygen, demanded by the regulations, is not present, but we need to be able to determine when the percentages approach the limit set by the legislative provisions.

DETERMINATION OF OXYGEN

For open-light mines the tube and taper apparatus of Dr. Haldane may be used to determine the oxygen and carbon dioxide percentage, but in safety lamp mines it may, as a rule, be assumed that the oxygen and carbon dioxide percentage will be kept within the regulations by proportioning the ventilation properly to dilute the inflammable gas. In mines where safety lamps are used and inflammable gas is given off by the coal, the only method of determining the percentage of oxygen and carbon dioxide is by means of the analysis of samples.

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Of this issue of Coal Age, we will print 7000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

The Jammage Mine Fire

It is so customary to regard mine fires as the outcome of burning gas, explosions or of inflamed brattices, whether of cloth or wood, that the history of the Jammage mine fire in England should serve to recall those less general conditions to which the lignite fields of North America are especially subject.

On Nov. 25 of the past year, a fire broke out in the gob of a mine generating gas. The area was worked by longwall, but the extraction of coal was not complete. Because the mine was developed irregularly, due to the contortions of the strata, there were more than two approaches to the district where the fire occurred, and it was necessary to confine the conflagration by the building of several stoppings. Moreover, as the area mined was not in panels surrounded by pillars of coal, the gob to be shut off was large.

It was some time before the fire made itself apparent. A sulphur smell is alleged to have appeared early on Thursday morning. A pillar of the mine was found to be heated on Friday, and at 7 a.m. that day all the men were removed from the mine except those that were to close off the fire.

Unfortunately, the colliery officials decided to build their stoppings once for all of stone and dirt, and made no effort to keep air from the fire by the use of temporary brattices. It must be remembered that they appear to have expected an explosion and desired to assure themselves that when it occurred, only that part of the mine which was not working would be involved. The stoppings for some reason took 27 hours to build, and during that time the coal must have inflamed and the gas exploded. The damage done by the explosion was inconsiderable, nevertheless, six men were killed by the resulting gases.

It was suggested that the fire should have been extinguished by water. Those on the ground were best able to judge, but surely wood brattices could have been more rapidly constructed than brick stoppings, such as the experts suggested in the Home Office investigation. This would have shut off the air within an hour of the time when the need for closing up the fire area was recognized.

The objection to a brick stopping is the long time required for the maturing of the cement in the joints. It is slower in erection than wood, and slower to become efficient than a stone filling. Nothing but a rock wall should have been ultimately relied upon, but it does appear that the first protection should have been secured by the use of timber.

Efficiency

There is, in any language, no word that spells SUCCESS as surely and as plainly as *efficiency*. Thrift is a near neighbor to efficiency, the latter is indeed the outgrowth of the former; for what man can become efficient who has not learned the principles of thrift, or who is thrifty without proving his efficiency?

Success is the crowning sheaf—the certain award of efficient toil. That man is efficient as a worker who can produce results; or, in common terms, "deliver the goods." Such men are needed today in coal mining more than in any other trade or calling.

It requires no argument to demonstrate the fact that the industry of coal mining is peculiarly environed. It is subject to limitations so proscribed as to demand the exercise of the strictest economy in operation. A living wage for the miner, a reasonable profit for the operator, and a price to the consumer that will place this great necessity of life within the reach of all.

The problems of coal mining would be less difficult of solution if coal could be classed as a luxury. The demand for wage increase could then be met, if necessity required, by a corresponding increase in the cost to the consumer. The luxuries of life will always bring whatever price their production and a fair business profit demand. Only those whose means will allow them to pay the price

can have the luxury; others must do without.

But we are face to face with the fact that coal is not a *luxury,* to be had if one possesses ample means; it is a necessity of life that *all*, rich and poor alike, require and must have. It is this fact that fixes the upper limit in the coal mining problem. It is a hard, cold fact, as cold as the cheerless fireside without fuel in December.

The high cost of living may create a demand for wage increase. What is the coal operator to do in that event? The margin between the *living wage* and the *living price* is so narrow that the risk does not warrant investment. If there is not soon found some way out, capital will seek other more lucrative fields.

This is only one of the many problems confronting the coal operator. There are others as serious and as threatening, which we have not space to treat as they should be treated, now. What is the remedy? This is the question that operators in all coal fields are asking today.

There is but one answer as far as the mining of coal is concerned. There must be greater efficiency. This does not mean more work or longer hours, for the same pay. That would not spell *efficiency*. It means less waste of time and material in and about the mine; more system in the planning and execution of work; more devotion to the work of mining and less sympathy for the idlers whose only thought and desire is apparently to give less and demand more. No honest worker can uphold such a creed; but all must recognize that the only sound doctrine is *"a day's work for a day's pay."* Let this be written on the heart of every mining man, whether he be mine official or miner; and let each strive to prove himself more efficient in the work he has to do.

Methane in Coal Dust Explosions

Under the above caption in the present number of COAL AGE, Mr. Wilbur summarizes the results of his inquiries and researches into the origin of mine explosions. The publishing of this paper should not be construed as an endorsement of all Mr. Wilbur's conclusions. For any such detailed approval, he must look to others, to the hundreds who in face of all proof to the contrary still contend that coal dust will not explode unless ignited by methane. Such statements are never backed by any careful reasoning. The usual method is to face the issue by a personal asseveration, by the *ipse dixit* or "take it from me" of the asseverator. Signs of such a standpoint are found in Mr. Wilbur's argument, but in his paper he makes a plea for the reasonableness of his view, so that we feel he would not compel us to accept it on the mere force of his authority.

But for what imaginable purpose have the experiments at Pittsburgh, Bruceton, Altofts, Liévin, Frameries, Gelsenkirchen and Babitz been conducted at so much unnecessary trouble and expense if we, following Mr. Wilbur, are complacently to avoid quoting the results there obtained and are to draw on the unexperimental dicta and baseless imaginings of a decade or two ago?

He quotes the well-known Chamberlin monograph, as far as quotation will serve his purpose, carefully showing how much free methane can be liberated by crushing and carefully abstaining from showing how slowly, we had almost said laboriously the coal liberates methane thereafter. Even so far as Mr. Chamberlin is quoted, with all the handicaps of an *ex-parte* quotation, we cannot see that the Bureau of Mines and its explosions' expert, Mr. Rice, are hoisted on their own petard. If Mr. Wilbur had quoted the further remarks of Mr. Chamberlin, he would have arrived at the conclusion that coal after crushing ceased to deliver gas with the rapidity with which it is liberated when crushed.

There is no reason to suppose that every particle of coal dust is surrounded by a methanized gaseous pellicle, or that the mine in general is made explosive by the emission of methane from the floating or the resting dust. In the first six weeks coal crushed in air and immediately placed in a vacuum only developed 0.0538 per cent. of its whole volume of methane per hour. In the following ten weeks the percentage fell to 0.0101 per cent. and in the ten weeks succeeding, it still further fell to 0.0035 per cent. As the air in the mine is changed about every half hour, these figures might well be divided by two.

Even if the mine were packed full of dust, the hourly percentage of gas it would generate would nevertheless be inappreciable. We must remember that Chamberlin was dealing with a coal of high methane content for the dust just described came from Monongah. Dust from non-gaseous mines, as we term them, would have lower values of methane emission, especially when newly pulverized.

But this method of arguing may be fortified by still another. The Bureau of Mines, in its Pittsburgh gallery, has obtained ignition and propagation when using only two pounds of dust and no gas. This gave a dust density of 25.3 grams per cu.m. According to Mr. Chamberlin's figures, the coal, before crushing, would have held 2.67 cu.cm. of free gas, of which 39.65 per cent. by weight would have been methane. Careful estimation shows that had the coal been broken into bottles in vacuo and these bottles sealed and conveyed to the confined gallery, they would have added to the air in that gallery on release only 0.0000808 per cent. of methane. Judge therefore how little methane must have entered the gallery when two pounds of dust comminuted in air, were blown into it to circulate at a pressure not less than atmospheric.

In conclusion it may be added that modern research has proved that the explosion of methane in an atmosphere insufficient for complete combustion results in the generation of carbon monoxide, thus contradicting the results of Dr. Brookman of Bochum whom Mr. Wilbur quotes in his article ,with apparent approval.

The question has been raised whether pure coal dust on a safety lamp can be exploded from the lamp. Few persons have met with this experience in practice, and it is probable that the question has been given thought by only a small number of coal men; however, under certain conditions, it is possible to get such an explosion experimentally. A mining man in South Wales relates an instance of a safety lamp that had been continuously in use underground for some hours and on the gauze of which coal dust had collected; he experienced a slight explosion in the lamp, followed by a second and much more violent explosion immediately afterward. The second explosion was believed to be due to the shock of the first explosion precipitating more coal dust into the flame.

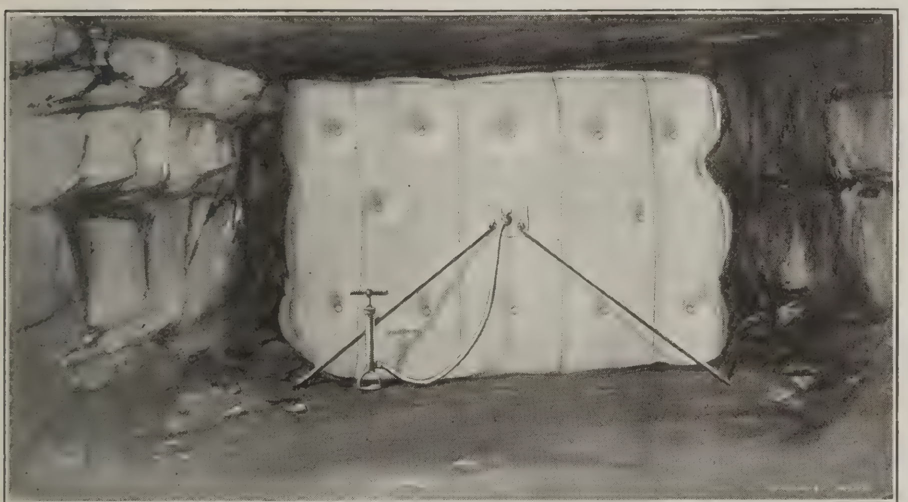
Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Sealing off a Mine Fire

(Continued from Feb. 10)

Letter No. 24—I think that when a fire occurs at the end of an entry, the first thing to do is to diminish the circulation of the air past the fire. Under ordinary conditions, it would seem easier to build a wall on the intake side first; then, by reversing the circulation, the smoke could be forced back so that the fire would be confined to the smallest possible area. This would reduce the supply of air, walled in with the fire, to a minimum. To accomplish this, it is best to set the first stopping of brattice cloth or lumber far enough ahead of the last open crosscut to permit of the building of a permanent wall between the crosscut and the temporary brattice.



An Air Mattress for Confining Fires

In some gassy mines, square air mattresses, blown up by a hand air pump, as in the illustration, are utilized to make the first stopping. With these provided, in about four minutes the circulation can be stopped and the sealed-off territory reduced to a much smaller limit than could be done if the men had to build more elaborate stoppings in the smoke.

I inclose a rough sketch of such a pneumatic curtain. It can be folded up and quickly carried to the place affected. The mattress is 14 in. thick, and in its other dimensions is the size of the heading it is intended to fill. A central plate, with a pipe affixed thereto, permits the attachment of a rubber hose, through which the air can be pumped into the mattress for purposes of inflation. The bag stopping is supported temporarily by four legs, two of which are hinged to the central plate just mentioned, and two to a corresponding plate at the rear. The front and back walls of the mattresses are prevented from bulging outward under the air pressure by the use of ribbon stays. When the bag is properly inflated, it fits and adheres to all the various irregularities of the outline of the heading, and is prevented from forming itself into the shape of a balloon by the restraining force of the stays, just mentioned.

Carl Scholz,
Vice-Pres. and Gen'l. Mgr., Consolidated Indiana Coal Co.
Chicago, Ill.

Letter No. 25—There are mine fires and mine fires; there are men of experience, men of practice, men of theory; there are numberless and varied degrees and conditions in mines. The successful mining man today is a student of these conditions.

From the very nature of the case mine fires are dangerous; and the fire that has assumed proportions beyond control requires not only knowledge and experience, but, more than all, nerve, tact, a clear head, an instant grasp of all the conditions, and the ability to act promptly and with fortitude.

That such prompt, decisive, intelligent action at the Cherry mine, in the first stages of that terrible disaster, would have saved a large proportion, if not all, of the 256 lives then sacrificed, no practical mining man will deny.

In the present discussion it is proper to ask or assume, what are the conditions of environment. No one will deny the practical impossibility of approaching sufficiently close to a raging fire, on the return side, to enable a stopping to be built in the return airway for the purpose of cutting off the circulation of air and confining the fire. The same is true where the return airway is completely filled with dense volumes of smoke and gases; unless, of course, the work can be done by the use of breathing apparatus.

On the other hand, no intelligent mining man will attempt to deny that whenever it is possible to get in and erect the first stopping on the return airway, and later close the intake, this is the thing to do. "Why?" Because the stopping erected in *any* portion of an airway will block the circulation of air. The stopping built on the return is just as effective in cutting off the flow of air past the fire as a stopping built on the intake.

The erection of the first stopping on the return, however, possesses the additional advantage that it confines the products of the combustion to the area of the fire. Not only do the expanding gases force back the air and, to a large extent, prevent it from reaching the fire; but the carbon dioxide (CO_2) produced by the combustion, renders the gases generated nonexplosive.

Again, suppose the first stopping is erected on the intake airway, under conditions that would have permitted its erection on the return. It is true the fresh air is cut off from the fire; but a very explosive mixture begins at once to form behind the stopping, in the region of the fire. It may happen that the sudden extinction of the flame of the fire, by the cutting off of the direct access of the air, will create a depression within the fire zone that will cause some air to enter the return openings before these can be closed. Now, while building the return stoppings under these conditions, the explosion of gas, or dust, in the case of a roof-fall within the area, is most liable to occur. This is what has often happened when the intake stoppings have been erected first and the return stoppings last.

It is almost idle to attempt to lay down rules or form a plan of procedure without having before us a plan showing the location of the fire, the course of the air current and the position of all crosscuts, stoppings and doors affecting the

circulation. But in general it may be stated the air current should be short-circuited and, as far as possible, diverted from the fire by the erection of temporary canvas brattices. By the partial removal of one or two stoppings and the erection of a line of brattice, it may be possible in many cases to conduct sufficient air past the fire to the place where the return stopping must be built. In some cases a canvas sheet can be arranged in the return, ahead of the stopping to be erected, so as to throw the smoke and gases over the men engaged in the work. When the stopping is built nearly to the roof, this canvas must be removed and the work finished. The men in the meantime receive a sufficient supply of fresh air from a crosscut close to the stopping being built. The erection of the intake stoppings is then easily accomplished. In all cases it is necessary for the mine foreman in charge to exercise the utmost ingenuity, judgment and skill.

J. T. Beard.

New York, Feb. 6, 1912.

Letter No. 26—I have read with interest the opinions on fighting mine fires, and I believe that since there is no established standard of occurrence for these fires that there cannot, accordingly, be any standard method for fighting them. The method of attack is determined entirely by local conditions, but must be decided upon quickly, since what otherwise may be a disastrous fire might be easily controlled if caught in the incipient stage.

I believe I have had an unusually bitter experience on an exceptionally discouraging piece of work of this character. This fire occurred in April, 1900, in the thin-vein district not far from Pittsburg; it originated in an electric pump house which consisted of a wood-stopping on each side of the pump, between the intake and return airways, somewhat over a mile from the mine entrance.

One man was known to be behind the fire, and desperate chances were taken to effect his rescue. We tried to conduct a narrow airway along the rib so we could get near enough to force water on the fire. The roof had fallen for about 6 ft. above the coal along this section; so to get a support for our brattice we leaned rails, about 7 ft. long against the sides diagonally and pulled canvas over them. Only a few feet at a time could be gained, the smoke having backed up some 300 ft. against an air current of about 20,000 cu.ft. per minute, and the work was particularly trying, for in addition to the heavy smoke, the roof was continually falling. When we had reached a point about 100 ft. from the fire, a heavy fall occurred behind us, breaking down the brattice and cutting off our air, with the result that we were only able to escape with our lives.

A second attempt was made by nailing boards in the shape of an inverted L, to which the brattice cloth was attached and carried in. By this means we were successful in getting to within 25 ft. of the fire, when our brattice took fire and was consumed before we could get water on it.

It was now evident that all hopes of saving the miner had to be abandoned, and we turned our attention to smothering the fire. We entered through a door into the return airway, but were greeted by such a blast of heat, smoke, sparks and falling roof that we were compelled to retreat immediately. Crossing back to the intake airway, the door had scarcely been closed when an explosion occurred, the flame sweeping out over us as we dropped to the bottom. Fortunately, the flame was only of short duration, but it left the most surprised, frightened, disgusted and discouraged set of mine officials struggling in the mud, water and inky darkness that could be imagined. This explosion was caused, I think, by the accumulation of carbon monoxide near the fire after the door was opened.

We now closed off the intake temporarily with boards, opened our way into the return again by using canvas, and finally closed off both with brick stoppings. I think about 12 dams were then built, holes drilled from the surface, and the section flooded, which took several weeks.

I wish to add that the men working at this fire were all experienced and well posted mining men. One was a company inspector, another a mine foreman who a few years later was appointed state mine inspector, and we all should have known better than to have cut off the ventilation over the fire and then restore it again, as we did. It is a striking example of the difference between planning under assumed conditions, and actually working under any old conditions on a moment's notice, especially when human life is at stake.

J. T. Colburn.

Uniontown, Penn.

Letter No. 27—I was much interested and pleased to see your issue of Feb. 3. The discussion on mine fires will certainly tend to clear up this much-talked-of question.

As far as I am able to judge, *Letter No.* 2, by Edw. H. Coxe, gives the solution to the question and the reason why in a nutshell. My own conclusions are: Place your men where they will not inhale the fumes. There is absolutely no more danger in sealing off a fire from the intake side than in any other work of that nature, as, for instance, in timbering-off and stopping-off a squeeze.

No official has any moral, pecuniary, or physical right to place his men in more than necessary danger to produce the desired results of safety to life and protection to property. For half a century, I have been working in and about the mines—two-thirds of the time underground—and have worked at many fires. I always have, and in the future will continue to place my men first on the intake side. You can probably hurry matters by having the men build both stoppings simultaneously, but the workers on the return will suffer more or less from the effects of the fire, and the result will be bulging eyeballs, headache and nausea.

I was much interested in letter No. 5, which advocates fighting the fire from the intake side, but when it comes to sealing off the trouble, this gentleman recommends building the first stopping on the return. In this connection, let me say, the conditions are similar. Suppose a large amount of CH_4 is being generated in both headings. This gas drifting from the intake to the return over the fire will surely ignite and light the gas in the return. And furthermore, my experience has been it will keep burning until suffocated, or extinguished; or until the pressure of the blower is reduced to an intermittent one.

Two Fires in One Heading

I have had two fires in one heading, each one larger than a gas-grate, burn for 13 days and nights, until we forced up a crosscut on the other side. This gave us no fear, because the products of combustion were carried direct to the return and there was nothing to explode.

It is quite different with the argument put forth in letter No. 5. I can easily understand how the gas from the return could diffuse through the products of combustion, harmless enough until they reached the still smoldering fire; then there would be a flash, slight perhaps, but sufficient to knock down your men.

In sealing off a fire, we have three most important things to accomplish: 1. Suffocate the flaming gas by its product CO_2. 2. Smother the coal fire by the inert pure CH_4, and free N and the CO_2 products. 3. Make your stopping stronger than the pressure of the blower and the expansion of the heated gases.

I also notice that the "intake" advocates give reasons, while those who advise closing the return first are supported only by theory. Let me ask all coal men to read, mark and learn, and perhaps we may be able to save a life or two, even tomorrow. I am sure the valuable discussion that has occurred will cause hundreds of us to consider the methods outlined and be wholly prepared in case of emergency.

Joseph Virgin,
Supt. of Mines.

Plymouth, W. Va.

Mr. Norris Answers Mr. Garcia

Mr. Garcia has evidently misunderstood my letter, in regard to closing off a mine fire, in making his criticism.

In suggesting a procedure in the case of the evolution of large volumes of gas at the seat of the fire, I had in mind conditions not uncommon in the anthracite region when the full air current may be needed up to the moment of closing, to dilute the firedamp, and not merely the possible products of combustion.

I have too much respect for the character of your readers to assume that any one of them would be senseless enough to reverse an air current with the returns in irrespirable condition; the original assumption of a fire beyond control presupposes ample time in fighting it to obtain a knowledge of the state of the workings. Under proper conditions the air current *can and should be reversed.*

After all, the way to fight a fire is to get at it promptly and let the method of procedure be governed by the conditions.

R. V. Norris,
Consulting Engineer.

Wilkes-Barre, Penn.

[*We expect to close the discussion on mine fires next week, when W. D. Owens, superintendent for the Lehigh Valley Coal Co.; J. C. McDermott, chief mine inspector for Montana, and others will express their opinions.*—Editor.]

The Davy Lamp in Testing

I notice in Coal Age, Dec. 16, 1911, p. 322, in answer to the question, "What is meant by the flame test?" you state the Davy lamp is a favorite lamp for testing for gas. In my travels I have found many who say the Davy lamp is unsafe, owing to its liability to flame, and in some localities it is prohibited by law. Why is the Davy lamp so often preferred, when the Wolf lamp will show ¼% of gas, and is called safe in all countries.

J. H. Needhammer, Supt.

Sullivan, Ind.

The Davy lamp, owing to its simplicity of construction and sensitiveness to gas, has always been a favorite lamp among firebosses and still holds its prestige. It is not a safe lamp to place in the hands of an ordinary miner, and is not adapted to general work at the face. The use of the unbonneted Davy is prohibited by the old mining law of Great Britain. The new law, which will probably go into effect not later than Jan. 1, 1913, does not mention the Davy or any other lamp specifically, but requires that no lamps shall be used in any mine other than those provided by the owner of the mine and approved by the Secretary of State.

In the United States, as far as our knowledge goes, the only prohibition by law of the Davy lamp or any other lamp, occurred in the old bituminous-mine law of Pennsylvania, which forbade the use of the Davy and the unbonneted Clanny lamps for general work in bituminous mines, but permitted their use by mine officials, examining the mine for gas.

Because of the free circulation of air in the lamp, the inside atmosphere of the Davy most closely approaches the same gaseous condition as that of the air surrounding the lamp. The flame cap, however, as is well known, is not visible in this lamp until the gas reaches 2 per cent., and many firebosses fail to detect a cap in less than 3 per cent. of gas. For this reason an indicator should be used in the Davy, capable of showing small percentages of gas.

The Wolf lamp burns naphtha, a highly volatile oil that reveals a flame cap at about ½ per cent. of gas. The indication of ¼ per cent. of gas, as stated by our correspondent, is extremely uncertain and not apparent to most observers. The lamp is not a good testing lamp for several reasons; namely, the lamp is bonneted, which fact, together with the vaporous oil burned, modifies, at times, the atmosphere in the combustion chamber, so that it does not truly represent the gaseous condition of the outside air. The lamp heats readily in gas, the oil volatilizes more quickly and the lamp gives higher indications than it should, after being exposed to gas a short time. The lamp flame is easily extinguished, and when relighted, after a short period of extinction, the lamp may flash (pass flame).

Opinions vary in regard to the use of naphtha or other highly volatile oil in mine lamps. The slightly improved illumination scarcely compensates for the increased danger arising from the explosive nature of the oil burned. The same difference of opinion exists in regard to the use of the various carbide or acetylene lamps. At the present time, electric lamps are receiving much attention. The chief objection to electric lamps, however, is their inability to reveal the gaseous condition of the mine air.

Mine Telephones as Life Savers

Relative to the explosion at our mine No. 7 at Radley, Kan., on Jan. 3, in which it was reported that the two shotfirers, J. W. Keeran and W. M. Martin, were saved from death by means of the mine telephone, I wish to state, in my opinion, this is correct. We have a mine telephone law in this state which went into effect last fall, and all of our mines are equipped with telephones.

In regard to this particular accident would say that the mine telephone undoubtedly resulted in our being able ot save the lives of these two shotfirers. In all of our mines we have a system of requiring the shotfirers to report by means of the mine telephone to the night engineer, the progress of their work as they go through the mine lighting the shots; by this means we know at all times just about where the shotfirers are The night engineer also becomes thoroughly acquainted with just the manner in which the shotfirers fire the mine, and knows just when, within a few minutes, a certain shotfirer should report from a certain station. In the event that he fails to report the engineer suspicions something wrong, and when this runs over ten or fifteen minutes past the usual time he summons help.

At the time of the explosion in our mine No. 7 we had, in addition to the regular mine telephone, installed a telephone in a refuge hole for the shotfirers. This refuge hole was provided with a door, the idea being for the shotfirers to light a certain entry and get in this refuge hole while the shots were going. The particular entry for which this refuge hole was installed had been giving us considerable trouble in the way of windy shots, and we, therefore, took this additional precaution.

When the explosion came one of the shotfirers was in the act of ringing the engineer to tell him that they had lighted the shots in this entry. The force of the explosion was so strong that it blew in the back end of the refuge hole, and the shotfirer did not even get to talk, but was immediately overcome by the afterdamp. His partner, who was with him, was likewise overcome. The night engineer, knowing that this was the station from which they should next report, immediately tried to call them, but was unable to get any response and started the distress whistle. In fifteen minutes after the explosion had occurred a rescue party was in this refuge hole and had the two shotfirers out working upon them and succeeded in resuscitating them. A little later it would undoubtedly have been impossible to revive them.

I might say that our mine telephones are so installed that they are practically explosion proof, the wires being laid in pipe along the entry. We have had three quite severe explosions in this particular mine this winter and none of the telephones was damaged in the least.

C. W. Waterman,
Pittsburg, Kan. Mine Supt.

Question on Shot Firing

Discuss briefly the question of the advantages arising from, and the risks incident to, the very common practice of firing two or more shots at the same time, in an entry or room.

Seanor, Penn. J. N.

[At the earnest request of a correspondent we submit the above question for discussion, and hope the readers of Coal Age will respond freely and give the results of their experience or state their own views.—Editor.]

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Cross-Bar Timbering in Mines

We have had some considerable trouble in our main-haulage-road timbering. The cross-bars, which are a good quality of straight-grained, white oak, seem to have a tendency to split at the notch, as I have shown in the rough sketch (Fig. 1) I am sending you. Can you or any of the readers of COAL AGE tell me the trouble and suggest a remedy? We have a rather weak, shale roof and a soft fireclay bottom. The coal (bituminous) is 5 ft. 4 in. high and overlaid with a 10-in. drawslate that falls a few yards behind the face and before the timber frames are set up.

The air cuts the roof at each rib badly, and then the trouble with splitting of cross-bars begins. Please explain why the roof cuts at the ribs where the velocity of the air is less than at the center.

Pittsburg, Kan. ANXIOUS FOREMAN.

From the excellent sketch (Fig. 1) you have sent us, there appear to be at least two main reasons for the splitting of the cross-bars at the notches. (1) The cross-bar appears to be tightly wedged its entire length. (2) The legs are not properly jointed to the cross-bar. These causes are probably greatly augmented in their effect by the cutting of the roof at each rib.

When roof "cuts" it is almost invariably along the ribs of openings. It occurs more generally in entries and passages where a good current of air is traveling and less frequently in rooms. The trouble is commonly attributed to the air current, which is said to "cut the roof"; but this does not express the reason for the cutting.

Cutting occurs chiefly in mining coal under a roof that disintegrates readily under pressure; or in other words, crumbles under excessive roof pressure. This crumbling is greatly augmented by the action of the air current on the moisture escaping from the stone, slate, or shale. The action is greatest along each rib, because that is where the crunching of the roof is greatest. The crumbling of the strata at the rib, however slight, facilitates the escape of moisture, which in turn assists the disintegration. The cutting is thus largely due to excessive roof pressure, for the particular roof in question. Its remedy must be sought in: (1) enlarging the entry pillars and stumps; (2) reducing the length of rooms and carrying a smaller area standing on props; in other words, shorten the time rooms must be kept open, draw back pillars and let roof fall as quickly as possible in the rooms; (3) a proper system of timbering.

The cutting of the roof at the rib lines throws an extra burden on the cross-bar, and the manner of wedging the timber its entire length, as shown in Fig. 1,

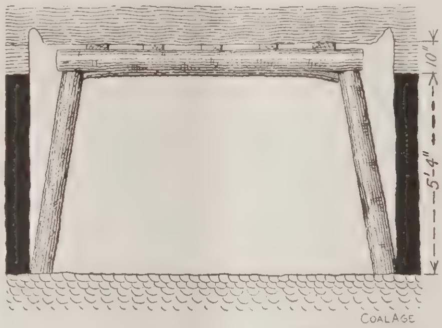


FIG. 1. WRONG METHOD OF WEDGING AND NOTCHING A CROSS-BAR, CAUSING BAR TO SPLIT

makes the bar take the whole weight over the span and naturally bends the bar and starts the splitting at the notches.

WEDGING A TIMBER FRAME

Observe in Fig. 2 there are no wedges driven over the central portion of the span; but two good flat wedges are

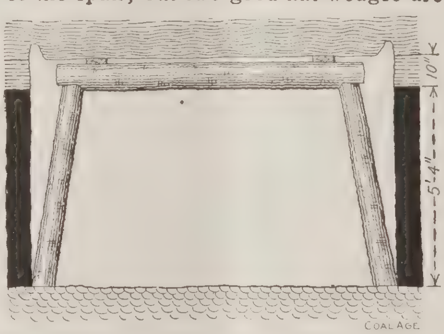


FIG. 2. PROPER METHOD OF WEDGING AND NOTCHING A CROSS-BAR

driven, one on each side, just in from over the top of the leg. The effect of this is to arch the weight over the span, throwing it on the legs at each side, and leaving the cross-bar free to resist the thrust of the legs inward with its entire strength.

NOTCHING A CROSS-BAR

When setting up a timber frame first take down any loose rock or slate that should not remain; clear away rubbish and cut a solid foothold on the floor against each rib where the timbers must stand. Now, measure the spread of the legs at the floor, inside of timbers, and the vertical height from the floor to the under side of the collar, allowing for the thickness of the collar and wedges. From the inside spread of the legs at the floor subtract from 3 to 4 inches, for each foot of height; and the remainder will be the distance between notches. The collar or cross-bar must be sufficiently longer to allow a full bearing for the head of each leg.

It is important to cut the notches on an angle of 45 deg. and make a smooth flat bearing for the head of each leg. The top of each leg must then be sawed to fit this bearing as shown in Fig. 2. By this arrangement each leg will lean toward the center of the entry from 1½ to 2 inches for each foot of headroom under the collar.

Gases Distilled from Coal Dust

Assuming a coal dust having the following proximate analysis:

Moisture	1%
Volatile matter	28%
Fixed carbon	63%
Ash	8%
	100%

and supposing the temperature of the dust to be gradually raised without bringing it into contact with flame; in what order will the various gases be distilled and at what approximate temperatures?

Lethbridge, Canada. ENGINEER.

Coal exposed to a free atmosphere gives up much of its moisture. It also loses some of its occluded gases if such are present. This emission of moisture and gas takes place at all temperatures until saturation of the surrounding atmosphere occurs. As the temperature is raised the emission becomes more rapid.

It cannot be definitely stated at what temperature oxidation begins, since coal absorbs oxygen from the air and it is possible the absorbed oxygen enters into combination with some of the elements of the coal. But, sensible combustion of carbon with production of carbon dioxide, or carbon monoxide, or both, according to conditions, occurs at about 300° to 350° F. The temperature at which spontaneous ignition of fine coal dust will take place must, evidently, depend on the nature of the coal and the fineness of the dust. This temperature is given as 284° F. (Bedson); 356° F. (Fayal), Mine gases and Exlosions, page 155.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions for Beginners

BELT-DRIVEN VS. DIRECT-CONNECTED FAN

Ques.—What are the advantages and disadvantages of a belt-driven fan?

Ans.—The belt makes it possible to attain any desired speed of fan for the same speed of engine by changing the pulley on the fan shaft or on the engine. It is also plain that the belt-driven fan runs more smoothly and is not as hard on the engine as a direct-connected fan. When the fan is belt driven, it is possible to employ a smaller size of engine run at a higher speed for any given power and speed of fan. The chief advantages of a direct-connected fan are: The fan is under better control; and there is no loss of power by the slipping of the belt.

SIZE OF DRILL—SOLID SHOOTING

Ques.—What size of drill (diameter) would you recommend to be used when shooting off the solid?

Ans.—In shooting off the solid, it is particularly desirable to avoid the use of too large a drill. The diameter of the bit should not exceed 2 or 2½ in., depending on the hardness of the coal. It must be remembered that the diameter of the hole is always greater than the diameter of the cutting bit. A drill hole of too large a diameter causes too great a localization of the charge and produces what is known in mining as a tight shot, which may blow the tamping instead of breaking down the coal.

MINE-HAULAGE SYSTEMS

Ques.—What system of haulage would you consider best adapted for mines, under the following respective conditions: (a) When the haulage roads have an uneven grade? (b) When there is a grade of 5% against the loads? (c) When the haulage roads are fairly level?

Ans.—(a) When the grade of the haulway is uneven or variable, the tail-rope system is generally preferred as being more readily controlled.

(b) For a grade of 5% against the loads, a combined gravity and engine-plane system should be employed, in which the weight of the descending empty cars would partly balance the weight of the ascending loads; and to that extent relieve the load on the engine.

(c) When the haulage road is practically level, the endless-rope system gives the best results.

MINE GASES

Ques.—In dealing with carbureted hydrogen, is any other danger to be guarded against besides that of explosion?

Ans.—The possible ignition of the firedamp that is formed when this gas is mixed with air in certain proportions is the chief danger to be feared in dealing with marsh gas, CH_4 (carbureted hydrogen). Pure marsh gas undiluted with air would, of course, suffocate, as it contains no available oxygen; but this danger is not possible in any ventilated workings. The gas diluted with air produces no ill effect when breathed, except it may be a slight dizziness if much gas is present.

COMPOSITION OF ATMOSPHERE

Ques.—Of what is atmospheric air composed?

Ans.—The composition of pure air, by volume, is: nitrogen, 79.1%; oxygen, 20.9%; and small amounts of carbon dioxide, moisture and other rare elements, which it is not important to mention.

EFFECT OF TEMPERATURE IN MINE

Ques.—If the temperature of a mine passing a large volume of air is 50° F., while that of the outside atmosphere is 80° F.; (a) what effect will this difference of temperature have on the circulation of the mine? (b) In what other way will it affect the condition of the mine or airways?

Ans.—(a) In a slope or shaft mine, or in a drift mine ventilated through a single shaft sunk back on the hill, this difference between the inside and outside temperatures will create an air column that will either assist or oppose the circulation. In the one case, the installed or artificial circulation will be supplemented by a certain natural current, increasing the circulation in the mine; in the other case, the natural agency will oppose the artificial means and the mine circulation will be reduced thereby.

Wherever practicable, the artificial circulation should be arranged to conform to the natural circulation during the winter season, when the inside temperature is above that of the outside air, as the mine activities are greater then, and the mine has greater need of an ample supply of air.

(b) The air entering the mine at 80° F. may carry sufficient moisture to exceed its capacity when cooled to 50° F. In that case, there will be, at times, a considerable amount of moisture deposited on the walls, roof and timbers in the airways; and, at other times, when the outside air is drier and carries less moisture, the air current in passing through the mine will take up moisture. This alternate wetting and drying of the mine timbers rots the wood and shortens the life of the mine timber. The same wetting and drying is hard on some mine roofs, causing the roof to crumble and crack.

EFFECT OF PRESSURE ON FIREDAMP

Ques.—Is firedamp compressible; and how is it affected by a decrease of atmospheric pressure?

Ans.—Firedamp being a gaseous mixture is compressible, as are all gases and air. Gases are compressed by any increase of pressure, and expand when the pressure is decreased, the compression or expansion being in the inverse ratio of the absolute pressure. For example, 29,000 cu.ft. of firedamp in an abandoned room in a mine, is expanded to 30,000 cu.ft. when the barometer drops from 30 in. to 29 in. These ratios are expressed as follows:

$$\frac{2d\ volume}{1st\ volume} = \frac{1st\ pressure}{2d\ pressure}$$

$$\frac{30{,}000\ cu.ft.}{29{,}000\ cu.ft.} = \frac{30\ in.}{29\ in.}$$

In this case, the difference 30,000 — 29,000 = 1000 cu.ft. of firedamp would be forced out of the room into the entry. If this fall of barometer took place in, say 10 hours, every 29,000 cu.ft. of space in abandoned rooms in the mine would furnish 100 cu.ft. of air or gas per hour during the fall. In gaseous mines this often causes serious trouble by rendering the mine air highly explosive when least expected by men underground.

STOPPING OFF AIRWAY, EFFECT ON FAN

Ques.—If an air-tight stopping be erected in the main-return airway 100 ft. from the fan, what effect will be produced on the fan?

Ans.—The erection of the stopping in the main return will stop the circulation of air, and no air will pass through the mine or the fan. Now, assuming the power applied to the fan shaft remains unchanged, the fan will run faster after the stopping is built than before; because, there being no air passing, no work is lost or absorbed in the fan and all the power is now available for turning the fan. Hence, for the same power, the speed of the fan is increased by stopping off the air course.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

The Other Half

By Charles L. Fay*

In these days of social unrest, there are many organizations and committees, which have come into existence aiming to be mediums though which the prime-moving spirits may have an opportunity to express in deeds their overwhelming conviction of the need that something should be done to contribute toward a clearer understanding of present social conditions, and to aid in the betterment of society.

Usually a fitting background is arranged by securing the coöperation of men and women of superior character and of a national repute in such matters as pertain to civic progress, philanthropy and humanitarianism. Too often, perhaps, both the men and women, whose wealth or position, integrity or state or national standing make them leaders, lend their names and nominal interest to an enterprise while the policy and the labor of development are left to the discretion of the zealous promoters. This occurs, possibly, because the *objective* of the plan is noble and the *principle,* in general, well established. It is easy to enlist approval from those who are already too active in other lines to contribute any personal assistance or direction in the promotion of the enterprise, but it is not easy to secure their effective support.

Having proceeded thus far, under the influence of an earnest and honest enthusiasm, and under the spell of genuine oratory and devotion, the development of the organization is delegated to *specialists* who, of necessity, have created the movement, or are related to it in a professional way.

Surveying a La Mode

Thus we have committees, foundations and societies with general offices, branch offices, national and state divisions, equipped with publishing houses, official organs, publicity bureaus and corps of statisticians, writers and investigators. Conventions and conferences are numerous. Surely in this day "one-half the world is seeking to find how the other half lives."

Of the making of "reports" there is no end. Many thousands of dollars annually lubricate the wheels of that machinery which ceaselessly grinds out data wherewith to fill reports that other data may be secured, from which other reports may be made and further investigation aided. Additional conferences are held, happily around the banquet board, to call yet more conventions that other lengthy reports may be fruitful in yet more brilliant oratory, influencing still further investigation whereby remedy may be discovered for social ills, and *the other fellow* made unselfish.

The Surveyed

Surely one-half of the world is striving to show the *other half* how to live and pursue happiness. The *other half* ought, at least, to be very grateful for the self-sacrifice and unselfish devotion of the mighty host which labors so diligently over mahogany desk, on pullman car and around the banquet board for so great a purpose!

Who compose the *"other half"*? The captains of industry, the employers and the industrial workers, the courts, the law makers and the guardians of the peace, the churches and the public schools. Of course, the courts, the law makers, the guardians of the peace, the churches and the public schools are only in a degree part of that *"other half."* That is, they belong to it only in their relations with the "hewers of wood and the drawers of water"—the industrial workers.

What an impressive spectacle it would make if the mighty army of social betterment specialists with their equipment could form in one general convocation at a point where the *"other half,"* from ocean to ocean, could see the men and women—in their world but not of their world—studying, working and investigating unselfishly for their benefit. Surely there should soon be no "other half"—selfishness would be swallowed up in unselfishness and segregation would be displaced by coöperation.

Let us look more directly to the operators or specialists of this product of social unrest and to the methods they employ, in order to discern if we may, some obstacles to the progress of truth and civilization.

Many Remedies

All realize that the social unrest is the evidence of wrong social conditions, but like the experts of various schools of medicine, each "school" for social betterment seems to diagnose the case differently and then prescribes its own remedies, while the "other half" cries out "Oh, wretched man that I am!" and Job, as he listened to the advice of his three officious, self-satisfied friends, is better understood.

One specialist says to the "other half," you must combine and *fight* for your rights. Another says, you must develop "class consciousness"; another teaches "class hatred"; another directs the "other half" to recreation, amusement and contentment with its lot and place in society, and still others teach paternalism and the high ideals of coöperation. There is anarchy, political socialism, trade unionism and coöperation battling against corporate and individual (assumed or established) prerogatives and the spirit of selfishness and segregation.

All the while "investigation" is followed by "investigation" while agitation is epidemic. The "other half" will soon be resigned to the operating table. All this is but an illustration of the difficulties under which truth has to progress, through the débris of human *miscomprehension.*

I would not minimize the wrong conditions that exist nor undervalue the great aid that various social-welfare organizations, committees and foundations are to the progress of society. Society is debtor to the self-sacrificing and intelligent efforts of many welfare specialists; but it *will not* be amiss to call attention to some types of superficial investigation that contribute to the development of wrong and biased public opinion which, consequently, is based upon wrong conclusions and not upon facts.

The specialists specialize *apart* by "schools" and humanity pays the price of its own *temperamental divisions.* Let us consider, then, the individual investigation—the *dynamic* of every organization, society and committee.

Steiner's Inductive Method

Would that we had more Dr. Steiners—men who contrive to *live in* the *stratum* of the society they would investigate and then labor to aid in its uplift! Dr. Edward A. Steiner studied the immigrant races in North America as *an immigrant—lived the life—was the life* of the society he came to benefit—when he *investigates* he does it with a comprehension of the lives of the men he would *uplift* and a consciousness of the values of the social status to which he would lift them.

(To be continued)

*Mining Secretary, Penn. State Y. M. C. A., Wilkes-Barre, Penn.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Senate committee on inter-oceanic canals has just published the proceedings of its investigation into the use and distribution of coal on the Isthmus of Panama, made during the recent visit of the committee to the Canal Zone. It appears that considerable attention was devoted to the coal question and particularly to the position of the Panama Railroad Co. with regard to it. No one is allowed to sell coal in the Canal Zone except the railroad, although there is no regulation or law that prohibits anyone from so doing. While there are a few small dealers in charcoal, there is no other dealer in bituminous coal either small or large.

The price of coal is fixed by the president of the railroad who determines the rate at which it shall be sold commercially to ships. A profit of about 33⅓ per cent. is made when the coal is sold to private individuals. The Pacific Mail Steamship Co. and the Bates & Chesebrough line are furnished coal at the same price at which the Canal Commission buys it and the profit on this coal is a small one, amounting to not more than 5c. or 10c. per ton.

Recommendation by Col. Goethals

Colonel Goethals urges that the government should arrange to furnish coal to private shipping and estimates that for the use of the navy alone, a storage capacity amounting to 200,000 tons, with a maximum increase of 50 per cent. should be provided on the Atlantic side and that provisions for storing 50,000 tons of coal with a possible increase of 100 per cent., should likewise be made on the Pacific side of the canal. He thinks that the government would be able to sell coal to private vessels and regularly replenish its supply so as to keep on hand a constant residuum, representing the amount needed by the navy on the basis of the figures indicated.

Considerable attention has also been given to the question of supplyng petroleum for fuel use by vessels and to the best methods of storing and handling this material.

The data filed with the House Committee on Interstate Commerce relative to the rates for coal charged by the Panama R.R. Co. are considered to show that these charges are unreasonably high in so far as they apply to private commercial buyers on whose coal the Senate testimony showed that a profit of about one-third was being made. The present indications are that new legislation relating to the Panama Canal will call for a governmental system of selling coal that will be somewhat like the plan that has been outlined by Colonel Goethals.

Public Coal Land in Alabama

The Senate, on Feb. 5, passed a bill that extends the operation of the act of June 10, 1910, to cover coal lands in Alabama. The bill, as now before the House, is as follows: "That all the public lands containing coal deposits in the state of Alabama which are now being withheld from homestead entry under the provisions of the act entitled 'An act to exclude the public lands in Alabama from the operations of the laws relating to mineral lands,' approved Mar. 3, 1883, may be entered under the homestead laws of the United States subject to the provisions, terms, conditions and limitations prescribed in the act approved June 10, 1910."

Joint Rates and Rebates

The Interstate Commerce Commission has rendered a decision in the matter of divisions of joint rates for transportation of coal to points in North Carolina from points in other states, in which it finds that:

"1. The doctrine that this Commission has no concern with the divisions of rates which carriers make by agreement with each other has decided limitations, and if a railroad is a shipper, or is so linked up with a shipper that a division of a rate means a rebate or a discrimination in favor of or an advantage to a shipper, this Commission may properly look into the nature of the service which the carrier gives and the division which it receives.

"2. Where the industry-owned carrier, by virtue of a trackage agreement with a trunk-line carrier, conducts its operations in part over the trunk line's rails, that fact becomes an additional reason why this Commission may take cognizance of the divisions of joint rates to which the industry-owned carrier is a party."

Mine Rescuers Bill Passed

A House bill extending to the employees of the Bureau of Mines the right to receive compensation from the government for injuries received while on duty was passed, Feb. 5, by the Senate. The bill now goes to the President.

California

Amador—Sixty-five miners were imprisoned, Feb. 7, by a cave-in at the Bunker Hill mine, near Sutters Creek. The men were entombed at the 200-ft. level of the shaft. A rescue party was able to get into communication with them by the following morning. None of the men were injured, and their chief danger lay in the possibility of another cave-in. The Bunker Hill mine is one of the oldest and most famous mines in California. The accident was due to the collapse of timbers that were rotted with age.

Colorado

Denver—The state land board proposes to regulate the price of coal mined from state land leased to operators. The Consumers' Coal Co. has applied to the board for a lease on school lands at a point 20 miles north of Denver, and was informed that the company must agree to sell coal in Denver at a price not to exceed $4 per ton. The company was willing to agree to a proposition that it should not seek more than 50c. a ton profit by the sale of the coal, but the board wanted it understood in the agreement that a charge of not more than $4 per ton, delivered, should be made in Denver. The matter was taken under consideration by the company.

Lack of activity on the part of state officials to afford protection to the nonunion men working in the northern coal fields and the failure of the state administration to compel the sheriff of Boulder County to maintain order there have forced the operators to seek Federal protection. Recently the Rocky Mountain Fuel Co. filed an application for an injunction in the United States district court to prevent members of the United Mine Workers of America from interfering with employees of the company and the company itself at its mines in Louisville, Marshall, Lafayette, Superior and Erie. Final hearing in the case will be held Feb. 19. Arguments will then be presented as to whether a permanent injunction shall issue. Action upon a temporary injunction was practically waived by the company.

Illinois

Belleville—Freeburg, about eight miles southeast of here, has almost been depopulated recently on account of a practically complete suspension of operations in the coal mines there. The men have

gone to Belleville, French Village, O'Fallon, Collinsville and other coal-mining centers for employment. The suspension at the mines, it is said, is due to the inability of the operators to obtain railroad cars for the shipment of their output. Operators say the Illinois Central, whose freight service is said to be crippled as a result of the strike of the shopmen, has been furnishing only about one car to each of the four mines at Freeburg once a week.

Paris—It was announced recently that a seam of coal has been found on the Morton farm, near Nevins, at a depth of 610 ft. The vein is 6 ft. thick, with a sandstone roof 14 ft. in thickness. The same vein has been struck, in boring for oil, in the same township at a depth of 784 ft. Two other seams of minor importance were struck, one at 370 ft. and one at 404 ft. It is reported that representatives of the United States Steel Corporation are securing leases in the vicinity and will investigate the field.

Danville—On Feb. 9, the hoisting wheel at the Fairmount Coal Co.'s mine at Bennett Station broke and a cage dropped a short distance and stuck in the shaft. No one was injured, but there was no way left for getting the miners out because the air shaft was blocked with ice. After being imprisoned for 15 hours, the 50 miners were released by a rescue party that succeeded in chopping the ice from the air shaft.

Springfield—About 800 miners recently went on strike at Witt, near here, and 200 more, at Kortkamp, were also induced to strike. The men of Burnwell No. 2 mine, at Witt, demanded the discharge of a mule boss, against whom they had a grievance and the company refusing to accede, a strike was declared. Efforts to effect a settlement have been unavailing.

Indiana

Gary—Eight of the ten blocks of by-product coke ovens being built at the U. S. Steel company's plant, have been completed. This means that about 450 ovens are in operation. The completed plant will consist of 560 ovens, with a daily capacity of 7000 tons.

Indianapolis—Representatives of the Western Federation of Miners and of the United Mine Workers of America held a meeting in Indianapolis, Feb. 7, and effected a tentative organization of a miner's department of the American Federation of Labor. Charles H. Moyer, of Denver, Colo., president of the Western Federation, was elected head of the new department.

The announcement that a railroad will be built from Gary to Vincennes makes the outlook bright for the development of the coal fields in Knox and Gibson Counties, Indiana. Discoveries, within the last few months, of a vein of coal of excellent quality, together with the steady operation of existing mines is said to have induced the Steel Corporation to extend its railroad connections. The Indian Creek Mining Co., which recently opened one of the best equipped mines in the state, is now employing several hundred men. Two additional shafts are to be sunk in the spring. New mines are also being opened in Gibson County near Bicknell.

Kentucky

Barbourville—The Clover Fork Coal Co. has the grading done for its incline at its new mine on Clover Fork above the town of Harlan. The spur line of railroad being constructed up Clover Fork, to the property of the Clover Fork Coal Co. and the Harlan Coal Co. is completed for a distance of between one and two miles and work is going forward as rapidly as the weather will permit.

Lexington—A bill has been introduced in the Kentucky legislature that provides for a tax assessment of one cent on every ton of coal mined.

The Commercial Club of Lebanon, Ky., has filed a protest with the Interstate Commerce Commission complaining that the rates on coal over the Louisville & Nashville R.R. from Big Stone Gap and Norton, Va., and from the fields in Tennessee are unjust and discriminatory.

Louisville—Benham, another of the magic cities of the eastern Kentucky coal fields, that has sprung up as a result of the rapid local development, has now a population of about 3500. Benham is on the newly completed line of the Wasioto & Black Mountain R.R. and was started by the Wisconsin Steel Co. The Wasioto & Black Mountain is being pushed into Harlan County and the population of Harlan is expected to double in the next 12 months. Dozens of small towns are springing up in that section. Poor Fork is developing into a mountain metropolis. In time, it is said, the Wasioto & Black Mountain will be extended to the head waters of the Cumberland, where rich coal fields abound in the upper Black Mountain section.

Following the announcement from the coal mines in Kentucky that they were unable to secure cars from the Illinois Central R.R. for commercial shipments of coal, railroad officials claim that they are now furnishing the mines with cars and that coal is being received for revenue shipments.

Michigan

Corunna—The Kerby Coal Mining Co., with property consisting of $35,000 in coal leases, and owned principally by Tod Tincaid, of Detroit, has been dissolved on application of S. Q. Pulver, a stockholder. The company never engaged in mining.

Detroit—This city's threatened coal famine assumed a more serious aspect, Feb. 1, when announcement came from the Detroit City Gas Co. that the supply of coke was at the point of exhaustion. At the same time it was learned that the Solvay Process Co. is away behind in its supply of this commodity. Serious shortages of coal supply are reported from throughout the state and the situation at many points threatens to become critical in the event of continued cold weather and lack of relief in the matter of transportation.

Missouri

St. Louis—Traffic representatives of the railroads interested in the proposed abolition of the arbitrary on coal within a 100-mile radius of St. Louis met recently in the offices of General Manager McKeen, of the Vandalia. This was the second conference held in an effort to arrive at an agreement by which the roads could meet the demands of the Business Men's League Traffic Committee. According to Mr. McKeen, nothing definite has been decided. He could not predict, he said, how soon an agreement among the railroads would be reached.

North Carolina

Charlotte—William Guthrie, of Durham, acting for a Philadelphia syndicate, has completed a deal for the purchase of the Cumnock coal-mine property in Chatham County, embracing 2700 acres of land and the only coal mine in North Carolina. The purchase price is given as $60,000. The mines, where a low-grade bituminous coal is found, will probably be developed. They have not been worked for several years, the low-grade coal not competing for most purposes with the West Virginia and Tennessee product.

Ohio

Canal Dover—Surveyors employed by the Pennsylvania R.R. Co. are at work on what is believed to be a proposed extension of the Cleveland & Marietta division of the system, to connect with the Cleveland, Akron & Columbus division at Orrville, giving the line a river to lake route. The line would be about 30 miles long, and would lessen the haul to Cleveland from the coal fields along the Cleveland & Marietta branch by about 25 miles.

East Liverpool—The West Point Coal Co., which operates several mines on the Youngstown & Ohio River R.R., six miles north of this place, plans to establish large coal-storage yards here to develop the trade among nearly 50 potteries in the vicinity. The West Point Coal Co. was organized several years ago by J. L. Francis, of Chicago, and it was only after his preliminary surveying

of nearly 20,000 acres of land in the central part of Columbiana County that it was known that large deposits of coal existed there. As soon as the Youngstown & Ohio R.R. Co. can establish a switching arrangement with the Cleveland & Pittsburg railroad, the West Point Coal Co. plans to ship the greater part of its product south by the Ohio River.

Oklahoma

Coalgate—The shaft of the new mine being opened here by the coal department of the Missouri, Kansas & Texas Ry. has been completed and one of the best veins of coal in the Southwest developed. It is expected that the new mine will be in operation within a few weeks and employment given to 300 miners. The completion of the shaft was celebrated by firing a number of shots of dynamite.

Pennsylvania

Bituminous

Irwin—The coal trade is now at about capacity production in the Irwin district. The Yukon mine, shut down to make repairs, started, Feb. 6, and 600 men returned to work. The Pleasant Valley mine, north of town, is now running, after an idleness of nearly two years. Edna No. 1 and No. 2 mines of the United Coal Co. have twice as many hands employed now as on Jan. 1. Operators declare the Pennsylvania railroad is doing wonders in moving coal to the markets during the extremely cold weather.

Scottdale—The old Dexter coke plant, near Scottdale, together with the underlying coal, was recently transferred from the Stauffer estate to Connellsville interests for the sum of $30,000. The deal includes the coal under several tracts in Upper Tyrone township, the complete equipment of 40 ovens, all in good repair, and the necessary mining rights and trackage. The new owners are said to be making preparations to at once get the plant ready for a steady run. It has been idle since the slump in the fall of 1907.

Ebensburg—Local owners of coal land have been interested lately in the activities of two men who have been endeavoring to secure options on a 5000-acre tract of coal lying immediately northwest of Ebensburg. It is not known what interests they represent, but the name of J. Blair Kennerly, of Philadelphia, has been mentioned in this connection. Mr. Kennerly owns mines in Cambria, Clearfield, Blair and Indiana Counties.

Pittsburg—The brief of former Attorney-General Wade H. Ellis, as chief counsel for the Pittsburg district coal operators, against the freight rates to the lake ports of the coal-carrying railroads, was filed Feb. 6, with the Interstate Commerce Commission in Washington. The arguments will be heard on Feb. 19, and a heated discussion is forecasted by the claims made in the brief.

Fire, Feb. 9, partly destroyed the tipple at the Grant mine of the Pittsburg Coal Co., at the west end of Carnegie. The damage is estimated at $500. The fire caused great inconvenience to the Pittsburg, Cincinnati, Chicago & St. Louis Ry. Co., as it ordinarily uses the tipple for coaling engines several hundred times a day.

Anthracite

Scranton—The big modern breaker and the steam plant of the Connell Anthracite Mining Co., at Bernice, were destroyed by fire, Feb. 2, entailing a loss of $150,000, fully covered by insurance. The breaker being some distance from the head of the shaft, the lives of the men inside were not endangered. Live coals falling on oil soaked woodwork or an overheated boiler is believed to have caused the fire. It started in the boiler room and quickly spread to the breaker proper and then to the office building adjoining. The colliery buildings were all comparatively new, having been erected since the opening of the Bernice coal field not many years ago. The fire throws over 500 men and boys out of employment.

Wilkes-Barre—Work is well underway upon the new Stackhouse breaker that is being erected in Salem township near the Shickshinny line about 11 miles above Berwick. The breaker will cost approximately $80,000 and will be one of the most modern in Luzerne County in construction and equipment, being electrically driven throughout. The new operation is looked upon as a big boon to Shickshinny.

Pittston—Eighty mine workers from from the Pittston district are to receive first-aid instructions from the Federal Bureau of Mines. One of the mine-rescue cars arrived in this city recently, and is stationed near the Erie depot. It is in charge of Daniel D. Davis.

Tennessee

Briceville—The output of the Cross Mountain mine of the Knoxville Iron Co., in which an explosion occurred last December, killing 84 men and imprisoning 5 more, has been increased to 200 tons per day. It is working now full time and is employing all of the miners who apply. More could be used. The mine and the village of Briceville are just now beginning to assume their normal attitude.

West Virginia

Fairmont—It is said that with the opening of spring, 1500 men will be brought into this section to mine coal. Several mines that have been closed down lately will resume work and the outlook in the coal industry for this section is exceedingly bright. The additional men will work in the mines of the Consolidation Coal Co.

Wheeling—A big deal in Marshall County coal is said to be pending between the owners and J. W. Miller, of Mannington, who is understood to be representing the Consolidation Coal Co. of Fairmont. The coal in question is the Mapleton vein underlying 20,000 acres in the Meade district and if the deal goes through the owners will receive in the aggregate, about half a million dollars. Coal rights for the Pittsburg vein have been selling for more than $50 an acre but no sale of rights for the Mapleton vein has been reported for some time. The Mapleton seam is from 4 to 6 ft. thick and lies near the surface, above the Pittsburg seam, which here runs from 7 to 10 ft. in thickness.

McDonald—It is estimated that $2000 worth of property was destroyed by a fire, Feb. 1, in the blacksmith shop at the Jumbo mine of the Pittsburg Coal Co. The building was completely desrtoyed but will be rebuilt at once.

Mexico

Coahuila—All the mines in northern Mexico are closed down as a result of the revolution in this locality. It is also reported that the foreman and a number of Japanese miners were murdered at the Palos mine, near Muzquiz, Coahuila. American capital is heavily interested in this district.

England

London—The probability of a general coal strike on Mar. 1 and complete disturbance of the industry was greatly increased by the failure, Feb. 7, of the national conference of coal owners and miners to effect a settlement. The miners met Feb. 13, to consider the operators' refusal to grant their demands. The delegates were in a defiant mood, and a general strike seems almost inevitable.

Belgium

Brussels—Fierce rioting broke out, Feb. 12, in connection with the coal strike at Mons. Soldiers were rushed to the scene on a special train. Strikers in mobs looted much of the town, overpowering the police when resistance was made. Many were injured.

Prussia

Antonienhütte—Many lives were lost in one of the pits near here, Feb. 12. Seven bodies have been brought to the surface, and the authorities believe at least 20 more men perished. The number of men in the pit is not definitely known, but all except those in the immediate vicinity of the bottom of the shaft were cut off and are almost certainly dead.

Personals

A. M. Hartwell, president of the Berwind Fuel Co. was recently in Duluth, inspecting the company's dock and briquetting plant.

B. W. Wistar, who has been with the Goff Kirby Coal Co., Cleveland, Ohio, for the last ten years, succeeds Mr. Houston in Cleveland on Feb. 1, as sales manager for the Moreland Coke Co. at that point.

W. D. Washburn, of Minneapolis, president of the Washburn Lignite Coal Co., recently visited the company's mines at Wilton, N. D., and while there formulated plans for improvements to be made during the coming summer.

D. G. Davis, recently appointed special inspector of mines for the Union Pacific Coal Co., will leave this month for an extended trip to the company's various properties, returning later to Evanston, Wyo., where he will make his home.

David Selway, manager of the Selway Coal Co., was in Columbus recently, with a view to selecting office space, preparatory to removing the headquarters of the company to Columbus. The Selway company operates a large new mine in the No. 8 seam at Fairport, and is an important factor in the eastern Ohio field.

Charles J. Coll will return to the employ of the H. C. Frick Coke Co. as superintendent at Brownfield, after an absence of 11 years. In 1900, Mr. Coll left the Connellsville region to go to Stellarton, Nova Scotia, where he was general manager of the Acadia Coal Co. Mr. Coll now succeeds W. L. Affelder, who is leaving to take another position.

C. E. Tobey, superintendent of the coal mining department of the Delaware, Lackawanna & Western R.R. Co., and president of the Scranton Y. M. C. A. District Mining Institute, has been secured as one of the speakers at the Pennsylvania Y. M. C. A. State Convention which meets at Bradford, Feb. 22-25. Mr. Tobey will address the convention on "Present Day Evidences of Social Advancement in Coal Mining Communities."

George W. Brymer, who succeeds J. F. Hannigan as superintendent of the Edgewater plant of the Tennessee Coal, Iron & R.R. Co., has taken up his new duties at Ensley, Ala. Mr. Brymer was formerly engaged as chief engineer of the northern division, Pennsylvania Coal & Coke Co., Cresson, Penn.; as superintendent of the Jed Coal & Coke Co., Jed, W. Va., and as division superintendent for the Pennsylvania Coal & Coke Co., at Patton, Penn. He went to Alabama from Philadelphia, Penn., where he was engaged in consulting work as an assistant to E. T. Connor, mining engineer, in making several extensive examinations and reports on large mining properties.

Obituary

J. H. Shelly, aged 28, of Jellico, Tenn., was instantly killed when a motor he was testing in the No. 1 mine of the Jamison Coal & Coke Co., near Greensburg, Penn., jumped the track and crushed him against the wall. Shelly was employed by an Illinois firm and was installing electric locomotives in the mine.

Calvary Morris, coal operator, banker and capitalist, died Feb. 5, at the Lakeside hospital, Cleveland, where he had gone, on Dec. 24, to undergo a minor operation. He was well on the road to recovery when he was taken with pneumonia and later was striken with apoplexy. Mr. Morris laid the foundation for his business success at the coal mines. He was born in Athens, Ohio, 61 years ago, and gained his first knowledge of coal by weighing the product at the mines. He came to Cleveland over 20 years ago and entered into partnership with B. D. Babcock, under the name of Babcock, Morris & Co. Later he went into partnership with J. W. Ellsworth, under the name of the Morris & Ellsworth Coal Co. In 1897, Mr. Morris formed the Morris Coal Co., and later the Jefferson Coal Co and Morris-Poston Coal Co., taking an active part in the management of all three.

Industrial Notes

Monks & Johnson, architects and engineers, 7 Water St., Boston, report the complete installment of a $23,000 coal-handling equipment for J. B. & W. A. Lamper, Lynn, Mass. The plant includes a single-man discharging tower of the Boston or steeple type with cable road over the present sheds. It is stated that this coal-handling equipment, manufactured by Mead, Morrison & Co., has greatly reduced the cost of handling the coal.

The Link-Belt Co. has just closed a contract for building a large coal tipple for the McGregor Coal Co. This will be erected on Rums Creek, Logan County, W. Va. The president of this company is John Laing, who is also chief mine inspector for the State of West Virginia. The tipple will be one of the largest in this section of the country. It will be built of structural steel, sheathed and roofed with corrugated iron, and will contain car feeders, trip makers, picking bands, a double set of "Link-Belt" shaking screens, slack conveyors and conveyors for taking the slack coal to the boiler house. The Link-Belt Co. will design, furnish and erect the entire equipment complete.

The Watt Mining Car Wheel Co., Barnesvillle, Ohio, announces that Ira E. Stevens and the Stevens Mine Fan Co., Old Colony Building, Chicago, no longer represent this company, and that on and after Feb. 1, 1912, all orders and inquiries will be handled directly from the main office at Barnesville. The company is prepared at all times to give prompt attention to mine-car requirements and maintains a force of expert car men for the purpose of designing new equipment or changing the old to meet present mining conditions in the various districts.

New Publications

FOURTH ANNUAL REPORT OF THE DEPARTMENT OF MINES, OKLAHOMA. Ed. Boyle, chief mine inspector, Guthrie, Okla. 180 pp., 6x9 in.

Report is for the year ending June 30, 1911, and is devoted almost exclusively to coal mining, although the production of lead, zinc, asphalt and oil is also covered. There was produced during the year, a total of 2,569,869 tons of coal, involving the employment of 8191 men in and around the mines.

THE RATE OF BURNING OF FUSE. By Walter O. Snelling and Willard C. Cope. Technical Paper No. 6, U. S. Bureau of Mines. 28 pp., 6x9 in.

The safety of a miner in his daily work depends to a great extent upon his ability to gage with reasonable accuracy the time that a certain length of fuse will take to burn and ignite a shot. Misfires and retarded shots, with their accompanying dangers, are largely due to defective or improperly handled fuse. Inasmuch as tests made by the authors of this report show that an ordinary fuse with a normal rate of burning of from 25 to 30 sec. per ft. may, under certain conditions, burn as fast as 1 sec. per ft. and, under other conditions, as slowly as 227 sec. per ft., the importance of keeping fuse from unfavorable circumstances of storage and use at once becomes apparent. Under ordinary conditions, nearly all types of fuse were found to show great uniformity in their rate of burning, but under the influence of pressure the rate was found to increase, in at least one instance, from a normal value of 28 sec. per ft. to something over 6 sec. per ft. Similarly, high temperatures were found to have a retarding effect and mechanical injury, due to pounding or hammering, resulted in such an increase in the rate of burning as to make it almost instantaneous. The paper gives in detail the results of tests that were conducted with the idea of investigating the effects of pressure, temperature, moisture and mechanical injury on the rate of burning of the several ordinary forms of miners' fuse.

Trade Catalogs

Howells Mining Drill Co., Plymouth, Penn. Catalog No. 28. Howells Mining Drills. 112 pp., 6½x9½ in., illustrated. A complete and profusely illustrated descriptive catalog of the numerous forms of electric, compressed-air and hand-power drills manufactured by the Howells company. Lists and prices of repair parts are given.

The Draeger Oxygen Apparatus Co., Pittsburg, Penn. Catalog R, "Oxygen the Life Saver." 212 pp., 5¾x8¾ in., illustrated. This volume contains in addition to a complete, detailed and well illustrated description of Draeger rescue apparatus, a number of interesting and valuable notes on the general subject of oxygen breathing devices, the construction and equipment of rescue stations and instructions for rescue brigades. Five pages are devoted to listing old and recent literature on the subject of breathing apparatus.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

Coal supplies are reduced to a point where the situation is acute. In spite of the utmost efforts of the railroads, the movement has been below the consumption for some time, and actual suffering is now in evidence at some centers. Spot coal can be had only at fancy prices and many large steam users can get only sufficient fuel to keep their plants from freezing.

In the East at some anthracite-burning cities, a number of dealers have been supplying their customers with soft coal, and even wood. It is believed that six weeks of uninterrupted work at the mines would be required to fill orders now on hand, and some new record prices for this grade have been quoted. The cold weather has so crippled the railroads that they are in many instances concentrating their entire efforts on the movement of perishable freight, and entirely neglecting the coal tonnages.

Considerable suffering is being experienced in Michigan and northern Indiana and Ohio, with mines in the latter state getting only sufficient cars to work about 25 per cent. capacity. Unusually cold and stormy weather has prevailed in that territory and the railroads appear utterly incapable of handling the situation. In the South the demand is reported heavy, with prices hardly quotable and the situation bordering on a coal famine at some points.

Railroads appear to be catching up on deliveries to a certain extent in the Middle West, with the exception of the Illinois Central, whose mines are working only one day a week. Heavy storing by the large transportation systems continues, especially the New York Central who, it is claimed, are laying in supplies to the extent of a quarter of a million tons.

In direct contradistinction to the East, the far West appears to be experiencing an unusually mild winter, with the result that the markets are quiet and dull.

Boston, Mass.

New England is still short of coal, and to say that consumers and dealers are worried over the outlook would be putting it mildly. In a number of ports to the Eastward the dealers are out of anthracite and are supplying customers with wood and soft coal. In Calais, Me., several cargoes from the Spring Hill mines, Nova Scotia, have been received for distribution through this section. The Boston dealers are able to get broken, stove and chestnut only in hand-to-mouth shipments, and at Providence the shortage is such that fancy prices are offered for prompt delivery.

All-rail, both bituminous and anthracite, are coming through slowly, and operators are slow about committing themselves ahead. Water freights have advanced; $1.30 was paid on 2500 tons, Baltimore to Boston, and $1.25 is asked from Hampton Roads.

Current prices are about as follows:

Clearfield, f.o.b. mines	$1.25@1.45
Somersets, f.o.b. mines	1.35@1.55
Pocahontas, New River, Boston, on cars	4.50@4.75
Pocahontas, New River, Providence, on cars	4.35@4.50
Georges Creek, f.o.b. Philadelphia	2.67@2.85
Pocahontas and New River, f.o.b. Virginia terminals	2.70@2.80

New York

The supply of soft coal at the New York piers continues extremely short. The demand on contract is heavy and with the continuance of a short car supply and slow railroad movement, shippers are hard put to take care of their New York Harbor obligations. There is a good deal of spot inquiry from consumers who are anxious to stock in anticipation of labor troubles and this, coupled with the cold weather, keeps the market quite firm. Prices are somewhat stronger than last week, with the cheaper grades of coal scarcer and the better grades practically unobtainable except on contract. West Virginia steam coals are quite firm at $2.65 f.o.b., while ordinary Pennsylvanias are held at from $2.70 to $2.75 f.o.b.

The loading piers continue to be handicapped because of the frozen condition of the coal and the delay in loading averages about three days. Towing conditions to the lower ports are extremely hazardous on account of ice in the river, making it difficult to get boats down to and up from the piers.

The stocks of all-rail consumers, owing to slow railroad movement, are gradually being reduced and from these consumers, more inquiry for extra coal is being received.

In the Sound ice conditions are extremely bad for marine transportation; at the Sound terminals scarcely enough coal is being received to take care of the demand, and there is a ready market there at good prices for any extra coal shippers have.

Philadelphia, Penn.

Seasonable weather still continues in this vicinity, and conditions as far as the retail trade is concerned, show no marked falling off. In fact, the demand is even better, and the supply is far from adequate. Temperature remains low, and as a consequence, the fires are kept going at top speed, the added consumption bringing increased business to the retailer. All sizes are moving off far more promptly than the dealers are able to replenish their stocks. Stove, chestnut and pea are far behind the market. As high as $2.50 at the mines has been offered for pea coal, and even at this record figure, orders are being turned down. The situation is certainly growing critical.

As it stands at present, the output of the mines, brought to the market by the wholesale operators, is not beginning to supply the demand, which is far in excess of the production. From broken to the steam sizes of pea, buckwheat and rice, orders are far in advance of the available supply, and work at the mines for six weeks at full pressure will not begin to cover the orders already entered. A car or two on orders for twenty or more of any size, are thankfully received, for most of which they pay better than the circular price. The meeting of the anthracite operators and miners' representatives takes place on the twenty-seventh of the month, and is likely to add additional complexities to a situation already desperate.

Pittsburg, Penn.

Bituminous—There have been no important developments in the wage-scale matter, and there is no likelihood of any approach to a settlement being made in the near future, as the situation can hardly be righted without a suspension of mining for perhaps six weeks. Stocking of coal by consumers is unavoidable and it will be necessary for the safety of the market to allow these stocks to be worked off. On the other hand, the prospects are for a large demand in the lake trade, stocks being light in the Northwest, and a suspension longer than six weeks from Apr. 1 would encroach upon the navigation season.

Demand continues good locally, both manufacturing and domestic, and mines are running as well as they can considering weather and transportation conditions. There is a fair supply of cars, but the coal moves slowly, on account of

extremely cold weather. Full prices are readily obtained. We quote: Nut, $1.05@1.10; mine-run, $1.10@1.15; 3/4-in., $1.20@1.25; 1 1/4-in., $1.35@1.40; slack, 70@75c. per ton at mine, Pittsburg district.

Connellsville Coke—Market prices show no change, but coke is a trifle easier to obtain. Sales of between 150 and 175 cars of prompt furnace have been made in the past week. Prompt foundry coke is about 5c. higher. We quote: Prompt furnace, $1.80@1.90; contract furnace, $1.80@1.90; prompt foundry, $2.20@2.30; contract foundry, $2.20@2.40.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Feb. 3 at 360,153 tons, a decrease of 40,000 tons, and shipments at 4052 cars to Pittsburg, 5592 cars to points West and 979 cars to points East, a total of 10,623 cars, a decrease of 500 cars.

Baltimore, Md.

Another spell of almost zero weather created an active market in the coal trade of Baltimore last week. The operation at the mines in both West Virginia and Maryland was seriously interfered with, thus reducing the output. Consumers appeared willing to pay almost any price for coal, but even at the higher prices, they were unable to procure any big supplies.

The higher prices for coal and the continued active demand has been the means of raising the hopes of the trade here. Jere H. Wheelwright, president of the Consolidation Coal Co., during the past week, spoke most optimistically over the future outlook for the coal trade. He stated that he believed that 1912 would be a splendid year for the coal business, and that he based his opinion on the large number of orders which his company had already booked for delivery. The market, at the present time, he further added, was in better shape than it had been for a long period.

The coke market continues active. Most of this product has been for consumers who made inquiries two or three weeks ago. Numerous inquiries were received during the past week, and the actual business done showed an increase over the previous week.

Buffalo, N. Y.

The coal situation here is fast growing distressing. There is difficulty with anthracite, on account of the enormous demand and the drawbacks to production and in both anthracite and bituminous alike the movement by rail is decidedly alarming. The railroads are swamped and every day reports come in that more of them are refusing to make the effort to move the nonperishable freight offered them. Shippers say that they have loaded coal cars extending all the way around Buffalo, from East Buffalo to Black Rock, chiefly for shipment to or through Canada, but are getting less and less service every day.

The situation Eastbound is quite as bad as it is West or North, for the New York Central is so blocked with cars that it cannot move and connecting roads, finding that their deliveries merely pile up at junction points, implore shippers not to route anything by that road if they can help it. This section and to the limit in all directions has seen nothing but severely freezing weather since the second day after Christmas and the mining regions are still colder, so that production is slow and has now become less than the new orders that come in.

Manufacturers are begging for a little bituminous so that their works will not freeze up and suffer from ice, but shippers can do very little but urge the roads to some sort of fresh activity. Buffalo is so far well enough supplied, as the mines are not far away and the coal roads are not badly congested.

Soft-coal prices are hardly quotable. All shippers are getting a 10c. advance and most of them could get almost any price in some instances if they could insure quick deliveries. For the present Pittsburg quotations remain at $2.60 for three-quarter; $2.50 for mine-run, and $2.25 for slack, with coke $4.25 for best Connellsville foundry and $3.50 for stock.

Cleveland, Ohio

Unusually cold and stormy weather has resulted in a continuous good demand for domestic, as well as steam coal, with prices firm. Many mines in Ohio, Pennsylvania and West Virginia are closed on account of frost, and in consequence markets in this vicinity have not been over congested. Everything in the way of coal of all grades is well and promptly taken care of, car service being at a premium during the past week. Slack that was a drug on the market last week, has been well cleaned up with the returning of high prices that prevailed during January.

Prices range as follows:

Cambridge	
Mine-run	$1.10
3/4-in.	1.20
1 1/4-in.	1.35
Slack	$0.95@1.00
Ohio No. 8	
Mine-run	$0.95@1.00
3/4-in.	1.05@1.10
1 1/4-in.	1.25@1.35
Slack	0.85@0.90
Ohio No. 6	
Mine-run	$1.10
3/4-in.	1.20
1 1/4-in.	1.30
Slack	$0.85@0.95

Columbus, Ohio

Demoralization still continues in the coal trade in central Ohio and railroads are utterly incapable of coping with the situation. The trouble takes two distinct forms, the lack of motive power of railroads which makes it impossible for the connecting roads to move coal from junction points, and the acute car shortage caused by the tie up of so many cars at way points.

As a result of this condition considerable suffering is reported from Michigan, northern Ohio and northern Indiana points. Probably the greatest trouble is in Michigan where many factories have been compelled to close down and permit the small coal supply to be used for domestic and heating purposes. Reports show about 8000 loaded coal cars at Toledo awaiting movement into Michigan and the connecting roads either unable or unwilling to complete the haul.

As a result of the car shortage, mines in every section have been running on very limited time. The output is less than 25% of normal and in many cases mines have been closed down the entire week. Operators are able and willing to increase the production if only cars were available.

Retail trade has been active during the past week and customers are demanding immediate delivery. In Columbus and immediate vicinity the supply is adequate and little suffering is reported. Ice has caused some trouble in making deliveries. Prices are firm on all grades.

Prices prevailing in Ohio mining districts are as follows:

Domestic lump in Pomeroy Bend district	$1.65@1.75
Domestic lump in the Hocking Valley	1.50
Three-quarter inch	1.35
Nut	1.15
Mine-run in eastern Ohio	1.00@1.05
Mine-run in the Hocking Valley	1.05@1.15
Nut, pea and slack	0.80@0.90
Coarse slack	0.65@0.75

Cincinnati, Ohio

It is doubtful if this market has seen such a combination of favorable and unfavorable conditions continuing for so long a time in many years. During the extremely cold weather in January the river coal interests were almost tied up tight by a frozen river, which prevented the movement of barges in the harbor.

The cold weather and heavy snows, not only in the mountains, but here also are credited with being responsible for the unfortunate car situation. Several of the coal roads are putting down and taking up embargoes on all Western movements so rapidly that the mines have hard work keeping track of them. Reports from other cities in the state indicate that conditions are not much better there. The continued ice and snow on the streets are responsible for the added cost of wagon deliveries in the city and suburbs.

Demand is just about the same as it has been for several weeks, nut and slack being the strongest with prices at 85c. to $1 and the tendency upward. The demand for lump coal is holding up un-

der the continued cold weather. The average temperature since the first of the year has been around 20°, with long stretches of zero weather.

Charleston, W. Va.

Except for a modification of weather conditions there has been no change in the coal situation in this section of the state during the past week. The milder weather has permitted a freer handling of cars, both loaded and empties, but normal conditions have by no means as yet been restored. Prices have not suffered on account of the improvement in shipping conditions and in some circles a belief prevails that there will be no drop back to where they were before the cold weather interfered with shipments.

West Virginia operators anticipate no labor troubles this year. The state went through the past year without a strike except for local difficulties lasting a few days at several mines. With the indications of trouble in other states, the West Virginia operators have hopes of being able to maintain a condition that will be of benefit to them in a financial way.

Memphis, Tenn.

Memphis has had one of the best coal-selling periods of weather that the coal dealers can remember. January saw the greatest tonnage of retail coal handled by dealers for any one month in our history. February has also opened up with fine prospects for a big business.

This good weather and good sales have made the wholesale market exceedingly stiff. To add to the weather conditions, we have had a shortage of cars both in Alabama and east and west Kentucky. These are the places from which Memphis has drawn most of its coal.

The Illinois Central R.R. is still tied up in their strike, which has certainly handicapped Memphis and all the territory south during this continued period of cold weather. The mines' prices have been stiff at $1.50 for Kentucky lump.

Illinois has, for the last few weeks, practically withdrawn from this market, as they are unable to make shipments over the Illinois Central R.R. It has been impossible for the brokers and dealers to secure anything like sufficient quantity of coal from the mines to take care of the trade that has been offered.

Prevailing prices are as follows per ton:

Nut	$1.00@1.25
Mine-run	0.85@1.00
Alabama lump	2.25@2.50
Mine-run	$1.25
Cahaba coals	2.75@3.00

Nashville, Tenn.

This district is in the midst of another spell of cold weather, together with a car shortage which has prevailed for the past several weeks.

The demand for coal has been greater than ever and for spot shipments, big prices have been offered for all grades. It has been many years since the cities and towns in this district have been as bare of coal as they are at the present time. It has been a desperate situation for the past few days, and there is nothing that can save it except a spell of warm weather which we are likely to have at any time. Should we go into the coming week with very cold weather, a famine will be the result.

Prices vary considerably and it is rather hard to quote, but they range about as follows:

Standard lump	$1.50@1.75
Standard nut	1.00@1.10
Standard screenings	0.30@0.40
Mine-run	1.00@1.10

Indianapolis

The steady cold weather during the past week caused a corresponding increase in the demand for domestic coal. While the railroads succeeded to a certain extent in catching up with deliveries, coal famines were reported at a number of points, necessitating the closing of school and other public places. The cold weather caused a lull in other traffic which permitted the railroads to concentrate their efforts on moving fuel and they were able to move practically all the coal mined.

Although the extreme cold weather and enormous consumption is thought to be over in this state, the sidetracks have become congested along the lines seeking to reach the Northern markets. This, however, is expected to clear up within the next few days. In the meantime the numerous orders coming from the Indiana dealers indicates that the next month will see vast piles of coal stored in preparation for a cessation in mining. It is given out that not in years have large consumers been so near the bottom of their storage piles as at present.

Chicago

Prices in the Chicago coal trade have stiffened in some directions. The belief is prevalent that there will be a suspension of the mines Apr. 1 and large consumers are attempting to acquire a surplus stock sufficient to tide them over until May.

Some dealers are inclined to believe that the prospective tie-up of the mines will last until midsummer and are advising customers to prepare for a suspension of that duration. The statement is made on good authority that the New York Central road is storing a quarter of a million tons of coal at Harrisburg, Ill. Prices for screenings still remain strong, and it is expected they will continue so until the present unsatisfactory operating conditions on the railroads have been remedied.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.87
Egg	2.87
Steam lump	$2.37@2.57
Screenings	1.97@2.07
Springfield:	
Domestic lump	$2.67@2.82
Steam lump	2.17@2.27
Mine-run	2.07@2.17
Screenings	1.92@2.03
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.22@2.32
Mine-run	2.17@2.27
Screenings	1.87@2.00
Pocahontas and New River:	
Mine-run	$3.25@3.55
Lump and egg	4.20@4.30

Coke—Prices asked for coke are: Connellsville and Wise County, $4.65@4.75; byproduct, egg and stove, $4.95; byproduct, nut, $4.75; gas house, $4.90@5.

St. Louis, Mo.

The market opened up strong the beginning of the week, following a slump the latter part of last week, especially in the Standard sizes. There has been a good demand during the past week for railroad coal, and a large tonnage of this is moving in equipment furnished especially for that purpose from the Standard field. All the railroad companies are laying in storage coal, and considerable of this is moving from the Springfield district, as well as the Standard, while but a small tonnage is moving out of the Carterville field. This is largely accounted for by the fact that the Illinois Central have no motive power even though they are receiving 50 new locomotives at the rate of one per day. The Iron Mountain has about all it can take care of at the present time.

Steam business in St. Louis and the country has put the market in good shape and all plants are preparing to store coal, several of them having already started. The same applies to several of the larger retail dealers, and it is taken for granted here that there will be a suspension in the Illinois field of at least three months, and possibly five.

Conditions on the Illinois Central seem to be getting worse, and the mines on that road are only working about one day per week. The Frisco Lines are doing better, as is also the Iron Mountain, with the exception that they are taking the larger part of their equipment for company coal. Indications are that the market on all grades will remain firm, with a tendency to move upward.

The higher-grade coals from the Inner district have been in remarkably good demand for country business, and the Mount Olive coal field is pretty well oversold. There has been an exceptionally good demand and a fair movement of anthracite at circular prices, also both byproduct and gas-house coke at $5.90 for the former and $4.75 for the latter has been hard to get. The smokeless market is in good condition.

The prevailing prices the early part of the week were as follows:

Franklin County	
Lump and egg	$2.15@2.25
No. 1 nut	2.00@2.15
No. 2 nut	1.75@1.85
No. 3 nut	1.35@1.50
2-in. screenings	1.10@1.20
Carterville	
Lump and egg	$2.00@2.25
No. 1 nut	1.60@1.75
No. 2 nut	1.40@1.50
No. 3 nut	1.25@1.35
Screenings	1.00@1.10
Mine-run	1.25@1.35
No. 1 washed	2.25
No. 2 washed	2.00
No. 3 washed	1.50
No. 4 washed	1.25
No. 5 washed	1.00
Standard	
6-in. lump	$1.60@1.75
2-in. lump	1.40@1.60
3x6-in. egg	1.25@1.35
No. 1 nut	1.15@1.25
No. 2 nut	1.00@1.10
Screenings	0.75@0.85
Mt. Olive	
6-in. lump	$1.75
3-in. lump	1.75
2x6-in. egg	1.40
No. 1 nut	1.30
No. 2 nut	1.10

Salt Lake City, Utah

Owing to the mildness of the weather the demand for coal is diminishing. All mines are well up with their orders, and the retail trade is quiet. The Denver & Rio Grande R.R. has placed orders with independent companies for 10 to 12 cars daily. This is a new departure in the policy of the railroad company and is taken to indicate that the Utah Fuel Co., a subsidiary organization of the Denver & Rio Grande, is conserving its own supply.

Mine prices are as follows: Lump, $2.40@2.75; nut, $2.15@2.25; slack, $1.75.

Spokane, Wash.

The weather here has moderated to such an extent that almost no coal is being sold, the supplies in the basements being ample. It is not thought that Spokane or the Inland Empire will experience any more severe cold weather this winter, and in some places the spring flowers are coming up. Furnaces are still in operation, however, but are being supplied by wood as far as practicable. Prices are inclined to fluctuate enough to stimulate trade by some of the dealers, while the majority are holding to the regulation price.

The prices of standard coals for the week ending Feb. 7, were as follows:

	Wholesale	Retail
Rock Springs	$7.20	$9.00
Owl Creek	7.20	9.00
Kirby	7.20	9.00
Carney	6.70	8.50
Bearcreek	6.25	8.25
Roslyn steam	5.25	6.25
Canadian steam	5.25	6.25

Portland, Ore.

The market situation remains practically unchanged, the demand for coal being light owing to mild weather. Oregon has enjoyed a very favorable winter and in consequence the demand for fuel has not been heavy. The demand for coal for manufacturing purposes shows no material fluctuation. The ruling price for Australian and Wyoming is $9.50, including cost of delivery within the city proper.

Production and Transportation Statistics

The Car Situation

The fortnightly bulletin of the American Railway Association states that on Jan. 31 the net surplus of idle cars on the lines of the United States and Canada stood at 32,581, compared with 90,285 two weeks before, a difference of 57,704.

The decrease in the number of idle cars was most noticeable in the coal-producing sections. But almost every part of the country has experienced great difficulty in moving cars, owing to the extreme cold.

Chesapeake & Ohio Railway

The following is a statement of the coal and coke traffic over the lines of the Chesapeake & Ohio Ry. for December and 6 months ended Dec. 31, 1911, in short tons:

Destination	December	6 Months
Tidewater	367,310	1,970,464
East	200,383	1,069,419
West	937,089	5,735,771
Total	1,504,782	8,775,654
Coke	17,557	110,597
From Connections		
Bituminous	23,404	117,326
Anthracite	3,338	18,749

Anthracite Supplies

Stocks of coal at tidewater were 521,283 tons on Jan. 31, 1912, as compared with 712,958 tons on Dec. 31, 1911, a decrease of 191,673 tons. The stocks at tide are lower than for years. It is generally estimated in the trade that the consumption of coal in January was 50% above the average. The actual consumption on the known figures in the month was nearly 6,000,000, but it was no doubt considerably more than this.

Anthracite Shipments

Comparative statement of anthracite shipments for January 1911-12 is as follows in long tons:

	1911	1912
Philadelphia & Reading	1,134,280	1,186,534
Lehigh Valley	1,021,447	1,020,447
Jersey Central	772,130	760,035
Delaware, Lack. & West	863,371	791,698
Delaware & Hudson	611,758	567,279
Pennsylvania	591,917	542,819
Erie	678,531	682,845
N. Y., Ontario & West	230,683	212,039
Total	5,904,117	5,763,696

Foreign Markets

Great Britain

Buyers continue to adopt a waiting policy pending further developments in the labor situation, and large coal prices are easier for both prompt and forward loading. Small coals are steady, with an upward tendency. Quotations are approximately as follows:

Best Welsh steam coal	$4.62@4.74
Seconds	4.44@4.56
Thirds	4.14@4.38
Best dry coals	4.26@4.38
Best Monmouthshire	4.20@4.26
Seconds	3.96@4.02
Best Cardiff small coals	2.58@2.64
Seconds	2.40@2.52

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those of Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½% discount.

Nova Scotia

Coal production of Nova Scotia, by companies, for year ended Dec. 31, 1911, was as follows:

Dominion Coal Co. (Glace Bay)	2,469,493
Nova Scotia Steel & Coal Co.	784,969
Acadia Coal Co.	278,131
Intercolonial Coal Co.	249,218
Inverness Ry. & Coal Co.	230,752
Dominion Coal Co. (Springhill)	216,325
Other companies	368,743
Total	4,597,631

Financial Notes

Gross earnings of Lehigh Coal & Navigation Co. for year ended Dec. 31, 1911, were $13,733,777, an increase of $1,091,664; net earnings were $5,534,793, an increase of $390,272; surplus was $681,174, an increase of $368,874.

The Boston Stock Exchange has recently listed 150,000 shares of the Pond Creek Coal Co. Authorized capital is 200,000 shares, par 10, of which 150,000 are issued. Stock is quoted at between $16 and $17.

Gross earnings of Huntingdon & Broad Top Mountain R.R. & C. Co. for year ended Dec. 31, 1911, were $538,730, a decrease of $133,507; operating expenses were $425,831, a decrease of $86,014; net, $113,898, a decrease of $27,494. Directors were reëlected at annual meeting.

The syndicate to underwrite bonds to be issued under plan for merging Alabama Consolidated Coal & Iron Co. and Southern Iron & Steel Co. has been completed. The new company, to be known as the Alabama Consolidated Iron & Steel Co., is to have a total capitalization of $33,986,000.

Lehigh Coal & Navigation Co. earned 10.2% on capital stock for year ended Dec. 31, 1911. Surplus available for dividends is $2,709,370, showing a gain of $465,326 over the best previous record. Gross revenues from all sources, $13,733,777, an increase of $1,091,664 over previous year.

January bonus awarded to the anthracite workers by the United States Commissioner of Labor amounted to 7% of their month's pay, and with the flat increase in wages of 10% allowed to the men by the Strike Commission of 1902, makes their rate of pay in January 17% higher than the wages prevailing before the Roosevelt Commission brought the operators and their men together. The total benefit to the mine workers from the bonus system has amounted to $30,000,000 since 1902. This is aside from the 10% flat increase in wages.

Alphabetical Index to Advertisers

Classified Index to Articles Advertised

The Representative Manufacturers of the Mining Field

The manufacturers listed above offer products of special interest to the coal mining world. The very fact that they advertise proves to a great extent that these products are reliable and efficient—worthy of your interest. For advertising is its own insurance of claims well backed up by the quality of the products advertised. Duplicate orders are what make advertising pay. And no manufacturer can afford to kill his opportunity for getting duplicate orders by false claims. *Only reliable products can be continuously advertised.*

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 20.
Issued Every Saturday.
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NEW YORK, FEBRUARY 24, 1912

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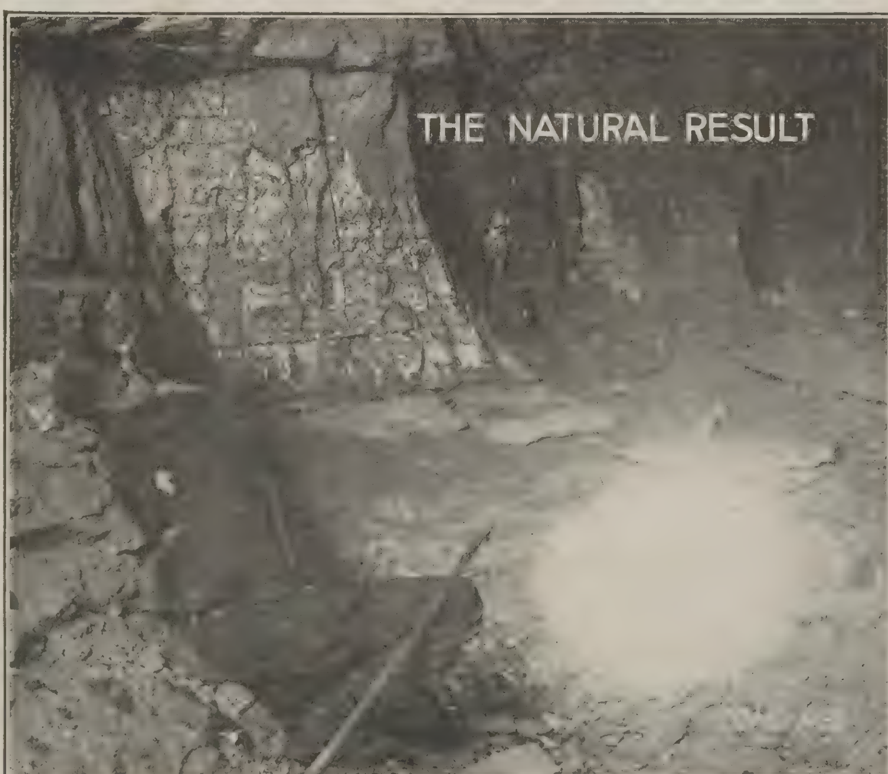
Leading Articles in This Issue



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And this advantage of the Williams Crusher has proven of great value to the Coal and Coke Trade.

It is obtained by the extreme adjustability of the machine which makes every part adjustable, not only to itself and to wear, but also to every other part.

Thus, Hammers are adjustable to Breaker Plates and Cage. Cages are adjustable to Hammers. Breaker Plates are adjustable to Hammers.

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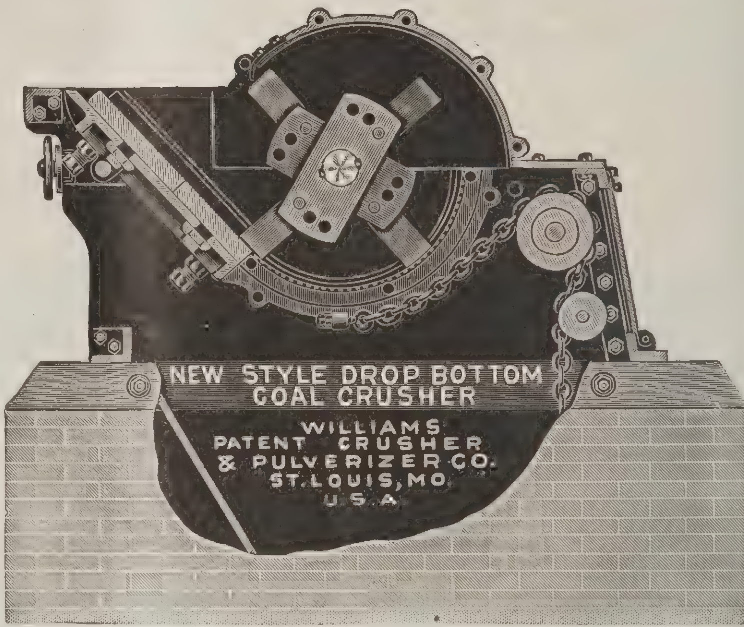

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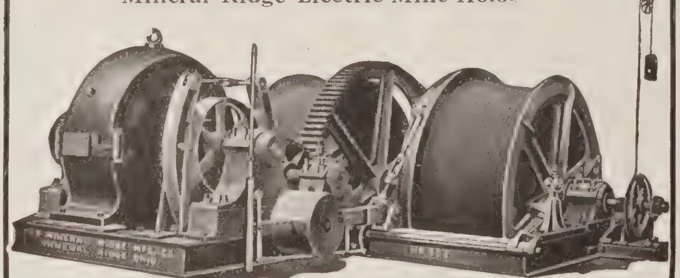

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Because of their *reliable* efficiency and their lasting efficiency, Mineral Ridge Hoists are suited to give most satisfactory service under any mine conditions.

They are so arranged that they can be operated from a distance, or can be made entirely automatic in action. Easily controlled, have a very low operating cost, and are perfectly safe at all times.

You will find that Mineral Ridge Hoists, either steam or electric, will answer your hoisting requirements in the most satisfactory manner.

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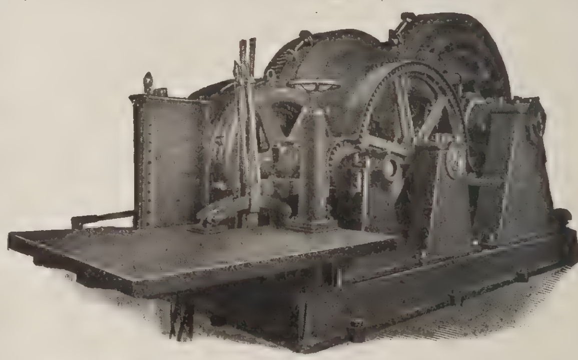


THESE are the hoists of proved reliability. They have been tested under every condition of mine service and found efficient.

Besides both Steam and Electric Hoists, we build Coal Crushers, Mine Locomotives, Elevating and Conveying Machinery, Screens, Tubular Boilers, etc.

Vulcan Iron Works
Wilkes-Barre, Pa.

COAL AGE

Vol. 1 NEW YORK, FEBRUARY 24, 1912 No. 20

THERE is always some incentive back of every worth-while effort. Success may be due to the force of a good example; it can result from the steadying influence of sound advice; or, again, necessity often compels the individual to exert his powers so frequently that habits of industry are formed, and in accord with a fortunate arrangement in the mental and moral economy of our nature, that which is performed as a duty soon becomes a habit, and the action of the human being is determined for good.

The best support of character is the exercise of the will, and this is the habit most essential to cultivate. When the will is weakened, the trained nerves continue to repeat the daily acts, even when the doer abhors them. What we at first choose, at last compels, and the threads we weave each day soon form a cable which cannot be snapped. There is no greater truism than "the chains of habit are too small to be felt until they are too strong to be broken."

What a man will do in any emergency, whether it is a mine fire, an explosion, or other disaster, is determined almost wholly by his first unthinking impulse, and the latter depends entirely on the habits of the individual. From earliest youth, our best and most lasting instruction consists in habits, not in reasonings; in examples, rather than in direct lessons.

It is therefore a fact that habit has most to do in shaping our lives, and "force of example" is the chief influence in the determination of habit. Precept may point the way, but example is silent, continuous, forceful instruction, operating imperceptibly, but with absolute certainty.

Believing it is the influence of acts, more than words, that molds and shapes human character, we will commence in March to publish in Coal Age each week a study of the career of some one successful coal man. Supplementing each biography, will be an interview giving the opinions of the subject of the sketch on important coal-mining problems, thus making each account a story of much technical value.

Furnishing the world's fuel has grown to be a monster industry, and the men who have advanced the art of mining to its present state overcame difficulties in a way that is worthy of record. The sketches will be written of men who are at present in the thick of of things—the ones who, through merit, have pounded their way to the front, whether they started from a room in a mine or a room in a college.

Although we will treat only of men who have so far succeeded in life, it must be understood that we realize failure has its Plutarch as well as success. It is doubtful, however, whether failure is an object that ought to be set before us. Nothing is so easy to learn as "how not to do a thing"; it needs neither effort, teaching, perseverance nor judgment. Of course, the best of us may fail, and failure in a good cause is honorable, while success in any bad cause is merely infamous; however, success in the good cause is undoubtedly better than failure.

In conclusion, we desire to say that this new department, "*WHO'S WHO IN COAL MINING*," will be created for the sole purpose of elevating the man, and thereby the industry, through the influence of human example and practical advice. Many a foreman, superintendent or engineer whose face is pointed in the right direction, but who is daunted by present difficulties, would hesitate no longer in getting a fresh grip if only the incentive was there. Most of us need to be reminded that "Any Man Can Do What Any Other Man Has Done."

The Trinidad District in Colorado

By F. W. Whiteside*

This is the first of two articles describing coal operations in southern Colorado, one of the most important districts in the West. This initial description covers the geology, power plants and haulage systems.

The Trinidad field is a portion of a large coal-bearing area lying along the Front Range in the southern part of Colorada. It extends from the state line on the south to the north line of Las Anomas County, a distance of 30 miles, and from the east exposure of the Front Range, west to the foot of the Sangre de Christos a distance averaging 22 miles. The field contains about 425,000 acres.

General Conditions

Trinidad, a flourishing town of 12,000 inhabitants, is the commercial center of this district. The Atchison, Topeka & Santa Fe, the Denver & Rio Grande, the Colorado & Southern, the Colorada & Wyoming and the Colorado & South-Eastern railroads all enter here. These railroads and their branches handle the entire output of the district. A small percentage of the coal mined is hauled directly to the consumer by wagon from the mines. All the larger properties load their coal directly into railroad cars.

South of an imaginary line extending west from a point about midway between Ludlow and Lynn all the coal mined will make coke of high commercial value. Large quantities of this product are shipped to the steel works of the Colorado Fuel & Iron Co. at Pueblo, to various copper properties in Arizona and Mexico, to a number of smelters, to a rapidly increasing number of gas-producer plants in Colorado and New Mexico and to a large domestic trade in the larger cities of eastern and central Colorado.

*Chief engineer, the Victor-American Fuel Co., Denver, Colo.

North of this line the coal, although still bituminous in character, will not coke successfully. This characteristic adds to, rather than detracts from, its value as a steam coal, as the non-coking coals are certainly superior for firing purposes.

Generally speaking, the market supplied with coal and coke from the Trinidad district embraces New Mexico, Texas, Oklahoma, Kansas, Nebraska, Mexico and Colorado. By this statement, it is not intended to convey the idea that all the coal and coke used in the above named states is mined in and shipped from the Trinidad district. There are other coal-producing districts which ship into the same territory, but the Trinidad coal holds an important place in the these markets. That the district supplies a great volume of the locomotive fuel used by the large trunk lines which enter the state is a fact which plays an important part in governing the production of all its mines.

Geology

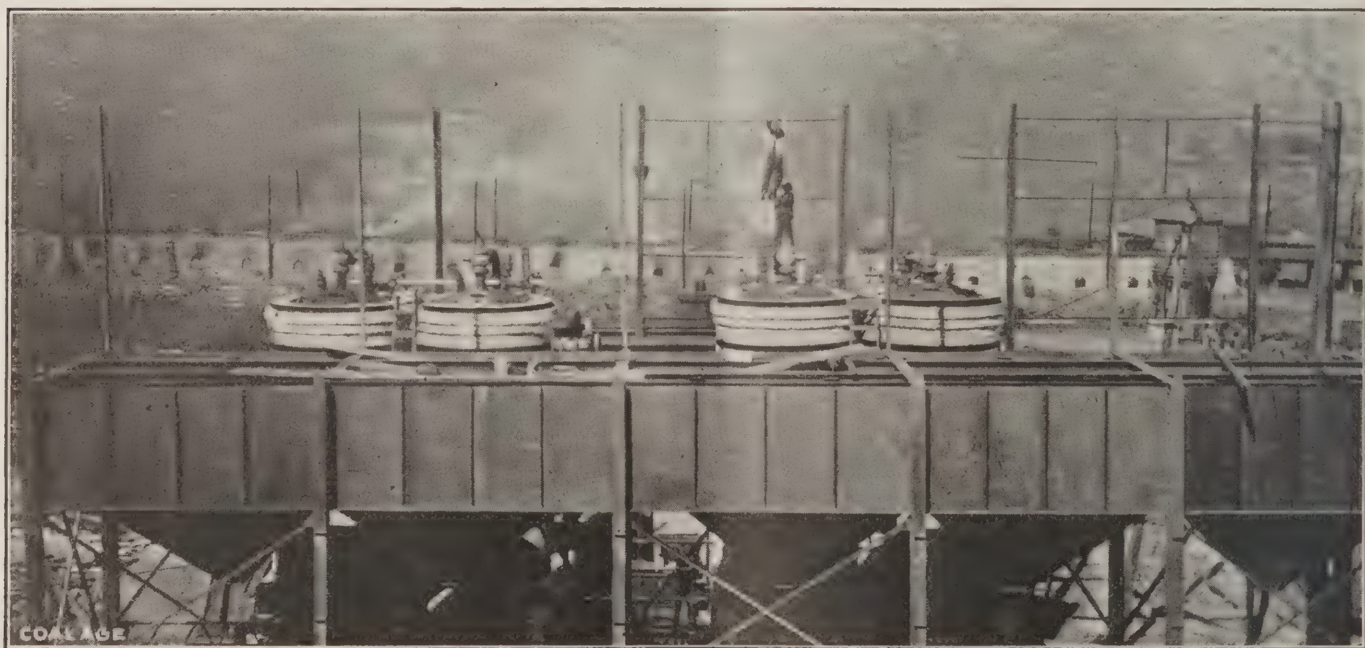
The Trinidad field is a part of the Raton Mesa Coal region, being separated from what is generally known as the Raton field in New Mexico by the Colorado-New Mexico state mine, each town giving its own name to its particular field.

All the coal-bearing regions along the Front Range in eastern Colorado, namely, the Denver, Colorado Springs, Canon City, Walsenburg and Trinidad districts belong to the Laramie formation and lie between five and nine thousand feet above sea level, those in the Trinidad field being between six and nine thousand feet.

The various coal seams are usually identified according to their distance above the Trinidad or Basal sandstone, which underlies all the coal measures in this district. Its thickness varies from 150 to 250 ft. Under this sandstone deposit is found the Pierre shales with a thickness of about one thousand feet.

The Laramie, or coal formation, rests upon the Trinidad sandstone and varies in thickness from one to three thousand feet. It consists of alternate layers of feldspathic sandstone and clayshale, with workable coal seams intersperced with considerable irregularity.

Igneous rocks occur in great quantities in certain portions of the field, proving that the region at some time must have been the scene of great volcanic activity. The intrusion of Fisher and the Spanish peaks undoubtedly destroyed vast areas of valuable coal. In many



Coal Bunkers for Central Power Plant at Hastings

localities, great masses of igneous rock have been intruded into the strata and large deposits of lava are found.

Igneous Intrusions

With the intrusion of the Spanish Peaks, a great system of dikes was formed which radiate from the peaks like the spokes of a gigantic wheel. Certain of these dikes may be traced in an easterly direction for many miles. They are usually vertical or very nearly so and their effect upon the coal is extremely varied. In most cases, aside from the expense of cutting through the dikes and the possible change necessitated in the plan of room or entry driving, they cause but little harm; the adjacent coal is not often coked to a serious extent and its bedplane will be found unaltered. Often the quality, hardness, and friability of the coal seam will be altered after passing through the dike.

It also happens that a dike will be encountered of from 100 to 150 ft. in thickness with something like an equal amount of coked coal on either side. This necessitates driving about 400 ft. of dead entry which on account of the extreme hardness of a great portion, especially the core of the dike, will cost the operator sometimes as much as $20 per running foot.

An instance is on record in the district where two seams of coal both reached a dike and passed through it, the quality of each being reversed upon reaching the further side. While this instance is not the rule it is not an extreme occurrance, and the operator who happens to be working a good seam is always far from pleased when an entry encounters a dike.

Perhaps the most serious intruder in the coal seam is the sill, a great system of which originated with the dikes in connection with the intrusion of the stocks of Fishers and the Spanish peaks. These lie nearly parallel to the plane of the coal seam, are composed of very hard igneous rock and while usually of a thickness of only one to three feet, are often of great extent. The adjacent coal is coked and large areas are made unworkable.

In the immediate neighborhood of Fishers Peak, the result of considerable volcanic action is noticible. A number of dikes and faults are encountered and in the case of one upthrow, in particular, the coal seam is displaced 110 ft. at its maximum throw. The great lava flows of this region evidently occurred far above the coal measures, but nevertheless had a marked effect upon them, although probably to a much less degree than in the immediate vicinity of the Spanish Peaks.

Bins, Boilers and No. 1 Turbo-generator at Hastings Power Plant

The Coal Horizons

Along the eastern out crop the coal seams pitch in a direction slightly south of west with an inclination of from 2 to 18 per cent. The mines here are, with two exceptions, slope and drift openings. In the valley of the Purgatoire, the measures lie nearly horizontal —and operations are carried on by drifts. Along the western boundary of the deposit the measures are turned up on edge and a pitch of from 45° to 90° is the rule rather than the exception. As the last mentioned portioned of the field contains no commercial mines the character and pitch of the measures have been determined only by preliminary surveys and small prospects.

The workable coal is found in three principal zones or measures, of which the lowest is the greatest in extent and has been the most thoroughly covered with mines and prospects. It extends above the Trinidad sandstone through a distance of approximately 250 ft. Above this measure is found a barren zone of between 125 and 325 ft. in thickness, containing no known workable beds in that portion of the district where mining has been carried on. The exact extent of this barren zone is a fact yet to be determined.

The middle measures occur next and they comprise a zone of about 200 ft. in thickness. Between the middle and upper measures a second barren zone is found which has a thickness varying from 140 to 340 ft. A number of very thin coal seams occur in this so-called barren strip, but so far as known there is no seam of sufficient thickness or good quality to be workable.

Probably less is known of the upper measure than of either of the lower. These veins outcrop still further back in the canons and are therefore more expensive to open up on account of their greater distance from the main lines of the railroads. The lower and middle measures consequently have been prospected to a much greater extent and much more is known of them.

From an economical standpoint the lower measures are by far more important, there being 32 operating mines in this formation. The minimum thickness of the seams in these measures is 3 ft. 6 in., or from 3 ft. to 5 ft. The maximum thickness of any seams yet opened, is from 5 ft. to 7 or 9 ft. while in one instance a seam has been found having a thickness at one point of 15 ft. These seams all occur at a minimum distance of between 5 and 25 ft. above the sandstone, and a maximum of between 250 or 300 feet.

In the middle measures there are only five operating companies, and the seams have a thickness of between 3 ft. 7 in. and 6 ft. 6 in.; these seams all occur between 400 or 450 ft. up to 550 or 600 ft. above the sandstone. The upper measures also have five operating mines, and the seams here vary from 4 or 5 ft. thick up to 6 or 8 ft. The upper measures occur between 740 or 790 ft., and 900 ft. above the sandstone.

Roof Conditions

The great majority of the coal seams in the district have a shale top or bottom and often both. This may vary in thickness from a few inches to many feet. When thin, the shale is usually overlaid with sandstone or in some cases with another seam of coal. A few mines are fortunate in having a hard slate or sandstone top.

As most of the shale softens rapidly upon coming in contact with the air, the proposition of timbering assumes great importance. The report of the State Inspector of coal mines of Colorado for 1909-1910 shows that, excluding the men killed by mine explosions, the total number of men killed, during 1910, in Las Animas County due to accidents was 52 out of which number 81 per cent. were killed by falls of the roof. This high percentage can be accounted for by the fact that many of the miners can not be made to understand the importance of keeping their places timbered.

The operators furnish plenty of timbers delivered at the miners places underground and the inspectors watch the timbering and do their utmost to get the men to provide fcr their own safety. When an accident occurs it is usually possible to trace the fault to the carelessness of the injured man or his partner. The lesson to be learned is that too much care cannot be given to the matter of timbering.

As few seams measuring less than 4 ft. 6 in. are operated, comparatively little brushing is necessary. The top is usually taken down, unless on account of a rolling condition of the seam, the haulage grade can be improved by taking up the bottom.

Analyses of Typical Coals

Generally speaking, the analyses of the Trinidad coals show the following: The volatiles decrease from 35.1 per cent. in the northern to 25.8 in the extreme southern part. The ash increases from a mimimum of 6.06 per cent. in the north to a maximum of 20.44 in the south of the district. Fixed carbon follows no particular rule but varies from 48.1 to 58.8 per cent.

The following table gives the average analyses of three typical coals found in this field:

ANALYSES OF COLORADO COALS

	A	B	C
Fixed carbon...	56.4	51.2	55.6
Volatile matter.	35.1	34.0	30.4
Ash	6.1	11.6	11.7
Moisture	2.4	3.2	2.3
B.t.u.	13,554.0	12,821.0	11,389.0

Sample *A* is one of the typical non-coking coals found in the northern part of the district.

Sample *B* is a coking coal from the eastern part of the field.

Sample *C* is from the southern part of the district and is one of the best coking coals found.

The foregoing may be taken as a fair representation of the coal analyses of the district. A trace of sulphur is found in all the coals, the highest percentage being 0.98 per cent. and the lowest 0.35. The highest B.t.u. value of any coal in the district is 13,981 and the lowest 11,-389, both of these being coking coals. These figures were obtained from analyses made by F. M. Stanton, of the United States Geological Survey.

Car Haul on the Cass Tipple

Feeder on Delagua Tipple

View of a Portion of the South Battery of 600 Beehive Ovens at Tercio

Power Plants

Until a few years ago, each mine operated its own power plant, but lately the tendency has been to combine the small units into large central stations. That is to say, when one company operates two or more mines separated from one another by but a few miles, a site is selected where fuel supply, quality and quantity of water together with simplicity and cheapness of ash disposal are best obtained, and a plant designed upon modern lines is installed.

The city of Trinidad has, for several years, boasted of a central power plant, which supplied light and power for the city, its local and interurban street car service, besides a number of coal properties in the district. The distributing power lines now extend as far north as Walsenburg.

The Victor-American Fuel Co. is erecting a new central plant at the town of Hastings, one of the largest producing mines, and by its use, expects to combine economy with efficient service. The equipment of this plant is patterned on the most modern lines.

The slack will be dumped from hopper-bottom railroad cars directly into steel storage bunkers, which will in turn spout the fuel into the receiving hoppers of Illinois's chain-grate stokers. The ashes will be taken from the building in buckets of a Trenton Aerial Tramway. General Electric Turbo-generators, La

Blanc Condensers, Cochran waterheaters and Stocker Cooling-Towers are included in the equipment of the plant. The buildings are entirely of concrete and steel and the plant will ultimately distribute 1500 kw. Particular mention of this plant is made, as it is one of the first of its kind to be projected by a fuel company.

The general pratice underground is to use direct current haulage and machine motors, the usual potential being 250 volts, although a number of mines are equiped with 500. The lower voltage is to be preferred on account of the saftey to men and mules. But little compressed air is used as a motive power, as the operators have found that electricity is cheaper, more easily installed and taken down, besides being more efficient. All mining machines, punchers, haulage motors, pumps, etc. are now equipped with some form of motor drive.

Above the ground, alternating current is daily becoming more popular wherever the nature of the equipment will permit its use. There is now so much alternating current circulating in the field that it is a simple matter for the operator to install an equipment which will operate with great efficiency and require little repairs. The usual voltages in service are; for long distances 23,000 and 6600; for the various units about the mines 440 and for lighting 220 and 110 with a frequency of 30 or 60 cycles.

Ventilating Equipments

Of the principal mines in the field, seven are ventilated by furnace, four by natural draught, 29 by ventilating fans and two by both fan and furnace. All the larger mines are fan ventilated, the other modes being confined to the smaller and more undeveloped properties.

A great many makes and types of fans are represented. In the majority will be found the Capell, Clifford, Crawford & McCrimmon, Jeffrey and Stein. The Sturtevant and American Blower Co. are rapidly getting into the field.

The Colorado Fuel & Iron Co. has for some time been manufacturing its own fans, at the Pueblo Steel Works and is said to be obtaining some flattering results in such tests as have been made. An American Blower Co.'s Sirocco type fan has recently been installed in one of the largest mines of the Victor-American Fuel Co. with gratifying results.

Both the force and exhaust fan is in use, the selection usually depending upon the character and arrangement of the airways and haulage entries. The practice in installing all new fans is to make them reversible although many of the old fans still operated are designed for one direction only.

Haulage Systems

On account of the great percentage of slope and drift mines, rope haulage, in its various forms is generally used. The most popular systems are the endless, the main and tail rope and the single rope gravity for the delivery of coal from the main partings to the tipple. Where grade conditions are favorable, electric haulage motors of from six to twenty tons weight deliver the coal from the mine directly to the tipple.

From the main partings the coal is brought to the tipple in a great variety of ways. At Cokedale, a powerful chain car-haul draws the cars up a steep incline to the dump. At the Cass mine, a similar chain lowers them from a parting located near the pit mouth to the tipple and a second chain-haul returns the empties to the top of the incline from which point an electric haulage motor takes them into the mine. At Wootton, the loads are taken up the grade to the dump by a cabin car-haul and the empties returned by the same means. At Delagua, electric haulage locomotives land the trips upon the car-haul at one tipple while a gravity rope performs the same operation at the other.

At Bowen, haulage motors land the loaded trips at the top of a self-acting plane, whose average grade is 55 per cent. From the bottom of the plane a second motor draws the loads to the tipple. There are many other systems which space will not permit one to mention.

Map of the Trinidad Coal Field in Southern Colorado

The Problem of Mine Timbering

By R. B. Woodworth*

The several forms of construction that are in common use for supporting mine openings and excavations, are discussed with regard to the character and magnitude of the stresses that they have to resist. The second of a series of articles on mine timbering with special reference to the use of steel.

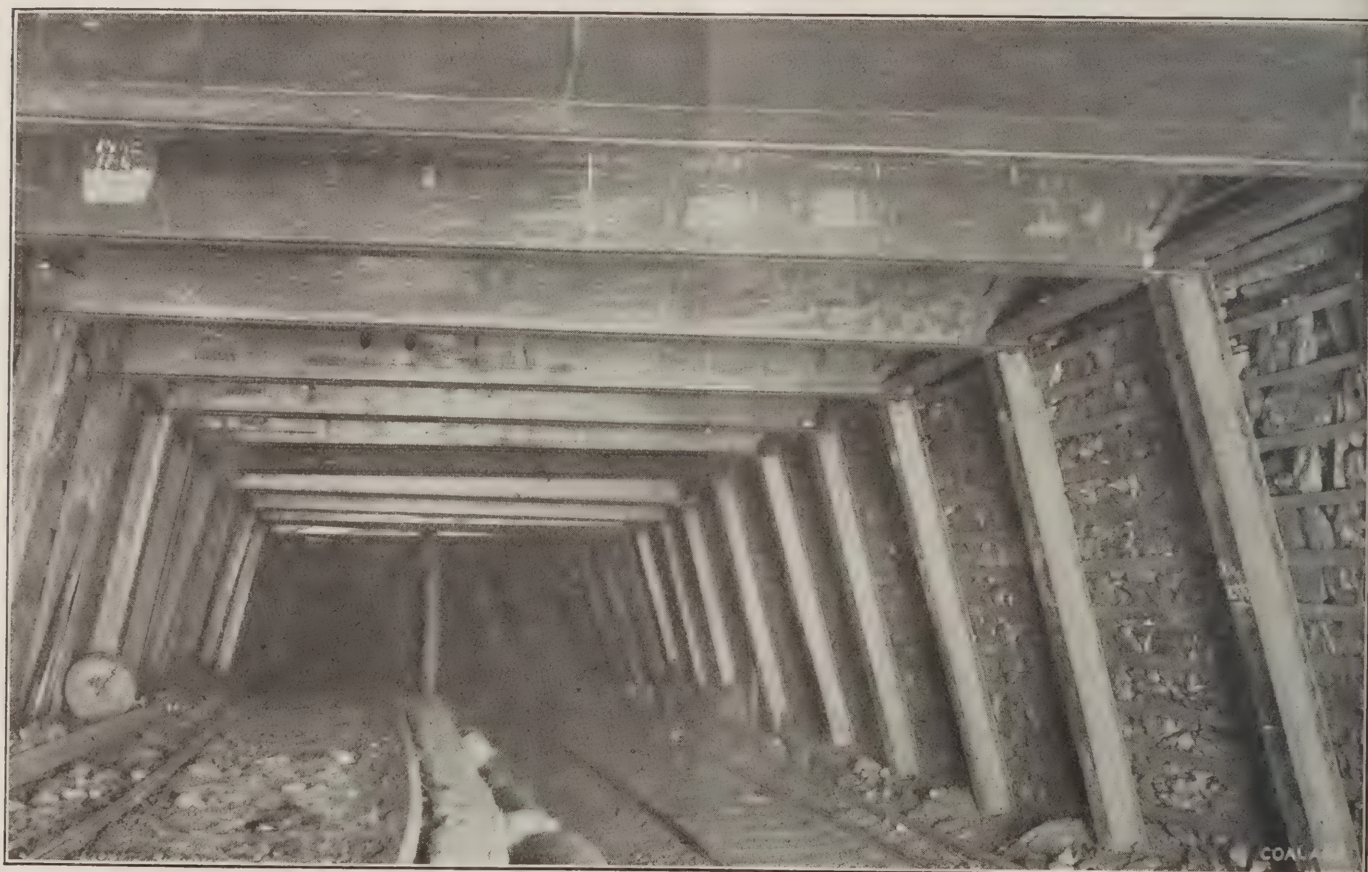
Having reached the conclusion that the practice of timbering coal-mine excavations will necessarily be continued for some time to come, the question next arises what kind of timbering should be used in order to accomplish the most satisfactory results from the standpoint of scientific conservation of our resources by their right use. The consideration of this further question presents three main sides:

1. The technical side, which deals with the loads to be sustained in each type of mine timbering, their character and reactions, and the stresses they produce.
2. The physical side, which has to do with the materials of construction and their fitness for use in the various forms of mine timbering.
3. The economic side, which has to do with the costs of the materials, the relative value of the various forms in which they can be employed, and the question of whether, after all, the use of any particular material or any particular form of that material means ultimate economy in expenditure and the lowest possible maintenance charges. Ultimate economy in this connection must needs involve the humanitarian aspects of mining, the preservation of life as well as that of property—life insurance as well as fire insurance.

A full and careful consideration of all these phases is necessary in order to secure that greatly desired end, namely: the reduction of the cost of production to the lowest possible amount.

*Engineer with the Carnegie Steel Co., Pittsburg, Penn.

Note—Paper read before the Kentucky Mining Institute, Lexington, Ky., Dec. 11, 1911.



Steel Timbering in Gangway, Maxwell Colliery, Wilkes-Barre, Penn.

Technical Aspects of Mine Timbering

The prevention of economic waste requires that the accepted practice in mine timbering be based upon correct principles of engineering design, which, in turn, requires accurate information as to the loads to be carried and the stresses induced thereby. This accurate information is not easy to obtain. There are no well defined rules by which may be calculated the load on a square mine-timber set, the compressive stress in a circular shaft lining or even the cross bending moment in a shaft compartment divider. Wooden mine timbers are installed largely on the basis of previous experience in their actual use either in the particular mine in which they are used or in some other mine subject to similar conditions. Even in the case of vertical shafts through undisturbed horizontal strata, the pressures to be sustained are dependent upon sinking conditions, a shaft through wet ground needing more material in its lining than one in the dry.

While the magnitudes of the stresses met with in mine timbering are problematical and do not admit of precise mathematical computation, their character and in consequence the proper form of sections to withstand them, can be understood from a study of the behavior under loading of the materials heretofore and at present used in underground construction. When, for example, a squeeze passes over a gangway timbered in the

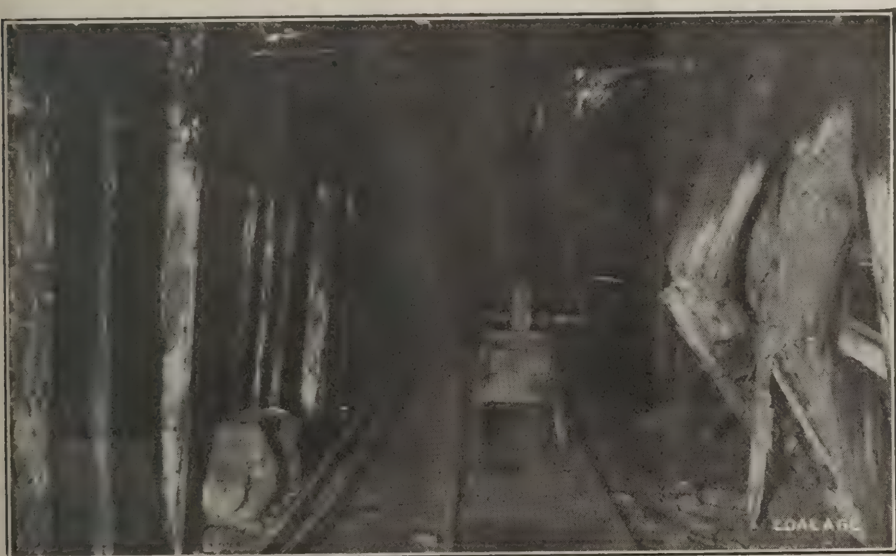
usual manner, the effect of its action is seen in the crushing-in of the collar by downward deflection and the breaking-off of the legs by bending in from each side towards the center line of the heading. The same thing occurs in an iron mine operated by the caving system, the tendency being always for the legs to break or shear off at about one-third their height, the pieces always falling toward the center of the excavation, while the collars fail either by breaking at the middle or by shearing at the ends.

In general, from the standpoint of engineering design, it does not make much difference whether the excavation is vertical or horizontal. The same general principles as to the character of the loading and the distribution of stresses apply in both cases. It is an interesting fact that the use of cast iron segments for lining subaqueous tunnels takes its rise from a previous use of identically the same thing in lining circular shafts. We may, therefore, argue with a high degree of certitude that what is true for the framing of a vertical shaft will also apply, in the main, to the framing of a tunnel or heading.

With these premises we may now proceed to examine into the various ordinary types of mine timber with a view to deciding what material is best fitted to replace wood wherever it is found.

Circular Shafts

The circular shaft lined with brick or cast iron segments is extremely common in England and Europe. All the fourteen shafts described by Meyer in his book on "Mining Methods in Europe" are circular except one, and that is elliptical. All the 150 shafts listed by J. Riemer in his book entitled "Shaft Sinking Under Difficult Conditions" are circular, except five. The circular shaft is hardly known in the United States. There is one in Grundy County, Illinois, and one in the iron region of Minnesota, but these two are all that I know of; and beyond doubt the usual shaft in the United States is rectangular. The advantages of the circular shaft (Redmayne, Modern Practice in Mining, Vol. 2) are: (1) Decreased cost of sinking due to the elimination of corners. (2) Smaller cost for lining. A rectangular shaft costs, in England, approximately $11.25 per ft. for timber lining whereas a circular shaft costs $6.00 per ft., when lined with brick at $5.00 per M. (3) Less difficulty in shutting off water than in a square shaft. (4) Uniformity of stress as regards position. The greatest width of a rectagular shaft should be across the cleat of the stone, so that the long side may be in the position most easily supported. (5) Decreased danger and expense as compared with a rectangular shaft, when passing through a fault. (6) Greater durability of cast iron and brick lining in the circular shaft as compared to the wood lining of a rectangular shaft.



Broken Timbers in Mine at Ironwood, Mich.

These advantages are due, in an ultimate analysis, to the mining conditions and to the geological characteristics of the strata through which the shafts are sunk and also to the materials used in their construction. In certain parts of England and in certain regions on the European Continent the upper strata are of recent geological formation, and the shafts are sunk in the valleys, while the seams of coal outcrop on the hills, sometimes many miles away. The result of this topographic configuration is to permit enormous quantities of water to percolate into and form reservoirs in the strata above the coal. As the shafts penetrate these strata, the pressures on the shaft lining increase approximately in the same ratio as the hydrostatic head. If under such conditions the shaft is made watertight, the shaft lining is in effect a tube loaded with a water pressure increasing in a constant ratio with downward progress, and, therefore, the thickness of the material of which it is composed may be determined by the rules that apply to hollow tubes. Of course, local conditions also may need to be taken into account, such as the inclination of the strata, the presence of faults and therewith the possibility of unequal rock pressures due to movement in the shaft wall, but in general, the tube formulas apply.

Rectangular Shafts

In the United States the coal-mine shafts are either not of any great depth, or where they are deep, almost always pass through strata of the Carboniferous Age. These strata are approximately horizontal in the bituminous coal regions or steeply inclined in the anthracite regions, in both cases extremely hard, free from faults and relatively free from water. The lining need not be watertight and is not, therefore, subject to hydrostatic pressure except in its upper sections. This condition, together with the relative cheapness of wood as compared with brick, etc., has made the rectangular shaft the standard practice in the United States, so that most shafts here are framed with wooden shaft sets and lagged with wooden sheathing.

The stresses to which rectangular shaft framing may be subjected, vary greatly with the character of the material through which the shaft passes. They may also vary with the verticality of the shaft, the members of an inclined shaft being subject to stresses different in character from those in the members of a vertical shaft. Shaft sets are as a rule placed normal to the axis of the shaft, and in a vertical shaft through solid ground and horizontal strata, the load to be borne will not be much greater than the weight of the lining.

The wall plates in such a shaft will, in general, be subject to bending stresses combined with direct compression, the loads inducing the bending stresses being applied transversely and the loads inducing direct compression being the end reactions from the next adjacent wall plates. The buntons or compartment dividers will take direct compression only, except for such small bending stresses as may be induced by their own weight or the weight of guides, ladders, pipes, etc. Where, however, a vertical shaft passes through inclined strata or an inclined shaft passes through horizontal or inclined strata, the buntons or compartment dividers may have to take, in addition to direct compression, bending stresses of large moment due to movement in the strata, while there will be

no sensible change in the character of the stresses in the wall plates. In a vertical shaft, the stuttles or hanging rods will take direct compression or direct tension only. In an inclined shaft they may be called upon to take, in addition, small amounts of cross bending stresses. We have thus in rectangular sets as ordinarily framed, all the varieties of stresses: tension, compression, cross bending and shear.

Elliptical Shafts

Rectangular cages are in almost universal use and the rectangular shaft, which is best adapted for framing in wood, offers also the largest useful area for a minimum amount of excavation. On the other hand, for the same area, useful or otherwise, the perimeter of the circular shaft is less than that of the rectangular. Given fixed sizes of cages, and ladder and pipe spaces, the useless area in a circular shaft may run from 25 to 45 % of the whole, and just that much additional expense for excavation, lining and maintenance must be offset by the cheapness of lining material and construction in order to make the circular shaft economical as compared with the rectangular form. The circular shaft has an advantage over the rectangular in that it offers less rubbing surface, and hence less friction to the air currents. The mining laws, however, usually require separate air shafts and this consideration is of little practical importance for main hoistways.

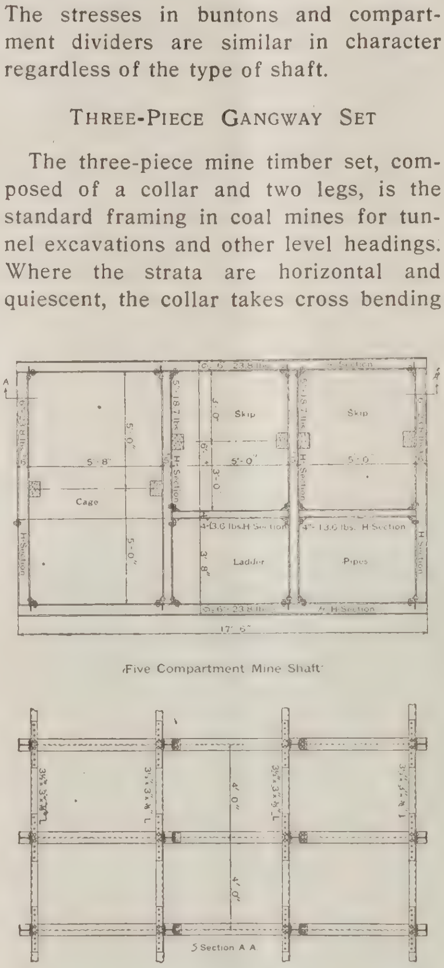
The elliptical shaft represents an endeavor to combine the uniform strength of the circular shaft with the space economy of the rectangular. It has not met with favor in England owing to the difficulties of keeping it plumb while sinking and the obstacles presented to the effective use of the standard walling or tubbing, the various sections of which must be special in the elliptical shaft while in the circular form they are alike and interchangeable.

There is some elimination of useless space in the elliptical shaft, so this type comes between the circular and the recangular in regard to the availability of space for mine uses. The elliptical shaft also takes advantage of arch action in the lining construction, which may, therefore, be of less thickness than if the shaft were rectangular. Where, however, the shaft is long and narrow, either the rise of the arch must be greater than desirable or else the lining must be made proportionately thick, with the danger of possibly giving rise to excessive shearing stresses between sections of different curvatures. The use of elliptical shafts in the United States is largely due to the employment of concrete as a lining material.

In rectangular shafts, the lining is simply a thin sheathing and serves only to hold the shaft from local fracture and to transmit local pressures to the frames which take all the important stresses. In circular and elliptical shafts the lining itself takes the stresses and, as ordinarily sunk, must be of constant or progressively increasing thickness throughout. The stresses in buntons and compartment dividers are similar in character regardless of the type of shaft.

Three-Piece Gangway Set

The three-piece mine timber set, composed of a collar and two legs, is the standard framing in coal mines for tunnel excavations and other level headings. Where the strata are horizontal and quiescent, the collar takes cross bending



Steel Framing for Five-compartment Shaft

stresses only and the legs pure compression. Failure takes place by the vertical deflection of the collar under stress beyond the elastic limit of the material or by the cross breaking of the legs under shear induced by undue compression. Where the strata are inclined and in motion, the collar may also have to take compression and the legs cross bending stress. In swelling ground, conditions are much the same except that instead of the sides of the excavation coming in, the bottom comes up or the top comes down, thus again throwing a bending stress into the legs. In case of failure, it is probable the pieces will fall towards the outside of the heading rather than towards the center. The character of the failure may be changed and its inception prevented, in a measure at least, by the use of mud sills under each set, which are always desirable in ground of this character.

Gangway sets in wood are usually made with all three pieces of the same diameter or width and depth. While in many instances this practice is wasteful, there are two reasons for it; first, the simplicity of the framing, and second, the low shearing value of wood and the possibility that under stress the full shear area may be required. As wooden mine-timber failures take place so largely by shearing, it would seem that after all, the practice may be in good accord with the best principles of structural design.

I have had occasion to coin the term "steel mine timbers" to cover the three-piece gangway set when framed in steel, and I use the term "roof support" to designate a single beam supported at its ends on the side walls and in turn supporting the roof. While the object of all mine timbering is to support the roof or hanging wall, the distinction between the framed set and the single piece has proven convenient. While it is conceivable in rare instances that they may have to resist compression, roof supports as a rule, whether of wood, steel or concrete, take cross bending stresses only, except at the ends, where they are subject to shear. They must, therefore, be figured by the formulas for flexure.

The Occurrence of Marsh Gas

By W. Hartman*

While marsh gas is occasionally found in the adjoining strata, it belongs essentially to the coal seams proper. Its distribution in the coal is often quite irregular. While not a positive rule, it is usually the case that the less cover over the coal, the smaller the quantities of gas found, since the light cover permits the gas to more readily escape.

As a result of a systematic comparison of a number of different coals, it has been found that those carrying from 20 to 25 per cent. volatile matter are as a rule the most gaseous. From coals of this volatile content, the gas proportion gradually decreases until it reaches its minimum in anthracite. This rule, however, should not be taken as infallible, for exceptions to it are not infrequent.

Thus, for example, a horizontal seam will often carry gas at one point and show no indications of it at others; and an outcropping seam seldom shows any gas near the crop but may have large quantities at greater depths. Probably one of the greatest influences on the gas contents of a fairly gaseous seam is the permeability of the strata that overlies the coal.

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Use of Grout in Shaft Sinking

By R. C. Johnson*

One of the chief difficulties of shaft sinking lies in dealing with the water that is frequently encountered. Forcing cement grout into the fissures of water-bearing strata by means of compressed air is a new and effectual solution of this problem. The advantages of obtaining dry shafts are apparent to mine operators and include a great saving in the usual cost of pumping.

Without doubt the most important step that has been taken in connection with sinking shafts in this country during recent years, is the introduction of the process for cementing water-bearing seams encountered in the sinking. Although the process has been used in a rather similar form in Germany, no reports show that its practice has extended to the grouting of comparatively small water-bearing fissures, with the idea of making practically dry shafts. In general it has been used there only when huge flows have been encountered and exceptionally great expense for pumping has been forced on the operator.

The process as actually used here, is one of forcing Portland cement grout into holes drilled in the bottom of the shaft, the cement and water being mixed in an air-stirred grout tank which is connected directly to the compressed-air supply on one side and to the hole to be grouted on the other. In view of the wonderful possibilities that the process offers for saving money, a brief description of the method as it would be used in the sinking of mine shafts should be of interest to those who have shafts to sink or to those who for years have been pumping water from the bottoms of wet shafts. To the latter, the advantages of the process will probably appeal most strongly.

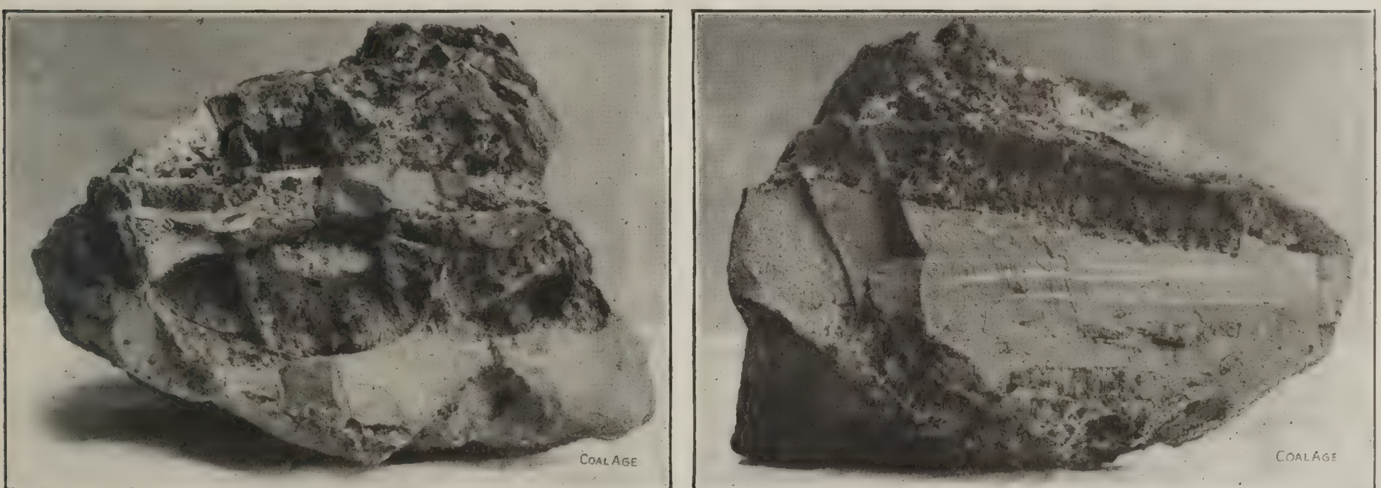

Fig. 1. Samples of Rock Showing Crevices Filled with Cement Grout

Description of Methods

Sinking is started in the usual manner. As soon as the drills "cut" water, preparations are made for grouting. The air line which is used for drilling is run close to the bottom of the shaft for connection to the grout tank. The drilling is continued until the longest length of steel used is run into the holes. Then the drills are taken out of the shaft and a small specially shaped pipe nipple, wrapped about its enlarged portion with flannel or burlap, is driven tightly into one of the holes.

To this nipple is connected a piece of high pressure hose that leads to the grout tank on the floor of the shaft. This tank is made of boiler plate, has about 4 cu.ft. capacity and is similar in shape to an upright air receiver on legs. As shown in Fig. 2, there are pipe connections for air at the top and bottom and a connection for the discharge of the grout. The sand, cement and water, which are admitted through a small opening at the top, are mixed into a grout by the stirring and bubbling effect of compressed air admitted at low pressure through the bottom inlet pipe. The only construction in the tank that aids the air in mixing the grout, is a steel grating placed midway between the top and bottom air connections.

At the bottom of the tank and opposite to the lower air connection is the pipe way for leading the grout to the drilled holes. The general arrangement is as shown in Fig. 3, certain additional blow-off pipes and connections for pressure gages being installed for cleaning and for testing purposes. Just before the grouting is started, the drill hole is cleaned by pumping, if it is merely a running hole; if the hole is a spouter it will practically clean itself.

Forcing in the Grout

The pipes are then connected to the nipple in the hole, the batch is put into the tank and air at low pressure is admitted through the bottom connection, for stirring purposes. Next, the tank door and all plug cocks are closed except one which admits air for running up the pressure in the tank to the desired mark. The plug cocks in the discharge line are then opened and the grout forced into the hole and into all the crevices leading to the hole. The holes are grouted to refusal, that is, until the gage shows by the rise of pressure that all crevices connecting with the hole are filled. The plug cock nearest the tank is then opened and the charge wasted. The other plug cock, immediately above the hole, is next closed, the grout hose disconnected from above the valve and the tank and pipes cleaned by blowing out.

The apparatus is then connected to another hole. If the grout from the first hole is seen bubbling up in other holes, they are immediately plugged. Such bubbling shows, of course, that fissures are connecting the several holes. The one grouting connection will in this case serve for all the holes in which the grout is seen. If the grout is seen to rise through crevices in the floor of the shaft, a different method of procedure is required. It is necessary to place over the

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floor of the shaft a reinforced concrete mattress which is allowed to set for a couple of days. Holes are then drilled through this mattress, just as if it were a shaft bottom, and the grouting process continued as before.

At first, the drill holes are spaced over the shaft bottom just as they are spaced for shooting and the grout tank is connected to every hole that shows water. The grout is allowed to set for about 8 hours and after this, test holes, deeper than the regular round, are

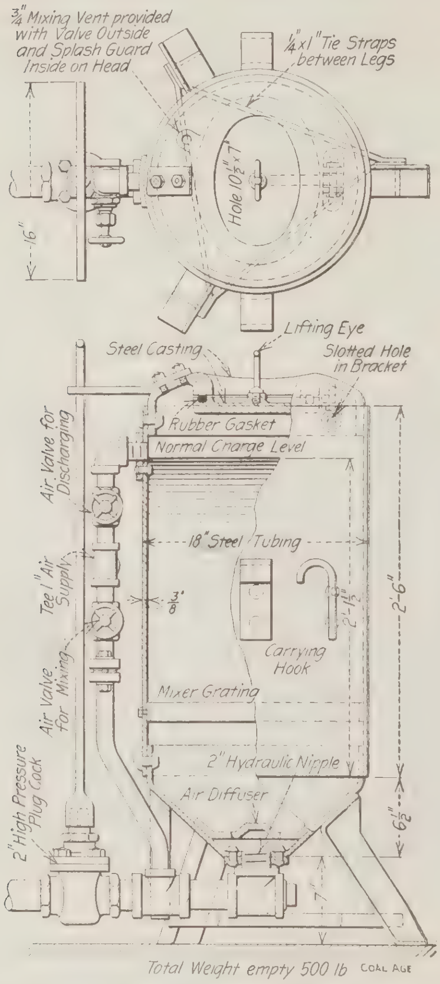


Fig. 2. Grout Mixing Tank and Connections

placed along the rib. If these show water, they are grouted and additional test holes are drilled until no water rises from the rock. The shaft is then again drilled for shooting, the number of side holes being increased so as to cut the rib as clean as possible and keep the grouted seams solid. In the regular process of sinking the shaft, the sump is then fired and mucked. The grout will appear in the crevices it has filled, like a white fine-grained sand stone. In one instance, a section of a gneiss rib, so treated, appeared as a prominently white-streaked dark marble. The benches are then fired and sinking resumed in the usual manner until more water is "cut," when the process is repeated.

Pressures Required for Grouting

The pressure required to grout a hole is dependent on the pressure of the water coming from the hole because the grout must take the place of the water. Theoretically the application of this process is limited only by the pressure that the air compressor can develop and the air connections can withstand. The height that the water reaches as it spouts from the drilled hole is an accurate indicator of the least air pressure that will be required but the pressure actually used will be often much greater than indicated by this head, in order that the most minute crevices may be plugged.

However, when using high pressure every precaution must be taken against blowing out the nipples and breaking the connections. In one case, described later, it was actually necessary to drill the rock and insert wedge bolts to chain down the pipe connections to the holes. The water and sand spouted from these holes with such force that a 2" plank, placed over the hole to deflect the water, was in one case completely bored

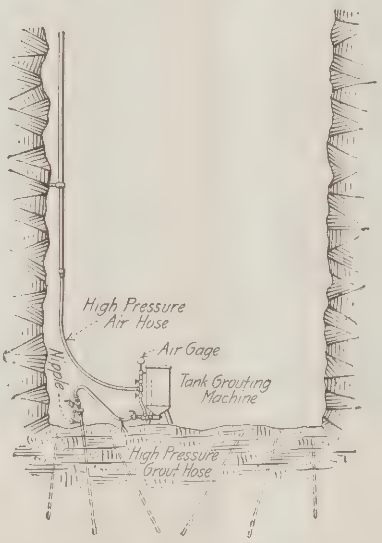


Fig. 3. Shaft Bottom, Showing Arrangement of Grouting Device

through in about two minutes. While drilling one of these holes, a 10-ft. steel dropped down the bore when it struck a stratum of sandy disintegrated gneiss that was later found to be producing the water. In a few minutes the steel was seen to shoot out of the hole and some distance up the shaft with a stream of sand and water behind it.

Recent Grouting Operations

In sinking the No. 4 shaft of the city tunnel for the Catskill Aqueduct in New York, a stream of water was encountered at a depth of 149 ft. As soon as the drills struck the water the contractor decided to attempt to cut off the flow by plugging the crevices with cement grout. Anyone familiar with shaft sinking knows of the many difficulties of pumping, and in round shafts such as are the large majority on this Aqueduct, the troubles are more than doubled because of the general practice of drilling the entire round on one shift. The handling of a pump at the bottom of a round shaft for only 30 gal. of water per min. means a loss of at least 5 ft. of sinking per week. It was of advantage then, both to the city which paid for the pumping and to the contractor as an aid to his speed that the water bearing fissures should be grouted if possible. Accordingly a grout machine of the Caniff patent type was procured and taken down the shaft for connection to the holes showing water. Only two days were lost in completely sealing off the flow and the sinking was resumed.

However, on Oct. 28, at a depth of 183 ft., the drills "cut" a stream of such high pressure that while there was no loss of time in deciding what methods to pursue, there was, and still is, considerable speculation as to its cause. A gage placed on one of the drill holes regis-

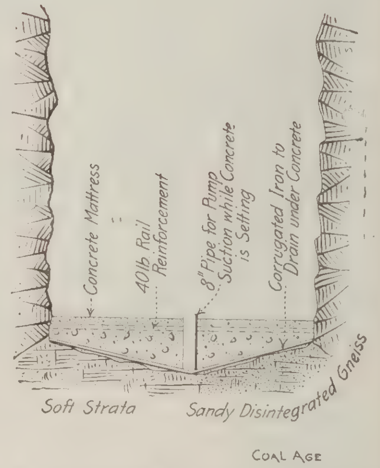


Fig. 4. Concrete Mattress at Bottom of Shaft

tered 65 lb. and it required but a moment to figure that the water was coming from near the rock surface. The shaft is situated within 100 ft. of the Jerome Park reservoir and within a few hundred feet of the Croton Aqueduct. Shooting into the water under such pressure seemed suicide and as later developed, the shaft would probably have been "drowned out" had it been attempted.

It was decided to provide a high pressure grout machine with high pressure fittings. As previously noted it is essential that the grout be forced into even the finest crevices, and when it is known that over 300 lb. pressure was used on some of the holes—335 lb. on one of

them—the effectiveness of the work can be appreciated. Nevertheless test hole after test hole was drilled and still the water persisted in appearing. Finally a complete ring of holes was drilled around the periphery of the shaft, the holes being kept close together. These were grouted and the cut and side holes fired. The water pressure had decreased considerably but a new condition appeared.

A Concrete Mattress Used

The bottom of the sump was soft and sandy and soon proved to be badly disintegrated gneiss, an unusual occurrence, surrounded as it was by the hardest kind of material. Attempts to grout off the water in this sandy structure failed at first because the grout would bubble to the surface and allow but little pressure to be put into the holes. It was finally found necessary to cover the whole shaft bottom with a reinforced

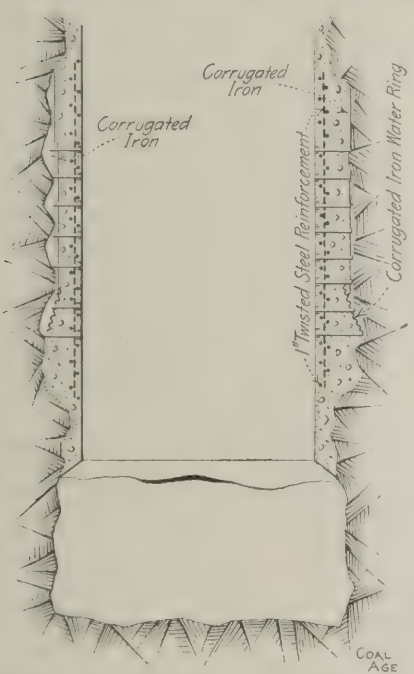


Fig. 5. Reinforced-concrete Shaft Lining

concrete mattress as shown in Fig. 4. The concrete was placed on corrugated iron to allow drainage to an 8 in. pipe that was stood upright in the center of the shaft to carry the pump suction while the concrete was setting. Holes were then drilled through the mattress and down into the rock and attempts made to grout.

The flow was decreased considerably but not entirely. The reason for this became clear when the concrete was removed and the rock shot up. Pieces of the grout, shaped precisely like a diamond drill core, were found in the muck with clumps of cemented sand clinging to them. Clean, or even fairly clean, crevices were grouted perfectly but strata of sand were only matted in spots and it was from these strata that the remaining water was coming. Sinking was then continued for about 20 ft. and the regular concrete lining of the shaft was started.

The shaft was enlarged through the soft sandy strata so as to permit ample drainage channels behind a heavier-than-usual reinforced concrete lining. As reference to Fig. 5 will show, grout pipes were run from the inside face of the lining back to these drainage channels. These pipes carried the water through the lining into the shaft and after the concrete had set for a week or so, they were closed with ordinary plugs, thus completely shutting off the entire flow. Later, these plugs were removed and grout forced in behind the lining to fill the drainage channels.

Advantages to the Mine Operator in Obtaining Dry Shafts

The fact that the problem of dealing with the water encountered in sinking a shaft has met with a new and effectual solution, marks a big step forward but by all odds the greatest advantage of the grouting process is the saving of money that the mine owner would otherwise have to spend year after year in pumping the water of a wet shaft. The cost of pumping 200 gal. of water an hour from the bottom of a mine shaft 500 ft. deep is easily figured. This is probably an average quantity for a shaft of that depth and will require about 25 water horsepower. Taking as a basis a direct acting pump using 90 lbs. of steam per horsepower hour it is readily figured that 75 boiler horsepower are required. A horsepower will cost the mine operator about $20.00 per year and $1500.00 per year will be the total expense for pumping the shaft water.

Grouting with cement and sand as the shaft is being sunk will save this expense and under ordinary conditions, crevices that will produce a flow of 200 gal. per hour, can be grouted solid for much less than a year's cost for pumping. With successful grouting, no water rings will be required and so the actual increase of first cost to the mine operator will be small. The idea is new in this country and the method as it has been described here is entirely new to shaft sinking practice. It has proved a success in every instance that it has been tried of late and engineers who have studied the operation pronounce the shaft water problem solved.

In certain English mines, experience has shown that a small quantity of soap dissolved in mine-sprinkling water adds to its effectiveness as a dust layer, as the soap tends to coagulate the dust and hold it down.

Pittston District Mining Institute

Special Correspondence

The annual dinner of the Pittston District Mining Institute was held, this year, in the new State Armory, at Pittston, Penn., Saturday evening, Feb. 17. The banquet was the most successful that has ever been conducted by the Institute. It was attended by 600 of the seven or eight hundred members. W. T. Jennings, superintendent of the South Pittston district, for the Pennsylvania Coal Co., and president of the institute, presided with his usual grace and efficiency. President Jennings introduced, as the toastmaster of the evening, Judge O'Boyle. The judge delivered a well rounded and eloquent address, and told in his own inimitable fashion many amusing stories.

One of the best and most forcible addresses of the evening was made by the Rev. W. T. Blair, of Plymouth, Penn. The reverend gentleman's subject was, "The Man on the Job." The address was full of encouragement and inspiration.

An excellent address was delivered by Samuel J. Jennings, mine inspector, eighth anthracite district, outlining the work and the purposes of the Miners' Institute. Mr. Jennings asked for a greater interest and coöperation on the part of all the members, and hoped in the coming year that they would be able to reach a larger number of the foreign element among the miners, and be able to help them to a better understanding of mining dangers and conditions.

Other District Institutes Send Greetings

The greetings of the Scranton District Mining Institute were presented cordially by Mr. Andrew Bryden, of Scranton. Mr. Charles Enzian, of the Bureau of Mines rescue work, was present, bringing the greetings of the Wilkes-Barre District Institute. Hon. James E. Roderick, chief of the department of mines, Harrisburg, Penn., was to have addressed the meeting, but was unavoidably detained.

The final address of the evening was given by J. T. Beard, associate editor, Coal Age, New York City. Mr. Beard spoke briefly of the peculiar environment of the coal-mining industry at the present time. He referred to the fact that coal, being a necessity of life, its price was limited to what may be called a *living price*. This was stated to be the upper limit, while the *living wage* demanded by the miner was described as the lower limit in the cost of production, in coal mining. Mr. Beard drew the conclusion that the range between these two limits was so narrow as to require a greater efficiency on the part of mine officials and miners alike. This was declared to be the practical solution of the problem.

Rock Dust in Explosions

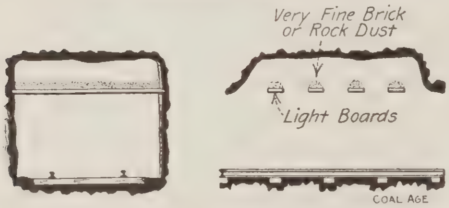
By A. E. Lindrooth*

The many recent disastrous mine explosions have shown one thing conclusively, and that is that could each explosion have been limited to the entry in which it started, the loss of life and damage to the mine would have been small.

There is a need for a simple and reliable method of stopping the progress of the flames propagated by the explosion.

From England comes a hint that is at least worth while trying. The flame of an explosion is doubtless of exceedingly short duration, and if a dead space of 20 or 30 ft. could be provided at each entry, it is probable that most of the explosions would be limited to the entry in which they originate.

The suggestion is to provide a means of instantaneously filling a portion of the entry with a noncombustible powder which will dampen the coal dust and stop the progress of the flames. This is accomplished by taking down about 2 ft. of the roof and resting light boards



Rock Dust for Deadening Explosions

about 10 in. wide, spaced about 22-in. centers, on notches made in the opposing ribs, and covering the boards as thickly as possible with exceedingly fine or impalpable rock dust. The force of an explosion would tend to dislodge this dust in a large volume, thus completely clouding the air and forming an obstacle to the spread of the flames. The scheme is so simple and so easy to try that further experiments should be made to determine its efficiency.

Electrical Shot Firing

By W. Hartman†

The principal disadvantage of electrical shot firing lies in its lack of simplicity, since electric current, wires and special detonators have to be arranged for. For this reason this method is often rather expensive.

As far as the safety of the miner is concerned, electrical firing is much superior to other methods, as it gives the greatest assurance that the shot will go off at a fixed time; thus enabling the miners to go to a safe place and fire the shot at their leisure. It also eliminates the danger incident to going back on a dead shot—a frequent cause of serious accidents. In addition to this, the gaseous condition of the mine need not interfere with the shooting.

In firing all the shots in the entire mine simultaneously, the danger of a dust explosion is also eliminated, or greatly reduced, as conditions at the face remain the same for all shots. On the other hand, when fired with fuse, by the time the last shots are being fired, the mine air is so agitated and filled with flying dust as to be in a highly dangerous condition.

The simultaneous discharge of a number of shots at the same point is also of advantage from an economical standpoint, as, when shooting off the solid, the result of several shots fired at the same instant is nearly double that when fired separately.

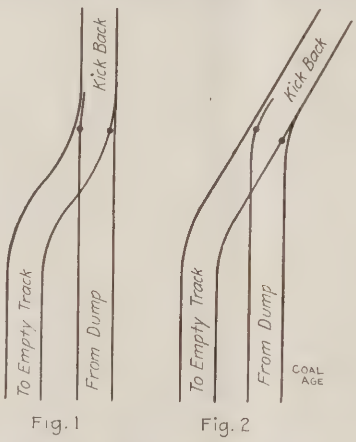
*Boston Building, Denver, Colo.

†143 Liberty St., New York.

Cross Over Dumps

By Benedict Shubart*

Where cross-over dumps are used, the ordinary straight track kick-back is a source of constant delay, due to derailed cars, particularly where cars have a short wheel base or are old and rickety.



Wrong and Right Way to Install a Kick-back

The usual method of laying the kick-back track is shown in Fig. 1. By laying the track as shown in Fig. 2, the switch is passed while the car is going comparatively slowly. Furthermore, the switch is trailing. When the car returns from the kick-back, it runs on the straight track and is much less liable to derailment. The curves shown on the sketches are exaggerated in order to convey the idea. In fact, the curves should be as long as the limits of the tipple will reasonably permit.

The coal fields of Spain cover an area of 4117 square miles and give employment to 26,932 persons, 1128 of whom are females. Anthracite, bituminous and lignite are included in the production.

*Boston Building, Denver, Colo.

Fifteenth Annual Banquet of the Northeastern Pennsylvania Engineers

Special Correspondence

Nearly 300 men attended the 15th annual banquet of the Engineers' Society of Northeastern Pennsylvania, held at the Hotel Casey, Thursday evening, Feb. 15. The whole affair was both interesting and instructive—interesting, because of the good cuisine service, and the excellent music rendered by a local quartette; instructive, because of several worthy addresses.

The president's address, delivered by A. B. Jessup, mining engineer of the Lehigh Valley Coal Co., was a most excellent talk, one of the very best it has been our pleasure to hear this gentleman deliver. Mr. Jessup particularly boosted the idea of a club house for the members of the society, and it does seem that such a representative body of engineers, largely concentrated in a small area with first-class transportation facilities, should be able to supply themselves with a common meeting place in keeping with the great industry these men represent.

Homer Greene, of Honesdale, Penn., was toastmaster and performed this service in a most creditable manner. Mr. M. W. Alexander, of Lynn, Mass., gave a talk on "The Industrial Value of Engineering Education." Mr. Alexander handled a rather dry subject in such a way as to command the close attention of those present. His experience derived from his sociological work with the General Electric Co. fitted him admirably to present interesting thoughts on present industrial problems.

Mr. Bigelow, state highway commissioner of Pennsylvania, talked to the engineers present about "The Roads of Pennsylvania and What the State Expects to Do with Them." Other addresses were delivered by Judge Newcomb, of Scranton, and Mason D. Pratt, president of the Engineering Societies of Pennsylvania, Harrisburg, Penn. Mr. Pratt advanced the suggestion that it would be a good thing for all the engineering societies of Pennsylvania to unite in a great federation so as to increase their power and thereby enlarge their influence for good.

The points which most impress mining experts visiting foreign coal mines are: In England, the care given to underground details and the perfection of all construction work; in Belgium, the high degree to which hospital and rescue work have been carried; in Germany, the magnificent equipment of the mining plants and power houses, and the fight against ankylostomiasis, carried on by means of sanitary provisions underground and baths for the miners; in France, the completeness of chemical, electrical and laboratory research.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Causes of Gob Fires

The report of W. H. Pickering, of the York and North Midland inspection district of England, gives the following details relative to the danger of explosions resulting from gob fires, and the causes which aid and create the latter: "When stoppings are being erected to shut off a gob fire, there is always serious danger of an explosion in cases where inflammable gases escape from the strata or are distilled by the heat. The danger increases with the extent of open area inclosed. If there are large open spaces beyond the stoppings, the danger of a violent explosion is great; but if the open area inclosed is small, an explosion is unlikely, and if one occurs it will be in the nature of a puff of flame with little force.

The danger is far greater shortly after the air current has been stopped or checked by the building of walls. The spaces within the stopping will be unventilated, and explosive mixtures of gas are likely to accumulate. The air will not be stagnant, for the heat of the fire will produce currents by convection, and these may be the means of carrying the explosive mixture to the fire. If no explosion occurs shortly after the air current is cut off, the danger is usually over, for the supply of oxygen will rapidly diminish and the products of combustion will also make the formation of an explosive mixture impossible. I had the experience of witnessing a very violent and extensive explosion while a colliery fire was being sealed. It occurred about five minutes after the air current was cut off.

Why Gob Fires Occur

The danger of gob fires is greater in the newer pits, for up to the present the fires have been more numerous, and extraordinary quantities of firedamp are found. In some cases petroleum oil drips from the roof, and saturates the timber. This is another element of danger. The gob fires occur for the most part at the edge of the shaft pillars, and in places where ribs or pillars of coal have been left or lost, and where timber has been left in the gob. Fires occasionally occur in the roadways in the coal, and at times in the shale over the seam.

At first sight it might be assumed that the fires in the Yorkshire mines were the result of leaving so large a percentage of coal in the gob. No doubt, this makes fires more serious and dangerous when they occur, but it is by no means certain that it is the primary cause. If it were, then fires could not fail to be more numerous at the pits where coal equal to a seam 4 ft. thick is left to be ground to slack in the gob.

At some of the collieries no fires occur, though their neighbors, working the same seam under what appeared to be the same conditions, have serious trouble. There is some evidence that the fires usually have their origin in breaks in the hard or steam coal, and they seldom occur when the whole of this is extracted. As this is the most valuable part of the seam, it is not left except in cases of shaft pillars, heavy falls, faults, etc.

Practical tests seem to show that this coal is more difficult to ignite than the soft coal, and it is posible that the fires are caused by the fine dust which results from the grinding of the soft top coal during the settlement of the strata. This lodges in the cracks of the hard coal and rapidly absorbs oxygen. This coal also contains iron pyrites, which would generate heat in such circumstances if moisture were present. Timber is far more easily ignited than coal, and that is the reason why it is dangerous to leave it in the goaf; it does not cause the heating, but supplies the tinder.

Periods of Danger

I am indebted to Mr. W. H. Chambers for a list of gob fires at Denaby and Cadeby Main Collieries during the past 30 years. Perhaps there may be some atmospheric reason why so many of them have occurred during the months of November and February. The figures for the months in which gob fires started are: January, 2; February, 8; March, 5; April, 1; May, 6; June, 3; July, 4; August, 6; September, 3; October, 4; November, 10; December, 4—making a total of 56, or nearly two a year. At the two new collieries recently opened in the Doncaster area, 17 cases of spontaneous combustion were reported during the past year."

Conveyors for Use at Coal Face

By H. Ridsdale

Several types of conveyors are being used in England to convey coal from the shoveler to the car. Some are continuous, some discontinuous and reciprocating. They not only increase output but reduce risk from falls of roof.

Note—Abstract of paper read before South Staffordshire and Warwickshire Institute of Mining Engineers, England.

The use of coal-cutters necessarily concentrates longwall workings, and, in order that they may be a commercial success, it is necessary to clear away rapidly the machine-cut coal from the face. This can be done either by an increased number of roads, or by the use of conveyors; and it is because the maintenance of roads—especially in thin seams—is such an expensive item that conveyors have been designed. Nearly all types of conveyors in use at the present day have been specially designed to suit some particular local conditions.

Apart from giving rapid clearance to coal-cutters, conveyors reduce labor and deadwork charges, even when coal-cutters are not employed. These charges are not only reduced by the rapid working of the seam, thus securing an increased output from a given length of face, but also by the consequent reduction in the ripping and deadwork required in the face and roads. The reduction of labor-costs naturally raises the question of the method of payment for labor in connection with conveyors. Various methods have been tried, and perhaps the most successful is the division of the tonnage delivered by the conveyor in proportion to the number of cubic yards worked by each individual man. Other methods have been adopted, such as payment of day wages, but everyone knows the disadvantages of this method; while, in other cases, the conveyor face has been let to a contractor; but, since he is a man without capital, the employer is usually expected to make good his wages in case of a deficit, while in the alternative the contractor reaps the benefit.

Electricity Economical but Compressed Air Safer

Conveyors are usually driven either by electricity or by compressed air; the former method is probably the more economical, while the latter is probably the safer, more particularly if the engine be placed at the delivery end of the conveyor. There a cloud of dust is created, which suggests the necessity for brisk ventilation, and seems to point to the use of compressed air. The position of the motive power for driving conveyors is usually fixed by the makers, but in some instances this is left to the discretion of the user. There are two positions available; the one at the delivery end, where it is under the direct supervision of the filler, and therefore to be preferred; the other at the trailing end, where it renders the tension arrangements simpler.

The Blackett Conveyor

The Blackett conveyor, which consists of an endless chain working in steel troughs supported by an angle-iron frame built up of sections called "gates," which are joined together by short spikes fitting into circular holes. The fact that the chain is made up of links, any one of which can be opened, and as many links as desired inserted, allows of an easy lengthening of the chain or the replacement of a broken link (unless it should happen to be in the bottom chain), and this constitutes one of the chief advantages of the conveyor.

The motive power, speed-reduction gear, sprocket drum and end trough are all mounted on the same bedplate, and

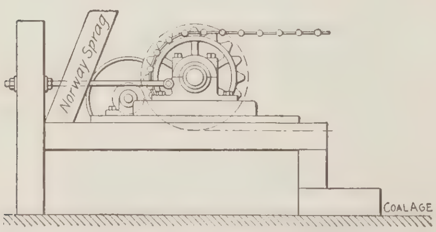


Fig. 1. Tension End, Blackett Conveyor

the whole can be swung across with a Sylvester pulling bar, when moving the conveyor forward. At the tension end of the conveyor the gates are held in position by two sprags placed between the roof and the bedplate, and the chain is tightened by the nut and bolt arrangement shown in fig. 1.

For the proper working of this conveyor, it is absolutely essential that it be laid down in a straight line, and that the floor be even. With an uneven floor, or in case of incorrect alignment, the chain will rise in the troughs. The chain tends to pull straight and in moving round a curve, under heavy load, it rises from the bottom of the troughs, allowing some coal to get underneath and forcing humps over the sides. Slack is also a source of trouble, as the chain will ride on it.

The Sutcliffe Conveyor

The Sutcliffe conveyor is similar in design to the Blackett conveyor, the chain being replaced by an endless canvas or wire-cloth belt 20-in. wide, which runs between two 3 by 3-in. angle irons supported on brackets. These angle irons are made in 9 ft. lengths, and are fixed to the brackets by bolts so as to form a

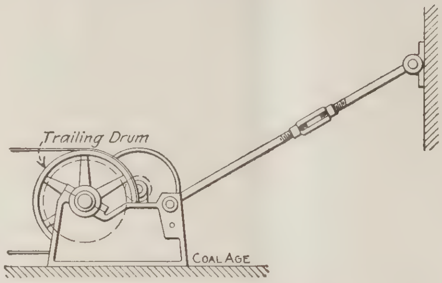


Fig. 2. Tension Arrangement, Sutclifee Conveyor

trough; the brackets are 9½ in. wide at the top and 13½ in. at the bottom, and stand 13½ in. high. Each bracket supports two rollers, one to carry the top and one the bottom belt; intermediate rollers are also placed halfway between the brackets for the top belt to run on, these rollers being fixed to the angle irons. The belt is joined together by riveting copper plates on to each half of it, so forming a dovetail joint like a hinge, through which is passed a steel or copper pin.

It is not desirable to have too many joints on the belt, or to have these too close together, as, being less flexible than the belt itself, they become a source of trouble. The engine, driving gear and first pair of angle irons are in this case mounted on one bedplate. The engine is slightly larger than in the case of the Blackett conveyor and drives the belt by a chain and sprocket wheels, the larger sprocket being attached to the drums round which the conveyor belt passes.

The belt in returning is carried over a roller fixed immediately behind and geared with the drum, so that the belt is in contact with at least two-thirds of the drum surface. The engine is capable of driving a conveyor up to 150 yd. in length. This conveyor is made so that it can be reversed when desired. The tension on the belt is obtained by using a Sylvester pulling bar or chain block the final adjustment being made by a double-threaded screw, as shown in Fig. 2.

The conveyor is moved toward the face in almost precisely the same manner as the Blackett conveyor, and, if the roof will not permit of its being swung bodily across, it must be systematically taken to pieces. It has been found in practice more convenient and better for the working of the conveyor to avoid breaking the same joints each time when moving it. This machine has one advantage over the Blackett conveyor; it will carry slack and small coal without difficulty; on the other hand, water will cause the belt to slip on the drum.

The Ritchie Conveyor

The Ritchie conveyor consists of a canvas-wire belt about 25 yd. long, working to and fro in steel troughs by a main-and-tail haulage arrangement, the main rope being attached to the front end and the tail rope to the back end of the belt. The troughs are made in 6 ft. lengths, 22 in. wide, 8 in. deep on the gob side, and 4 in. deep on the face side, to facilitate the filling of large coal. In order to prevent the belt from catching in the ends of the troughs as it travels backwards and forwards, projecting edges are avoided by specially constructed overlapping curved joints, made as shown in Fig. 3.

The engine (which may be similar to that used on the Blackett conveyor), speed-reduction gear, and main-and-tail drums, are all supported on angle-iron framework, and the whole run on rails in the gate-road, thus rendering all working parts easily accessible. The drums are driven by a chain drive and gearing, and are thrown in and out of gear by means of friction clutches. The first trough, which is fixed to the angle iron framework by four bolts, is placed immediately over the main drum, and projects beyond

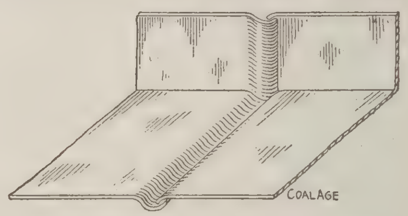


Fig. 3. Trough Joints of Ritchie Conveyor

it, allowing the belt to be wound on the main drum as the coal falls into the car.

This conveyor has the advantage of being easily and rapidly moved, even though it has to be taken to pieces. This type of conveyor is more simple to lengthen than the Blackett, and an undulating floor is not detrimental to its economical working. It has also these further advantages—no tension is required, and it takes an even load in either direction. It has, however, one advantage—it necessitates driving a road sufficiently wide to carry both the engine and the car to be filled. I again find it extremely necessary to insist that this conveyor must work in an absolutely straight line, otherwise the belt will catch in the troughs and buckle up.

The Gibb Conveyor.

The Gibb conveyor, which consists of two end-discharging gears and several intermediate cars, the number of which depends entirely on the length of face and local conditions, is a type of conveyor in which the position of the engine is not necessarily fixed, but the best position for it is at the delivery road. In order that the car may be efficiently filled the buffer skids must project out to about the middle of the road, and this projection is awkward and inconvenient. This conveyor need rarely be taken to pieces when being moved.

A soft and undulating floor is very detrimental to the economical working of this conveyor, and if these conditions prevail trouble is bound to arise. The conveyor must also work in a straight line; it is advisable to keep it a reasonable distance from the timber, as loose coal or rock will at times cause it to turn over and knock out the props. The efficiency of the conveyor depends on its being rapidly filled and emptied; and, consequently, if the coal requires much manual labor to get, the work is better concentrated on a length of face about equivalent to that of the conveyor, usually from 45 ft. to 75 ft.

Fig. 4.

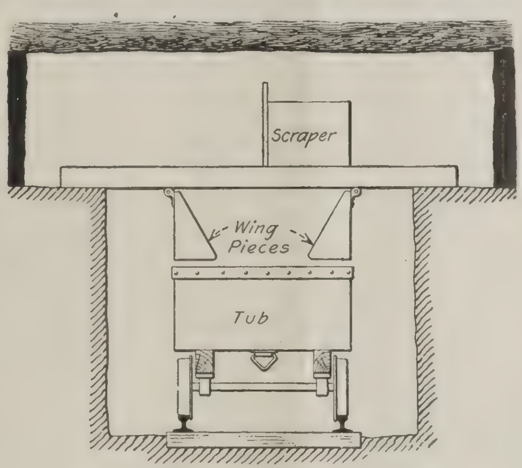


Fig. 5. COAL AGE

Figs 4 and 5 Show Section and Loading Arrangement of Thomson Conveyor

The Thomson Conveyor

The Thomson conveyor may be described as a broad iron trough having one side removed, built up in sections, each section being 6 ft. long, 21 in. wide, and 8 in. deep on the gob side, the face side being the one left open to facilitate the filling of the conveyor (Fig. 4). The sections are joined one to the other by a shackle and pin, the joints being protected by the sections overlapping each other. Riveted to each section are two strong steel skids, on which the conveyor slides along the floor. As the sections stand 4 in. off the ground, the extreme total height of the conveyor is 1 ft., and it can therefore be used in a thinner seam than any other type, which is one of its advantages.

The conveyor is designed to work in a face twice its own length, the delivery road being fixed in the middle. The conveyor works across the road on a bridge constructed of two steel girders spanning the opening; and to this bridge are fixed one or two scrapers, according as the delivery road is single or double. The scraper is hinged at one end, the hinge being bolted to the bridge, and is prevented from swinging too far in either direction by two pins.

The working of the scraper is automatic, the conveyor pushing it until it attains an angle of 135 degs. to the direction of motion, so that, as the conveyor passes on, the coal is diverted into the car beneath. Two wing-pieces placed underneath the bridge form a chute into the car. Fig. 5 is a sketch of the bridge. It must be noted that these wing-pieces constitute one disadvantage of the conveyor, in so far as they necessitate more being cut out of the road bottom.

I would advise a double road being used, in which case the two scrapers work as already described, one scraper being put out of action as circumstances require by lifting out the pin and swinging it back. The advantage of having the double road is that no time is lost in waiting for a car; but at the same time it must be remembered that a double road is being driven to serve one conveyor only, and not two, as is the case with the Blackett conveyor, for instance.

The makers use only one rope to drive this conveyor, but experience goes to show that it is better to use two ropes working on the main-and-tail haulage principle, which does away with the tension arrangement. If this method be adopted, it is found in practice advisable to have the conveyor working on one side of the timber and the rope on the other. The engine is usually fixed in a recess a little distance along the face. Any type of engine may be used, the horse-power depending entirely on the length of face to be cleared.

This conveyor is easy to move; it is simply drawn up to one end of the face, the main rope is then disconnected, taken round the timber, up the new run, and connected up again. A few props are knocked out near the bridge and the conveyor bodily pulled across into its new position, being guided through the pathway made by knocking out the timber. The last section of trough generally has to be moved by hand. When the conveyor has been completely pulled over, the tail rope is disconnected, taken round the timber, up the new run, and connected up again; the pulleys at the two ends of the face are moved, care being taken to get them into their correct position, as the satisfactory working of the conveyor depends largely on this. Lastly, the bridge is moved into its new position, its correct alignment, which is an important point, usually being determined by the lie of the ropes. This conveyor, like all others, must work in a straight line, but an undulating floor is not so detrimental to its economical working as in other types.

The Bunker Conveyor

The bunker conveyor is the cheapest and simplest of all the conveyors; it consists essentially of trams, the size and number of which depend entirely on local conditions. In the conveyors of this type which the writer has seen, the trams were made of sheet iron, with all four sides sloping at an angle of about 30 degs. towards the bottom. The dimensions of the bottom of the tram are 3 by 2½ ft., and the depth on the gob side 18 in., the face side being again lower to facilitate the filling of large coal. The bottom, which is the great feature of this conveyor, consists of two doors hinged at the ends, opening outwards and downwards and normally kept shut by means of a bar and pin, as shown in fig. 6. Fig. 7 shows a side elevation of a tram with the doors open. The trams are connected together by a shackle or coupler and run on rails which bridge the delivery road in a manner similar to the Thomson conveyor. It is the usual practice to make the gauge the same as that of the pit cars, although this rule need not be adhered to.

The engine driving this conveyor is situated in a recess in the gob near the delivery point, and the driving rope passes from the front end of the trams around a pulley at the top end of the face, back on to the driving wheel of the engine, whence it passes round a pulley at the other end of the face, finally finishing up on the back of the trams. The method of driving may thus

be compared to endless haulage. The necessary tension on the rope is obtained by means of a Sylvester pulling bar attached to one of the pulleys at the end of the face.

Almost any type of engine can be used for driving the conveyor, but a totally enclosed engine is to be preferred. The method of filling with this type of conveyor is as follows:—The car is brought up under the bridge, the first tram of the conveyor brought over it and the doors opened, thus allowing the coal to fall into the car, when empty, the doors are shut; the next tram is brought into position, and the process is repeated until the car is full. One of the chief advantages of this conveyor is that it will operate almost any length of face; but it is the better practice to have the delivery road in the middle of the step being worked.

The conveyor is moved in the following manner:—The trams are first drawn up to one end cf the conveyor face, the tension is slackened, the rope uncoupled and coiled up, and the rails are moved and relaid in their new position until the trams are reached. The trams are then lifted across on the rails already laid, the remaining rails fixed in place, and, finally, the engine is moved. The rope is then coupled up to the tension, and adjusted. This is the only type of conveyor on which alignment and undulating floors have no serious economical bearing. It is efficient, and is easily lengthened, and in addition, since the design is so simple, the cost of upkeep and repairs are correspondingly small.

Two Conveyors Should be Used

The most economical method of working conveyor faces is to have two conveyors, one a few yards in advance of the other, delivering into one gate road. The road should be laid with a double track, having the bottom cut out to such an extent that the tubs will pass under the conveyors and be driven on from 10 to 12 yards in advance of the first conveyor, so as to allow of standing room for cars. Should circumstances not permit of a double road being carried, it is better to have two face conveyors delivering into one gate conveyor; and when within 100 yards of the limit to which it is intended to carry the workings forward, I would suggest, as a general practice, the use of a gate conveyor, thereby saving the cost of driving the last 100 yd. of road.

The Blackett conveyor, when used as a gate conveyor, can be lengthened to suit the advance of the face, and herein lies one of its advantages. It will also be clear that continuous running conveyors, such as the Blackett or Sutcliffe, are more suitable for delivering into gate conveyors than the other types described.

The efficiency of a conveyor depends manifestly on the rapidity with which the cars are changed, and this is one of the difficulties of conveyor work, more particularly so when a single road only is available, or when a gate conveyor is used. In order to cope with this difficulty, it is desirable to use as large a car as possible, and to keep the permanent mechanical haulage close to the face.

Great difficulty in the successful working of conveyors arises from the presence of small faults, not merely because they present obstructions in working by breaking the continuity of the coal face, but because they also give rise to an undulating floor and bad roof, and assist in bringing on pressure or weight.

Conveyors, an Aid to Safety

Conveyors are a valuable aid to the rapid advancement of the face; their use also involves the systematic setting of timber, as much labor is saved when moving the conveyor if the posting be regular; while the rapid advance in the face and the systematic setting of timber, make for increased safety to life and limb by securing a better roof. Weight upon the coal is beneficial in making the working easier if the coal is hard; but, if the coal is friable, weight tends to produce a large percentage of small coal. Here, again, speed in working is economical, since the weight has a shorter time in which to act; and as conveyor work involves keeping the face straight, weight is more uniformly distributed, and an increase in the percentage of round coal results. The effect of weight on the floor is to make it heave, more particularly if the floor be soft or moist, and cases have been known where machine mining and conveyor work have overcome this difficulty—again by promoting rapid working of the face. From these remarks, it will be gathered that where it is advisable to work with rapidity, machine holing and the use of conveyors are advantageous, as the speed of working is from five to six times as great as by hand labor when both are used, or, with conveyors alone, from two to two-and-a-half times as great.

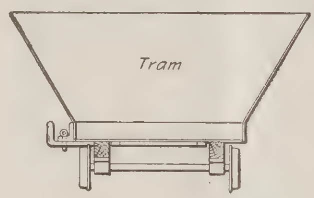


Fig. 6. Cross-section, Bunker Conveyor

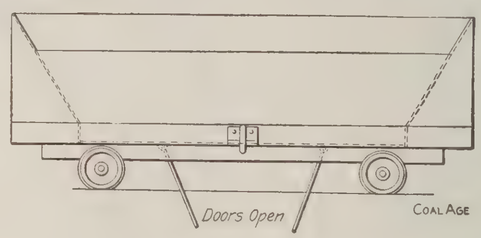


Fig. 7. Side View of Same Conveyor

Difficulty in Gob Filling

No reference has yet been made to the building of the pack or gob. In beds which do not make sufficient dirt, and which necessitate the making up of the gob, this is a difficult question; taking in filling for the gob is an expensive item, and affects seriously the results obtained from conveyor work, as, so far as I have observed, there are no conveyors which appear to be specifically designed to take in dirt, although most types are capable of doing so. If the gob is not built up with refuse, and especially if the seam is liable to great weight, the use of very strong timber on the gob side of the conveyor is unavoidable, in order to keep a good roof ahead, while allowing the roof to break down behind.

As regards the distribution of labor on the face, the great advantage of continuous-running conveyors, such as the Blackett and Sutcliffe, lies in the fact that every man gets an equal chance of using the conveyor. In other types, the men working near the delivery road will have the use of the conveyor for a greater length of time than those working further along the face, as, obviously, while the entire length of the conveyor passes the former, they have an added advantage in the slight delay required for unloading, whereas the latter only get a proportionately decreased length of conveyor and time for filling it. In order that the best possible output may be secured from the end of the conveyor-face, more labor is therefore usually concentrated there than at, or near, the delivery road.

The question of machine mining and conveyor work in very steep seams is an interesting problem. Cutters of the bar type can be used, and have been used, in seams of very high inclination; but, when the use of conveyors in steep seams is being considered, the "angle of rest" for the broken coal comes into play. This angle, which is not fixed, varies for different sizes and qualities of coal; where the seam, however, is too steep to allow of mechanical conveyors being used, a "natural" conveyor can frequently be made by using the floor as the bottom of a chute.

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Of this issue of Coal Age, we will print 7000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Another Minimum Wage

The minimum wage provision demanded by the anthracite mine workers is wholly different, more logical and in accord with economic principles than that which the labor leaders and the miners of England are demanding.

In that country, the miners hope that arrangements may be made whereby men who cannot earn a minimum on a simple tonnage basis may receive what is rated as a living wage. The rate is not placed unreasonably high, but it is high enough that men who desire to shirk their task can avail themselves of the minimum clause to assist in trifling their time away at the working face on the pretence that they can accomplish little because they are laboring in an "abnormal place" where the presence of clays, faults, binders or rotten roof, makes coal extraction slow and difficult.

Economically the demand of the anthracite miners is sound. They ask that when the operator desires to pay them by the day instead of by piecework, they shall receive $3.50 for eight hours' work. We do not attempt to say whether this is or is not the wage the miner should receive. We do not make any pretensions to the possession of the infallibility of those who seem gifted with the power to decide the due compensation of laboring men. Some of these wiseacres are sure that a day's wage should not exceed a dollar. Others think ten times that pay is due to the man who bears the heat and burden of the day. But what we do say is that the proposed minimum is not merely a living wage, but an adequate provision for comfort and even for modest luxury.

No matter how frantically the dailies, influenced by the wishes of their readers, may try to show that the fight is for a living wage—the promise of the barest clothing and most meager fare—the truth is, the miners of the anthracite region are not engaged in such an heroic struggle. They are fighting for comforts. The stranger in anthracite towns will note the many saloons lining the streets, almost all owned by one-time miners who have accumulated money by fairly remunerative toil, and who are using their surplus to debauch their fellows.

Let it be added that if any anthracite miner lives in a hovel, it is because he so prefers, usually because years of use have made it more suited to his tastes than a larger house. He should receive commiseration not because he is poor, but because, in many cases, a chance to live better makes no appeal to his impoverished mind.

On the other hand, the high wages paid in the anthracite region have produced workingmen of a high class, owning their own homes and well performing family, local and national duties. These men, sober, honest, hard-working Americans of whatsoever extraction make more difficult the decision as to what a day's labor should bring.

Archives

A commendable practice of the state and federal governments has been to print and place in the hands of the public a series of archives, describing the events of public interest in past history. One notable feature of such an enterprise will be eagerly awaited toward the close of this year, when the state and federal statisticians will give us figures on mine tonnages and on the accidents which occurred in the far away year of 1911.

It is true that some state reports on mine tonnages and accidents are being delivered in this very month of February, but it may be added that all the state officials, who are trying to vindicate themselves by this apparent promptitude, have had a full eight months to complete their reports, as their fiscal year ended June 30.

From our Britannic cousins, who, if reports be duly credited, vie with those of Philadelphia for slow motion, we have long ago received a report of all mine accidents suffered in 1911, this report, covering three separate schedules of collieries, metalliferous mines and quarries.

The British report gives a statement for each mine-inspection district, and divides up accidents according to cause.

It is true the British advance proof does not cover several of the items of interest, because these cannot be obtained and tabulated in a week. The complete issue will come later. Nevertheless, there is no reason for our slowness. The coal companies should be urged to keep their books ready for the annual returns. They should keep on hand for immediate use the sizes and horsepowers of their equipment units. In all probability most inspectors do warn the superintendents and managers of their duties in this respect, for some inspectors have long ago filed their 1911 returns at the state capitols.

We confess the trouble appears to lie higher up. Fortunately, this year accidents of magnitude have been few, and there has been a breathing spell for the inspectors, during which time, this work, which must ultimately be done—be it sooner or later—could be hurried to completion. We know that the inspectors do hurry the coal operators into compliance, and the U. S. Geological Survey is likewise insistent, but why should any operator care? In what harm does his dilatoriness result? For the reports, when filed with an inspector, classified, summed and turned into the chief, are permitted to lie in disuse on the state files.

It is to be hoped that, year by year, operators, inspectors, statisticians, printers, proof readers and binders will learn that every day's delay makes the reports they render to the public more of the nature of archives than of returns, less useful to the reader and less true to the conditions existing at the date of issue.

Mine Refuge Chambers

Some time ago there was considerable agitation favoring the use of refuge chambers as a safety precaution in case of explosions and mine fires. Several coal companies in this country followed up the idea and provided their mines with such rooms. The provision of this type of safeguard is not nearly as general as the need warrants. The idea has been followed to a much greater extent in European mines, and the records show that in those emergencies when the plan was tested, satisfactory results were obtained.

Almost every week we read of some particular case where one or more men have been closed in a mine and perished through lack of respirable air and sufficient food, which might have been supplied to them if they could have reached a properly equipped refuge chamber. The actual need of such safety rooms in each particular mine, of course, is not an everyday occurrence; however, if the urgency for such protection comes to each company but once in a decade, the expenditure necessary to supply such provision is justified and the foresight of the management vindicated.

It would be a good idea if all mines were divided into districts completely separated one from the other by a fairly continuous pillar. In this plan, each district should be provided with a refuge chamber. In shaft mines, a fireproof chamber should also be located near the escape shaft.

In German mines, such refuge chambers are equipped with a protected telephone line put down through a drill hole into the chamber itself. Air is also supplied through this same hole. These emergency rooms are supplied with food, water, safety lamps, dry-cell electric lamps, oxygen-rescue apparatus, chemical fire-extinguishers, rolls of brattice cloth, and first-aid kits. The size of such a chamber should be determined largely by the physical characteristics of the coal seam, and especially by the number of men who are employed in the district which the refuge room is to serve.

In constructing such an emergency chamber, it is well to see that the room neck is long, the side pillars unusually thick, and the nearby entries as narrow as possible; the observance of these points reduces the amount of masonry work to a minimum. One authority suggests that each room should have two 30-in. entrances leading from the main, or cross entry and equipped with two or three heavy doors, opening inward, and fastened into the masonry.

In one case, at a European operation, the estimated cost of six underground chambers was three thousand dollars. It is probable that if this same mine had been supplied with electricity and compressed air, the cost would have been reduced to about two thousand dollars.

Where there is no compressed air, the mining company would have to supply small motor-driven compressors, or better still, hand ventilators designed to circulate air through the drill holes—one hole being used as an intake and the other hole as an exhaust. Also, it would be easily possible to arrange and perfect a plan on the surface, whereby air could be sent down one drill hole into the rescue chamber. This would avoid the possibility of the ventilation plan failing through the destruction of underground electric or compressed-air lines.

The Engineer and Electricity

It must have seemed a reasonable conclusion some ten or fifteen years ago that the application of electricity to mining would advance more rapidly than along most other lines because as a source of power it is so peculiarly suited to the problem presented by the average mine. And yet, although it has been successfully applied to practically every phase of coal-mining work, from shot-firing to haulage, it cannot be said to have been either so rapidly or so generally adopted as its merits would lead one to expect. Indeed, it would seem to be, as was said recently at a meeting of the North of England Institute of Electrical Engineers, that in the application of electricity to some of the problems in coal mining, the engineer has shown an excessive amount of caution—even timidity.

While it is not intended to condone, much less advocate, the practice of taking any risks in connection with a fiery or dusty mine, and while it is recognized that perhaps the first duty of the engineer is to secure the safety of the miner, still it should be pointed out that in the application of electricity to coal mining, there is presented no problem that reasonable ingenuity cannot solve.

Unfortunately, where an element of uncertainty is found to exist in regard to the use of electricity in a particular instance there seems to be a tendency to take refuge in repressive legislation rather than in trusting to the inventive capabilities of the present day. Are we becoming less resourceful as well as more cautious, or is there here evidence of a lamentable disposition to let well enough alone, even in the face of needs so pressing as to show conclusively that all is not "well enough"?

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Sealing off a Mine Fire

(Continued from Feb. 17)

Letter No. 28—If there is a fire at the face of a pair of butt entries with an air current flowing up the one and down the other, we would seal it off in the following manner:

After ascertaining the local conditions as far as possible, and finding that no difficulties peculiar to the location were to be apprehended, we would approach the fire as near as possible with as light a current of air as our men could work in. If the last crosscut could not be reached, we would travel up to one which was closed, knock the stopping down, and await the effect of practically clearing the crosscut of smoke. This accomplished, we would erect a brattice cloth partition from the corner of the crosscut half way across the return air course. This would enable us to reach such a position as to allow of the erection of a cloth brattice and later of a board stopping across the return air course. We would then close the intake with a board brattice. Later brick stoppings should be put in.

The reason for closing the outlet first is to cut away from the fire the accumulated volume of gases between the point of location of the first stopping and the up-cast shaft. This method permits the sealing of a fire with the minimum of danger.

N. D. MONSARRAT,
2nd Vice-President.
D. H. WILLIAMS,
District Supt.
Sunday Creek Co., Glouster, Ohio.

Letter No. 29—I have read the Foreword in the issue of COAL AGE, Jan. 20, 1912, and make the following deductions:

Manager was notified of fire and location of same; men had started to work inside of fire; hoisting of coal had begun, at the mine; relay squads were fighting fire; main entry was the intake, the back entry, the return; mine gave off gas; was examined by fireboss. Whatever may have been the origin of the fire it had not been in progress long, and it may be assumed that no accumulation of gas had occurred, in the 12 or 14 hours since the last shift quit on Tuesday, 5 p.m. From the reports it appears there is no disturbance of the ventilating current.

It having been decided to seal off this fire, I would open up the crosscut between the main and back entries at the nearest possible point to the fire, so as to short circuit the air current at this point and prevent its reaching the fire. I would then run a line of brattice (Fig. 1) from this crosscut up the main entry, select a good place as close to the fire as safety would permit, and build the first stopping there on the main entry. I would so arrange the brattice that it would carry only sufficient air to supply the men at work and keep away the smoke and fumes. The brattice must be hastily built of any material at hand; a board stopping will do. In the back entry, I would erect the same kind of brattice, but it would be necessary to carry more air forward in the back entry, owing to the smoke and fumes coming down this entry from the fire.

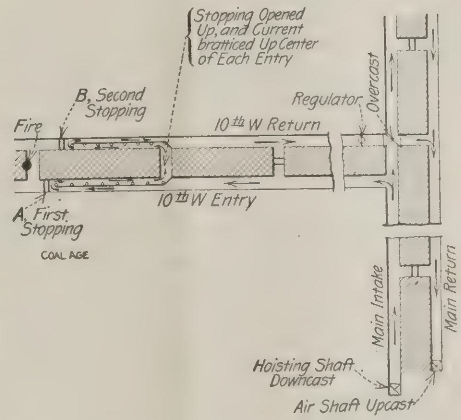


FIG. 1. SHOWING PROPOSED MANNER OF STOPPING OFF A MINE FIRE

I have seen it suggested (it is a German idea) that a good temporary stopping can be built from bales of hay. These bales are first stacked in the entry and wedged tightly with loose hay to make the stopping as nearly air-tight as possible, and then the hay is wetted, which causes it to swell. This makes a tight stopping, and the hay is said to be practically incombustible when properly baled. If no water line was available I would use a bucket brigade. The baling wire holding the hay should be cut before it is wetted, so as to allow of the free expansion of the hay.

Even if the crosscut was not opened up as I have described, I would place the first stopping on the main entry, as close to the seat of the fire as practicable. Then, when building the second stopping on the return airway, I would still be able to carry air by bratticing from the main-intake air course.

From the description given in the Foreword of Jan. 20, I have assumed the circulation to be as shown by the arrows, in the accompanying sketch, Fig. 1. Assuming this arrangement is correct, perhaps the quickest way to handle this fire after building the first stopping on the intake would be to build the second stopping behind the regulator, although if conditions would permit I should want to place the second stopping nearer to the seat of the fire and reinforce by building other stoppings, if necessary. In any case, substantial stoppings should be built immediately after and in front of the two temporary stoppings. These can be built of any material available.

In our state, one of the largest operating coal companies, the Norwestern Improvement Company, build all of their stoppings with logs, six, eight and ten feet long, the ends being wedged and the whole plastered. Broken mine timbers can often be utilized for this work. Each stopping is formed of a double wall of timber, and the space between is filled with clay or sand. Pipes should be built into each stopping, one at the bottom for draining the water, and the other at the top for testing the air for gas, in the inclosed space. This will permit of the taking of samples of the air inside the inclosure, in order to make a test from time to time, of its gaseous condition. These pipes are plugged. If it is desired, a steam line may be attached to the end of one of the pipes, at any time, and live steam introduced into the area to extinguish or dampen down the fire.

Conditions must always determine whether it is better to close the intake or the return airway first, in any particular case. In the case described in the Foreword, I think the first place for the stopping to be built would be on the intake, whether the crosscut was open or not.

J. B. McDERMOTT,
State Coal Mine Inspector.
Helena, Mont.

Letter No. 30—The question under discussion on mine fires, as I understand it, is to seal off a fire which has gotten beyond control. The words "beyond control" certainly mean that we have a serious fire, one which covers quite an area

and is giving off great volumes of poisonous fumes and smoke.

The first step to be taken is to short-circuit the air in the nearest crosscut to the fire. I would then build a stopping on the intake entry, which could be done in practically pure air; then close the return airway, which can usually be done without much difficulty after the intake has been closed, as it has been my experience that the volume of fumes and smoke gradually diminishes after the first stopping has been completed.

I would certainly consider it a dangerous practice to take men beyond the intake entry a distance of from 40 to 60 ft. to get into the return airway to build the first stopping. It is a common occurrence to have a heavy fall in the burning section, which forces the fumes and smoke out into the intake entry, making it necessary to retreat to fresh air as quickly as possible. Now if men were required to travel a distance of from 60 to 80 ft. through these fumes and smoke, it is probable that some of them would get down and the workmen would certainly become disorganized and the work delayed. An accident to the fan would have practically the same result. I fear that some of the readers have not considered the extent of the fire; however, the question is plain, and refers to fires which have gotten *beyond control*.

W. F. MANDT.

Longacre, W. Va.

Letter No. 31—A definite answer to the mine-fire problem cannot be given, as every difficulty demands its own solution and the local conditions must govern. The principal thing to be done is to attack the fire *promptly*, and for this reason the work of building stoppings should be begun at the earliest possible moment. First decide where the stoppings on the intake and return are to be built and proceed with the work at once.

While decision is being made as to which stopping to close first, the framework for a heavy door stopping can be erected and the heavy door itself made. This door can be arranged in a variety of ways: It may be installed so as to be closed by a heavy weight attached to a rope over a pulley, a trigger attachment holding the door open till withdrawn by means of a long rope extending to the surface, if necessary. Or the door can be closed by the direct pull of the rope.

The door-frames having been built and the doors hung, these can be left open until the men have *all been withdrawn* from the mine. Then the doors are closed simultaneously or in the order which has been in the meantime decided upon by the management. By this means the men are all in a place of safety when the doors are closed. This plan was first used in 1906 by the Lehigh Valley Coal Company engineers. If the rope is to be used to close the door by a direct pull, it can also later be used to pull down the door without entering the mine in case it is the desire to do so. This was so in the case noted above, where the door was later demolished by means of the rope.

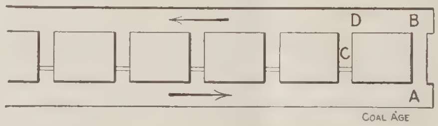
This plan often requires a long rope, but rope is cheap in comparison with the cost of a mine fire. A hoisting or haulage engine is usually necessary when the rope is long and no pulleys need be placed, as the engine can pull the rope around corners and pillars if necessary. If the door is not to be demolished later, a weak piece of rope should be inserted near the door to break when the door is closed.

A. B. JESSUP,
Mining Engineer.

Lehigh Valley Coal Co.,
Wilkes-Barre, Penn.

Letter No. 32—I wish to express my views concerning the best method of closing off a mine fire. I have assisted in subduing several during the 56 years I have been connected with mines.

Ten years of this period were spent in the bituminous-coal field of South Wales, which pitches from 15 deg. up to about 45 deg.; twelve years in the semibituminous longwall workings in the same coal field, and the remaining 34 years in the anthracite-coal field of the Wyoming valley, Penn.



ILLUSTRATING CONDITIONS EXISTING AT MINE FIRE

Whether the intake or the return is closed first is not material if the section of the mine where the fire is located is not very gassy. But when feeders or blowers are numerous, and strong in pressure, it is important that the return airway should be closed first. Twice I have built stoppings in the intake before I closed off the return, when the place was very gassy as described above, and both times an explosion took place. But not on even a single occasion did the gas explode when the return was shut off first. It seems that the intake airway quickly fills with an explosive mixture and this reaches the fire before the smoke produced from its combustion becomes dense or thick enough to prevent such an explosion. But when the return airway is closed first it produces such a heavy incombustible atmosphere about the seat of the fire, that any firedamp reaching the same becomes nonexplosive. If two places are driven parallel with crosscuts at stated intervals, as shown in accompanying sketch, of course each crosscut is closed by a stopping as a new one is completed. Therefore, the intake current passes by A, and returns at D.

Assuming the fire is at B and that said fire becomes beyond control, the first thing that must be done is to build a temporary door in crosscut C. Then the stopping in that same crosscut should be torn down. This secures a passable approach to the return airway B so that the quantity of air coursing at B is reduced. Also by this means material can be accumulated near the point D for building up the stopping at that point. All the props must be erected before any boarding is commenced. If much CO or CO_2 is present in the return from the fire, the men must be changed very often; in fact, at five- or ten-minute intervals. Then, when everything is ready, put on the boards quickly from bottom to roof. In so doing the density of the smoke becomes such that part of it fills the heading between B and A, and therefore prevents the accumulated firedamp from becoming explosive at the seat of the fire. No doubt you will find many opinions in the matter, and each man as positive as his opponent that his methods are correct, but those who have gone through the "fire of experience" under different prevailing conditions will hesitate long before they will allow the intake to be closed first.

W. D. OWENS,
District Superintendent.
Lehigh Valley Coal Co., Pittston, Penn.

Susie, Wyoming, Explosion

No doubt you have received a report on the explosion that occurred at mine No. 4 of the Kemmerer Coal Co., Jan. 20, 1912. I inclose a rough sketch of the mine, but did not have time to put in the rooms. I have made this sketch from memory, not having the map before me, but I believe it represents correctly the arrangement of the entries.

Referring to the sketch, there was a rock stopping at A, a box regulator at B, and between these, at C, was a canvas stopping that had been cleated down tight at the top and bottom. The rock stopping at A and the regulator at B were each blown toward each other by the force of the explosion. Under these conditions, I would like to ask, how would you account for the fact that the canvas stopping was not blown out, but was still in place after the regulator and the rock stopping were both found to have been destroyed? As I stated, each of these were blown in a direction toward the foot of the return airway. I would like to have COAL AGE and any other of its readers who have had similar experiences offer some explanation of the reason why this canvas stopping was not destroyed.

W. H. GEORGE.

Frontier, Wyo.

It rarely happens that a mine explosion of any considerable importance oc-

curs where the later investigation does not reveal many things that appear to be almost inexplicable. We are, however, confronted with the fact of their existence, and the question asking for an explanation is therefore a reasonable one.

It reminds one of the story of a prisoner who was found by a friend in a prison cell. After the first expression of surprise on the part of his friend, the prisoner was asked, "But how did you come here; what did you do?" The story of the arrest was briefly told. "But," said the astonished friend, "they could not jail you for that." The prisoner's response was, "Whether they *could* or *could not* is not the question; they *did*, and I am here."

So in a mine explosion, it is idle to talk of whether this or that could or could not have taken place. If it is a fact that is presented, the question, "How did it occur?" is a proper one. Our correspondent states that the tightly cleated canvas brattice at *C* was not destroyed by the blast that blew out the much stronger rock stopping and the box regulator, on either side of it, each of these being blown toward the foot of the return slope.

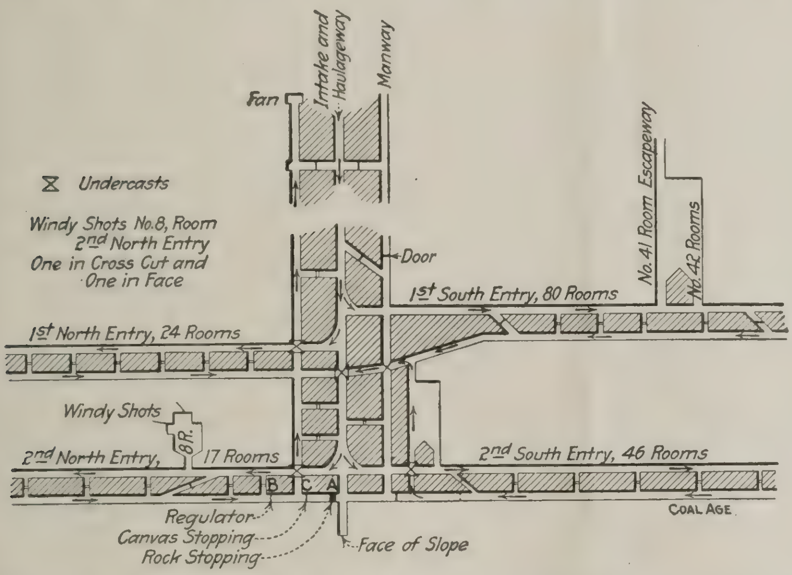
Assuming that this is a statement of fact and that the canvas brattice at *C* was not injured, the natural conclusion is that either there was a balance of forces exerted on the opposite sides of the canvas stopping; or that the force of the blast on each side was killed or wholly absorbed by the work done before it reached the canvas.

The first of these two assumptions appears the more probable one when one studies the airways and follows on the map the direction the blast would travel in reaching the mine opening. From our information the explosion originated in one of the rooms on the second north entry and was probably caused by one or more blown-out shots. The map or sketch sent us by our correspondent and which is the only information at hand at present, shows that if the expanding gases formed by the explosion took the natural course, feeding on the fresh air of the intake airway, the main haulage slope would be the principal outlet. If the initial force of the explosion were sufficiently strong, much of the shock of the blast would also be exerted up the return slope toward the fan. This, however, would be determined only by the character of the explosion, whether it was chiefly a gas or dust explosion.

To obtain an intelligent idea and solution of what took place at the moment of the explosion, the mine must be considered as a cul-de-sac, which in point of fact it was. In this case, the force of the explosion is exerted from within outward in the direction of the openings. The resistance offered by the airways to the gases thus propelled at a high velocity through the slope causes a kick-back on all the stoppings in the immediate vicinity.

It is a law of mechanics that action and reaction are always equal. If a man jumps forward he exerts an equal reaction, in the opposite direction, on the ground. The action of an explosion of gas in a mine is in every respect similar. As a consequence, two stoppings inby from *B* are blown out by the initial blast and almost simultaneously there is exerted the full pressure of the blast on both the regulator at *B* and the rock stopping at *A*. Both of these pressures would be exerted toward the canvas brattice at *C*. The pressure at *B*, however, is the direct pressure remaining after destroying the stoppings mentioned, while the pressure that blew down the rock stopping at *A* would be a kick-back due to the resistance met in propelling the gases up the slope to the mine openings.

This is only offered as a possible, but at the same time a reasonable solution. It is an interesting question and COAL AGE hopes many of its readers will offer their own solutions.



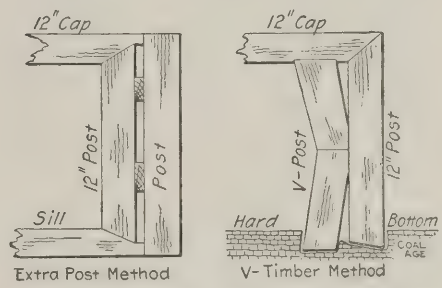
SKETCH PLAN, SHOWING A PORTION OF MINE NO. 4, KEMMERER COAL CO., SUSIE, WYOMING

Timber Framing for Side Pressures

With reference to the article appearing in your issue of COAL AGE, under date of Jan. 20, 1912, regarding timber framing for side pressure, by Joseph Virgin, of Plymouth, W. Va., I agree with him that when the timbers are notched, the leg or cap will invariably split, before either the post or cap has taken the weight they are expected to sustain. In this sketch, however, the small angular piece nailed in the interior corners does not add materially to the strength of either cap or leg; the only support it gives is the resistance of the nail, and we get practically no strength from the piece of timber itself.

Again, I know Mr. Virgin personally, and I am sure a man of his experience would not set the post at an angle of 45° from the perpendicular to support a side pressure, even if the ends or the upper corners were cut at such an angle.

I realize that he has increased the size of the post from 10 to 12 in., making it 2 in. thicker than the cap, but in my opinion, the pitch given the leg counteracts the extra thickness given the upright leg. The side pressure is the same on the leg, no matter what angle it is set on, but it also has to sustain a top pressure, in proportion to the degree it is set from the perpendicular.



DOUBLE TIMBERS FOR SIDE PRESSURE

Therefore, I think the best way to resist the side pressures, is to place extra support in the side timber. This may be done either by increasing its thickness, by putting an extra post at the back of the leg, or by using timber in the shape of a V, with the cap and the floor for the two ends to rest on, and joined in the center of leg, as shown in the accompanying sketches. The tendency of the side pressure would then be to push up the cap, or down in the floor, or both, and in this way we get the extra strength of these supports added to the strength of the leg.

MINE SUPERINTENDENT.

Johnstown, Penn.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Is Carbon Dioxide a Poisonous Gas?

Will COAL AGE please explain exactly what is or should be meant by a "poisonous gas," in mining; and state whether carbon dioxide should be classed as a poisonous mine gas?

MEMBER FIRST-AID CORPS.

Birmingham, Ala.

The meaning of poisonous is "injurious to health or tending to destroy life by impairing its functions." There is no doubt but that there are wide degrees of poisonous qualities.

Some poisons destroy life almost in an instant. Such are hydrocyanic acid, carbolic acid, carbon monoxide gas. Other poisons are slow in their action, but none the less sure in effect unless relief is obtained.

In mining practice, it is customary to class as poisonous only, two of the common mine gases; namely, carbon monoxide (CO) and hydrogen sulphide (H_2S). Carbon dioxide (CO_2) has not been considered as a poisonous mine gas. That is not to say, however, that carbon dioxide is not poisonous.

A clearer understanding will be gained by comparing this gas with pure nitrogen, which forms practically four-fifths of the volume of the air we breath, and which cannot be said to have any poisonous qualities whatever.

Pure nitrogen could not be breathed, for any time, without causing death by suffocation; but this is not due to any action of the nitrogen on the blood or tissues of the body. It is due simply to the exclusion of oxygen from the lungs, which oxygen is necessary to life. Likewise, when pure carbon dioxide is breathed, for any time, death ensues, because of the exclusion of the necessary oxygen from the lungs. However, while the presence of so large a proportion of nitrogen in the life-sustaining air amply warrants the assumption that nitrogen has no poisonous qualities whatever; there is not the same warrant of assurance in respect to carbon dioxide, which is the discarded refuse—the chief waste product in sustaining life. It would be unwarrantable to assume or even suggest that this refuse gas possesses *no* poisonous qualities.

In the mine, carbon dioxide forms a variable but important part of the mixture known as *blackdamp;* the other chief constituent being air poor in oxygen. As is well known, the breathing of blackdamp for a greater or less period of time produces drowsiness, headache, nausea, followed by ache in the back and limbs. These symptons indicate the action of insidious poison that slowly impairs the functions of life. Is it to be attributed to the nitrogen in the residual air; or to the vital functions not receiving a sufficiency of oxygen; or to a poisonous action of carbon dioxide? All of these possibilities exist in the noxious blackdamp. To answer this question we must look for a further comparison of these gases, under a similar depletion of the normal percentage of oxygen.

Compare, for example, the fatal artificial atmospheres formed by adding nitrogen and carbon dioxide, respectively to pure air until a mixture fatal to life in a like period of time, is produced. The lowest percentages fatal to life when these gases, respectively, are added to pure air are shown in the following table, "Mine Gases and Explosions," page 144:

FATAL ARTIFICIAL ATMOSPHERES FORMED BY ADDING NITROGEN AND CARBON DIOXIDE, RESPECTIVELY TO AIR, SHOWING COMPOSITION OF MIXTURE AND PERCENTAGE OF GAS ADDED

Gas added to pure air	Composition of mixture (Per cent.) N_2	O_2	CO_2	Proportion of gas added
Nitrogen	93.0	7.0	...	2 volumes
Carbon dioxide	64.9	17.1	18.0	$^2/_9$ volume

The above shows clearly that carbon dioxide acts on the vital organisms in another way than to produce simply suffocation by the exclusion of oxygen in sufficient quantity from the lungs. Fatal effect is reached by the addition of but $^2/_9$ volume of carbon dioxide to 1 volume of air, depleting the oxygen to only 17.1% (normal 20.9%). In the case of nitrogen, it is necessary to add twice the volume of the air, thereby depleting the oxygen content to 7%, before producing a fatal atmosphere.

What Is a Combustible Gas?

Is oxygen a combustible gas? The textbooks say it is a supporter of combustion, but why is it not also combustible? What is a combustible gas?

CHEMIST.

Denver, Colo.

Oxygen is the universal "supporter of combustion," because it is the active agent in the atmosphere that makes combustion generally, possible. The process of combustion in oxygen is termed "oxidation."

All combustion, however, is not oxidation, although all oxidation *is* combustion, in the broad meaning of the term. It may mean the slow oxidation of iron in a damp atmosphere, or the slow combustion of fine coal in the gob, in a mine; or it may refer to the rapid combustion of wood, coal, or other combustible, in a blazing fire. In each case, the iron, coal, wood, etc., is consumed and is no longer iron, coal, or wood. Instead, there remains the oxide of iron, or oxide of carbon—a new substance; and the change, in each case, is some form of combustion.

Combustion may take place in other atmospheres than oxygen; but it is not then oxidation, unless, perchance, oxygen is burned in an atmosphere of hydrogen. When hydrogen is burned in an atmosphere of chlorine; or chlorine is burned in hydrogen, combustion takes place, but there is no oxidation. The hydrogen and chlorine are consumed, and a new substance, hydrogen chloride is formed. The burning of sulphur in hydrogen produces hydrogen sulphide.

It is clear that the question of whether any gas or other substance is or is not combustible is simply relative, depending on the atmosphere in which the combustion, if any, must take place. Thus, wood, coal, oil, or other substances that are highly combustible in air are not combustible in an atmosphere of nitrogen, carbon dioxide, or other gas containing no available oxygen.

Oxygen will not burn in air any more than it would in nitrogen or carbon dioxide; because air contains no gas for which oxygen has sufficient affinity to cause chemical union under these conditions. Oxygen is therefore not combustible in air, but it is combustible in hydrogen. Likewise, and for the same reason, chlorine gas is not combustible in air, but burns readily in an atmosphere of hydrogen.

Strictly speaking, from a scientific standpoint, it is not a complete or exact statement to speak of any gas or other substance as "combustible"; except where it is clearly understood that the meaning is, "combustible in air." This is the usual meaning when not otherwise stated.

A gas or any substance whatever is combustible in a given atmosphere when it is capable of being consumed in that atmosphere.

Examination Questions

· Selected from State Examinations, or Suggested by Correspondents

Questions for Beginners

Mine Resistance

Ques.—What produces the resistance that a mine or airway offers to the passage of the air current?

Ans.—The resistance is due both to the friction of the air rubbing on the sides, top and bottom of the airway, and the obstructions met by the current in its passage, such as timbers, falls of roof, contracted breakthroughs or crosscuts, sharp bends in the entries, etc.

Ques.—How is the resistance of a mine commonly measured?

Ans.—Resistance in ventilation is determined by the ventilating pressure it produces in the airway or fan-drift. To ascertain the ventilating pressure it is necessary to measure both the inches of water gage and the area of the airway in sq.ft. Then, since 1 in. of water gage corresponds to a pressure of 5.2 lb. per sq.ft., the total ventilating pressure is found by multiplying the inches of water gage by 5.2, and that product by the area of the airway. Thus, calling the resistance R; the unit of ventilating pressure or pressure per sq.ft. p; the sectional area of airway a; and the water gage $w.g.$; the formula for mine resistance is

$$R = p\,a = 5.2 \times w.g. \times a.$$

Example—Find the mine resistance when the water gage reads 2.5 in., in an airway 6x10 ft. in cross-section.

Solution — $R = 5.2 \times 2.5\,(6 \times 10) = 780$ lb.

Ques.—(a) What is meant by the coefficient of friction in mine ventilation. (b) Give its symbol and value commonly used.

Ans.—(a) The coefficient of friction is the *unit of resistance,* which means the resistance per sq.ft. of rubbing surface, for a velocity of 1 ft. per min., in the air current.

(b) The common symbol for the coefficient of friction and its value are

$$k = 0.00000002\ lb.$$

Ques.—(a) Upon what does the resistance of a mine or airway depend? (b) How does the resistance of a mine or airway vary?

Ans.—(a) Resistance depends on three factors; namely: 1, coefficient of friction k; 2, rubbing surface s; 3, velocity of air current v.

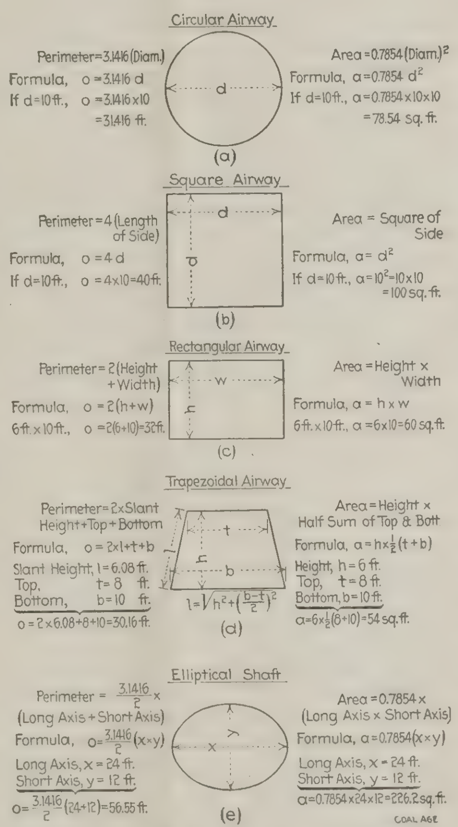
(b) Resistance varies as the rubbing surface s, and the square of the velocity of the air current.

Ques.—Give the formula for calculating the mine resistance when the rubbing surface and the velocity of air current are given.

Ans.—The formula for mine resistance calculated from the rubbing surface s and the velocity of the current v, is

$$R = k\,s\,v^2.$$

Example—Find the resistance of a mine when the size of the airways is 6x8 ft. and 5000 ft. long, including the return; and the air is traveling with a velocity of 8 ft. per sec.



PERIMETER AND AREA OF AIRWAYS OF DIFFERENT SECTION

Solution—First, find the rubbing surface by multiplying the perimeter of the airway by its length; thus,

$$s = 2(6 + 8) \times 5000 = 140{,}000\ sq.ft.$$

The velocity of the current is

$$v = 8 \times 60 = 480\ ft.\ per\ min.$$

Then, the mine resistance is

$$R = 0.00000002 \times 140{,}000 \times 480^2$$

$$R = 645.12\ lb.$$

Example—(a) Find the unit of ventilating pressure in the last example. (b) What is the water gage?

Solution—

(a) $$p = \frac{Resistance}{Area}$$

$$p = \frac{645.12}{48} = 13.44\ lb.\ per\ sq.ft.$$

(b) $$w.g. = \frac{p}{5.2} = 0.26\ in.,\ nearly$$

Ques.—Does splitting the air current in a mine change the mine resistance; and, if so, explain the effect of splitting.

Ans.—When the air in a mine is "split," the current is divided between two or more airways. The rubbing surface remains the same; but the *area of passage* in the mine is increased in proportion to the number of air currents traveling through the mine. It is evident that an airway 10x10 ft., 5000 ft. long, has a rubbing surface of $4 \times 10 \times 5000 = 200{,}000$ sq.ft., and an area of $10 \times 10 = 100$ sq.ft. Now, if the air passing in this mine in a single current can be made to travel the same entries in, say 2 splits, each 10x10 ft., 2500 ft. long, the rubbing surface is still $2\,(4 \times 10 \times 2500) = 200{,}000$ sq.ft., but the area is $2\,(10 \times 10) = 200$ sq.ft., or double the original area.

Now taking, first, a simple case where the air is divided at the mine entrance and passes through the mine in two separate currents, if the *power* producing the circulation remains the same, the rubbing surface being unchanged, the velocity of the air passing in the 2 splits will be the same as the velocity in the original single airway. This is true, because the velocity of the air depends only on the rubbing surface and the power applied to the air, without regard to the area of the airway. Thus, 10 hp. applied to a 10x10-ft. airway will produce the same velocity as this power would produce in a 6x8-ft. airway.

The mine resistance depends only on the rubbing surface and the velocity of the air. Hence, for the same power on the air, the mine resistance will not be changed by splitting the air current into two or more separate splits.

In common practice, however, the air is not divided till after it has traveled a greater or less distance through the shaft and main airway, and likewise the return current must travel the main return airway and upcast shaft in a single current, which reduces the power on the air at the point where the air is split. In this case, both the velocity and the resistance are reduced by splitting.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Mine Accidents and Their Prevention

The illustrations on our front cover are taken from the book, "Mine Accidents and their Prevention," written by J. H. Dague and S. J. Phillips under the supervision of R. A. Phillips, general manager, and C. E. Tobey, superintendent of the mining department of the Delaware, Lackawanna and Western Railroad Company. The book is published at the expense of that company for the instruction of their mine workers and certainly reflects great credit on all concerned.

The publication is intended largely for mine workers having a limited knowledge of English and is planned not only to instruct them in their mining duties, but to give them a working knowledge of the words used in describing their work and the tools they employ. Though the book is complete, it will be supplemented by the verbal instructions of the mine foreman, and to make his teaching successful, the European miner is provided in this book with a sufficient vocabulary whereby foreman and miner can make themselves mutually understood.

The Use of Pictures in Teaching

Teaching by pictures is not new. It has been proved by psychologists that a student will remember words better by association with pictures of the objects they represent than by placing those words side by side with their translations into the language of the pupil. This was exhibited some few years ago in the submission of Japanese words to pupils together with pictures illustrating them. Other Japanese words, together with their English equivalents, were likewise submitted, but it was found that the pictured words were more largely retained by the memory.

The immigrant is moreover possessed of a small vocabulary and one not usually correctly comprehended by him, and consequently a picture is more valuable than any other instructing medium. Many miners were employed as farm laborers in their home countries, and the objects in the mines they have to name for themselves with words which are doubtless not recognized in the technological dictionaries of their own or any country. Consequently translation is not easy.

But it is not nouns which principally try the foreigner. The elusive verbs, prepositions, adjectives and adverbs are his main trouble, and so the Roberts system of instruction is followed in this admirable mining primer. The sentences grow progressively harder, starting with "The miner is in the chamber" and "He lights a squib," to longer sentences which describe the pictures with which our front cover is graced: "The miners drill is too small at the sharp end. This drill will not make a hole large enough for the cartridge. The miner drilled a hole with this drill," and so on. Following these sentences are statements significantly printed in red ink: "He tries to force the cartridge into the hole with the drill. The drill strikes a spark. The spark flies into the powder. The spark sets off the powder." Down the side of the page are words used for the first time in the lessons and to which the attention of the student and his instructor is drawn. The book ends with notes on "how to become an American citizen" and gives questions, an applicant may be required to answer.

So excellent a book has not come to our notice for some time. It is an evidence that one at least of the anthracite coal companies has the training, citizenship and safety of its employees closely at heart. It is to be hoped that means may be taken to make such instruction general.

The Other Half

By Charles L. Fay

(Continued from Feb. 17.)

There are social students, like Dr. Steiner, who make a careful study of living conditions by a life in the environment, within which they try to uplift the worker, whose objects are not self-seeking and whose solutions are not premature. But what of some of the professional, "just out of school" investigators and writers for publicity bureaus and current literature? Is it not possible that some young and well meaning enthusiasts, fresh from college and obsessed by a spirit of socialism gained from socialistic, though scholarly literature and society environment, go to a "field" with their ideas of the conditions already *fixed* and then absorb only such incidents as will brace their fixed ideas? The mind of this type of investigator is so completely—though unconsciously—impervious on the one side and sponge-like on the other that part of the truth is automatically resisted while another part is as automatically absorbed.

Then, again, are not some investigators too "hurried" in their work? To cite a case in point. An investigator and writer will visit a coal-mining community to get data for an article on the conditions of mine workers. This writer will spend about two days in the "field," see the one or two labor leaders and perhaps one or two mine superintendents and ride through the community by automobiles, trolley cars and trains, looking at back yards, streets, water supply, beer wagons and "living conditions" from the windows of the fast moving vehicles, while his knowledge of local labor conditions is gained from a half-dozen brief interviews. Then, away to the hotel, pullman car or home office and pen picture after pen picture is produced by this facile writer. Some societies seem to believe in this type of investigation, some magazines innocently accept the "dope" while yellow journals "devour" it and cry for more.

This and similar types of investigation are back of a great deal of data which go in printed form to the public and contribute only too largely toward the forming of what we know as public sentiment.

Miners and operators welcome, I am sure, fair investigation of social conditions in coal-mining communities, when the investigation is carefully made by competent and unprejudiced investigators. But when writers are too biased to draw fair conclusions, too superficial in their investigations and treatment of a subject to assure the presentation of all facts or make *studies* simply to get "copy" for carelessly edited or yellow journals, then resentment is justifiable.

The loss to society and the danger, however, is in the power for evil in the wrong public sentiment thus created and in the prejudices thus stimulated.

Treatment for Carbon Monoxide

The treatment for carbon-monoxide poisoning is very simple. Remove the patient to the fresh air without delay. Keep the patient warm and administer oxygen at once. If necessary administer artificial respiration. This can be done by placing the patient in the prone position with the head turned to one side. Then press on the lower ribs at the rate of fifteen times a minute. When the patient has recovered, forbid all exertion and watch carefully for some time as relapses are apt to occur. Do not attempt to treat carbon-monoxide poisoning in an atmosphere that contains even a small quantity of that gas.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission has rendered a decision in the case of the Elmore-Benjamin Coal Co. vs. the Cleveland, Cincinnati, Chicago & St. Louis Ry. Co. *et al.*

The facts in the case show that in December, 1910, by permission of the Illinois railroad and warehouse commission, the carriers engaged in transporting bituminous coal to Chicago from the fields in Williamson and Franklin Counties, Ill., increased their rate 7c. per ton. At the same time a similar advance was permitted by the Interstate Commerce Commission in the rate to Chicago from the adjacent, or Harrisburg, field in Saline County, Ill., the movement from this district being interstate. On June 22, 1911, this advance was applied to the joint rate to Milwaukee. Under this adjustment the rate from Williamson and Franklin Counties continued to be 3c. per ton higher than the rate from Saline County. Effective in July, 1911, defendants attempted to equalize these rates by increasing the latter 3c., but the proposed advance was suspended by order of the commission. Complaints were filed attacking both the actual and proposed advances from the Harrisburg field to Chicago and points beyond, particularly to Milwaukee.

Finding of Commission

After full hearing and investigation, it has been held (1) That the advance of 7c. per ton is not found to be unreasonable or unjustly discriminatory nor to subject the Harrisburg field, Milwaukee, or the traffic in question, to any undue or unreasonable preference or disadvantage. (2) That the defendants have sustained the burden of proving the propriety of the proposed advance of 3c. per ton. Orders will be issued dismissing the complaint and vacating the orders of suspension.

In speaking of the conditions of competition in the coal trade which gave rise to this case, the commission says that the testimony introduced by complainants in these cases was largely addressed to the commercial competition which coal from the Harrisburg district meets at Chicago and Milwaukee. At Milwaukee this competition is from what may be called Appalachian coal, which moves by rail from the mines to the lower lake ports and thence by vessel. The allegations of the complaint indicate that this coal is delivered at Milwaukee at a total rate much lower than the former rate of $1.45 from the Harrisburg district.

It developed at the hearing, however, that the all-rail rate from Harrisburg to Milwaukee embraces services not included under the rail-and-lake combination from the Appalachian Mountains to Milwaukee, and that the total cost of getting a ton of coal from the Pittsburg or Eastern districts to Milwaukee was not simply the sum of the rail rates from the Eastern mines to the lower lake ports plus the lake rate to Milwaukee, whatever that might be, but involved the cost of unloading the vessel at the dock at Milwaukee, loading cars from the stores at the dock and switching from the dock to the required deliveries.

Coal from the Harrisburg field appears to be of fairly high grade as compared with Indiana-Illinois coal generally. Indeed, it may be stated that it is on the whole of superior quality, but it cannot be stored like Eastern coal without deterioration and it does not rank as high in heat-producing power as coal from the Eastern districts with which it competes.

Freight on Mine Car Wheels

The Interstate Commerce Commission has issued its decision in the case of the Diamond Coal & Coke Co., vs. the Baltimore & Ohio Ry. Co. *et al.* In this it holds that the rate on mining-car wheels from Rock Island, Ill., to Diamondville, Wyo., is unreasonable so far as it exceeds the rate on mining cars between the same points. The Commission says:

"Complainant contends that the commodity rate of 97½c. applicable on mining-car skips should also be applied on a part of the skip. The testimony shows that the wheels are an integral part of the skip and are subject to such rough usage in the mines that it is necessary to replace them several times before the body of the skip is worn out. Had these wheels been shipped with the bodies there would have been no question that the 97½c. rate was applicable. A shipment so made would not load nearly so heavily as a shipment of the wheels alone. The bodies of the skips are bulky and cannot be loaded to utilize all available car space. The wheels can be loaded compactly and require for transportation no equipment different from that provided for the bodies. Under the rate of 97½c. a particular car loaded with wheels would produce more revenue than one loaded with skip bodies or with the completed skip, including the wheels. Upon consideration of all the facts disclosed by our investigation, we are of opinion, and so find, that the rate assessed west of the Mississippi River for transportation of these car wheels was unreasonable so far as it exceeded the commodity rate of 97½c. applicable to mining-car skips."

Alabama

Birmingham—Announcement is made that a syndicate has been formed to underwrite the merger of the Alabama Consolidated Coal & Iron Co. and the Southern Iron & Steel Co. Harvey Fisk & Sons, of New York, are the managers. The new company will be known as the Alabama Consolidated Iron & Steel Co. and will issue $1,032,000 of 6 per cent. cumulative preferred, $4,130,000 common stock and $4.130,000 of 6 per cent. 20-year gold bonds.

The first battery of coke ovens at the Tennessee Coal, Iron & R.R. Co.'s new byproduct plant has been fired and the first coke turned out. The plant is being built at a cost of about $3,000,000 and in addition to producing coke and various byproducts will furnish gas power for a large electric plant that is to be erected in conjunction with it.

Arkansas

Denning—The coal tipple at mine No. 2 of the Western Coal Co. was destroyed by fire, Feb. 7. Two shot-firers were the only men in the mine at the time of the fire. They were quickly notified and escaped by climbing out the manway. About 300 men are thrown out of employment. The origin is unknown.

Colorado

Denver—Railroads engaged in coal traffic from southern Colorado to Oklahoma and Texas points, have been ordered by the Interstate Commerce Commission to establish joint rates and routes into these states from the Walsenburg district of Colorado within 90 days. This order was issued to enable Walsenburg coal shippers to compete on a fairer basis with the Canon City operators.

Illinois

Carlyle—The engine and boiler houses of the North Breese Coal & Mining Co., at Breese, were destroyed, Feb. 6, by a fire that was caused by an employee

dropping a lighted torch where waste and oils were stored. The flames spread instantly and soon were beyond control. Loss is $50,000, covered by insurance. The building will be rebuilt.

Medora—A 6-ft. vein of coal was recently discovered while drilling for oil on a farm in Shipman township. The seam was encountered at a depth of 180 ft. and is reported to be of excellent quality. The find was made at a point within a few hundred feet of the Chicago & Alton R.R.

Chicago—A proposed advance of 10c. in the minimum freight charge on small shipments to be made by all the railroads east of the Mississippi River and north of the Ohio was declared recently by the Interstate Commerce Commission to be without justification. An increase of 7c. a ton in the freight rate on bituminous coal from the fields in Williamson and Franklin Counties to Chicago was sustained by the commission.

Harrisburg—The annual convention of the Illinois Mine Workers will meet here, Mar. 10. The convention will urge that legislation be directed toward the provision of wash houses at all the mines.

The O'Gara Coal Co. has equipped a complete mine-rescue station, similar to those being established by the United States Government. The O'Gara company has 17 mines in the Harrisburg district, and the rescue station is centrally located so that any of the mines can be reached in a comparatively short time in the event of an accident.

Peoria—E. S. Barlow has decided to make every effort to pump the water out of his coal mine, near Kewanee. The mine was flooded recently, when an underground body of water found its way through the overlying strata, and caused operations to be suspended. A large pump has already been installed.

Indiana

Brazil—The Supine Coal Co., of Brazil, has leased 1000 acres of coal land near Center Point and is producing coal, clay and shale in large quantities. The work is being done with steam shovels and this method of operation is proving much more suitable and profitable than some previous attempts at mining in this section of the field. Similar operations are being carried on near Parkersburg and in other sections of Clay County. The miners are inclined to regard the advent of the steam shovel and stripping methods with considerable disfavor.

Indianapolis—It has been widely reported that certain business interests in this vicinity and in Illinois will petition Congress to intervene in order to prevent a suspension of mining at the expiration of the present wage-scale agreement. J. C. Kolsem, who presided at the recent joint conference of operators and miners, disclaims any knowledge of such a move being contemplated.

Kansas

Pittsburg—Employers of labor are slow in coming in under the provisions of the workmen's compensation act that went into effect Jan. 1. The act is not compulsory. So far only six coal companies have accepted its conditions.

Kentucky

Louisville—According to President Wheelright, the Elkhorn mines of the Consolidation Coal Co. will begin shipment early in the spring. Mining has already begun and the coal is being stored while awaiting the completion of the Sandy Valley & Elkhorn R.R. which is being built by the Baltimore & Ohio.

When the new branch of the Lexington & Eastern R.R., from Hazard to the coal fields east of Whitesburg, completes the tunnel just outside Hazard and two cuts, all the grade work will have been finished. One cut, near Boone Hill, will be finished in about 30 days, and the other, near Blackey, at about the same time. This causes the railroad officers to assert that the first train will be run into Whitesburg by May 1. The people of that section, as well as coal operators, are looking forward with much anticipation to the possibilities of the extension of a railroad to the center of Letcher County.

Barbourville—One of the most important announcements that has been made recently regarding Letcher County coal lands is that of the Lexington & Eastern authorities to the effect that a 5-mile spur line will at once be laid out, up Cholly Creek and that construction work will begin as soon as the weather permits. This spur will reach into a large territory, rich in coal and timber, and should greatly increase the traffic over the main line. The Currier Lumber Co., which owns a railroad terminating near the Kentucky-Virginia border, has announced that during the present year it will extend its line over into Kentucky and about six miles up the Pound River.

Michigan

Detroit—Reports from all over the state of Michigan indicate that the scarcity of coal is being severely felt. Large consumers in the Detroit district have appealed to the Interstate Commerce Commission to break the coal blockade at Toledo, Ohio. Through the inability of the Michigan railroads to receive cars consigned to them, the blockade reached an acute stage more than two weeks ago. Hampered by nearly 50 days of almost continuous zero weather, and by the heavy snowfalls that have prevailed throughout the northern portions of the state, the Michigan Central, the Pere Marquette, and other roads leading north from Toledo, have been confronted with the worst traffic situation in years. It is estimated that there are 8000 loaded cars on the tracks in Toledo, and on the sidings and storage tracks for a distance of 100 miles south of that point.

Ohio

Steubenville—Four hundred and fifty miners at the Bradley mine of the United States Coal Co. went on strike, Feb. 14, as the result of a dispute over pay for bottom coal and over the displacing of a miner who had been sick.

Four thousand acres of Pittsburg No. 8 coal in Munroe County, near Sunfish Creek, were recently sold for $190,000 by O. P. Markle and others, of Uniontown, Penn., who have large holdings in this district. There has been considerable activity of late in Monroe and Belmont County coal. The tract transferred by the Uniontown men is just south of the 21,000 acres recently sold to Toledo, Ohio, interests.

Columbus—The Imperial mine No. 1, at Derwent, in the Guernsey field, will have to abandon its slope entrance and construct a shaft instead, according to a ruling of the state mine inspector, backed up by the opinion of the attorney general. The laws of the state require that when the depth of a mine exceeds 100 ft., a slope shall not be used, and it is said the workings of the Imperial mine lie at a depth greater than this.

Announcement is now made of the completion of an agreement between the Chesapeake & Ohio and the Norfolk & Western R.R., that was stated as being under way last fall, whereby the Chesapeake & Ohio coal will be handled between Kenova, W. Va., and Columbus by the Norfolk & Western Ry.

It is stated that the coming conferences between the officials of the United Mine Workers and the operators of Ohio, western Pennsylvania, Indiana and Illinois, may be held at either Columbis or Cincinnati. When the joint conference at Indianapolis adjourned, some time ago, no place was fixed for the resumption of negotiations. Columbus is a central point in the field and the operators, in general, are said to desire to meet here.

Gallipolis—Representatives of an English syndicate have taken up the options on 8000 acres of coal lands in Perry and Greenfield townships, Gallia County. The same interests are behind the projected railroad from the Ohio River to Lake Erie, which will develop coal lands in Lawrence, Gallia and Meigs Counties.

Oregon

Marshfield— The announcement is made by H. B. Guthrey, president and general manager of the Pulaski Coal & Navigation Co., of Los Angeles, Calif., that his company has purchased the Pike coal property, on the Coquille River, three miles below Coquille. It is the intention of the new owners to develop the mine to its full capacity.

Pennsylvania

Bituminous

Myersdale—L. R. Brandenburg, of Baltimore, W. H. Clark, of Washington, and Col. Edward E. Robbins, of Philadelphia, representing a large eastern mining syndicate, were in Myersdale recently, making arrangements to take over the extensive coal holdings of the Hocking Coal Co., in Brothers Valley Township. It is understood that the new owners will at once proceed to develop the property and market the coal.

Monessen—Vesta No. 5 mine, at Fredericktown, which is claimed to be the largest bituminous mine in the world, recently began active operations. Although some little delay was experienced in getting the new machinery in order, everything is said to be working smoothly. No effort is being made for a "capacity" run and probably none will be made for some time. The officials will content themselves with a thorough trying out of the machinery before operations are begun on a large scale.

Pittsburg—Renewed activity in the coal industry of the Pittsburg district is shown by a report just issued by the Pittsburg-Buffalo company. This concern has recently given employment to 100 additional miners, and it is expected that 300 more will be given work at the company's mines in the near future. All previous records for coal production were broken at the Marianna mine, on Feb. 15.

Rockwood—The Keystone mines, at Casselman, have resumed operation, after being shut down since last July. It is understood that the tipple at the No. 1 mine will be abandoned before long and all the coal will be brought out and loaded at No. 2. Other improvements are also proposed.

Connellsville—A decision was recently handed down in the Westmoreland County courts which forbids coal-mining companies to polute domestic water supplies by draining into them the sulphur water from their mines. The decision was rendered in the case of James McCune against the Pittsburg & Baltimore Coal Co.

Ellwood City—W. C. and J. C. Cunningham, of Hazel Dell, have purchased the Wallace farm and coal mines west of Hazel Dell. They expect to begin operations at once.

Williamsport—The property of the Central Pennsylvania Coal Co. in Lycoming County consisting of about 1000 acres of coal land and improvements will be sold at public auction, March 8, to satisfy the claims of the Knickerbocker Trust Co. of New York.

Anthracite

Scranton—The great demand for coal on account of the continued cold weather kept the average wholesale price at tidewater at a high point during January. and the increase that will come to the mine workers as a result of the operation of the sliding scale will be 7 per cent.

The final hearing in the case of the Marian Coal Co. against the Lackawanna railroad is scheduled to take place Feb. 20 before the Interstate Commerce Commission in Washington. The outcome of the suit will determine whether or not the so called independents or individual operators shall continue to pay what many of them term extortionate rates for having their coal carried to tidewater by the big coal roads. If the commission decides that the rates are high, as is contended by the Marian company, it will result in a reduction not only on the Lackawanna, but on all the other railroads, for coal shipped from within the Scranton zone, which embraces that part of the anthracite region from Forest City to Shickshinny. Under the agreements with the big companies the individual operators get 65 per cent. of the price per ton that the coal roads get at tidewater.

Wilkes-Barre — Coal is being taken from the new Loomis colliery, at Nanticoke, by the Lackawanna railroad. The coal being mined at present, is taken from the Hillman vein, at a considerable depth and transported to the breaker of the Bliss colliery. A breaker will ultimately be built at the Loomis colliery but the plans are not yet completed.

Lansford—The Lehigh Coal & Navigation Co. has filed a bill in equity against the Central Railroad of New Jersey, asking for an accounting by the defendant for all sums expended in payment of rights of way and construction work done on the Lehigh & Susquehanna R.R., which was leased to the Central of New Jersey in 1871 by the Lehigh company. Bill alleges that the Central railroad has not lived up to the terms of the lease.

Utah

Ogden—The Black Hawk Coal Co. recently made its first shipment of coal. The mines have a daily capacity of 300 tons and within a few weeks it is anticipated that this will be increased to 1500 tons daily. The properties are located in Carbon County in southeastern Utah and embrace approximately 1200 acres, the coal vein being from 25 to 30 ft. in thickness. The mines are located on the Utah Southern railroad, about 14 miles southwest from Price and 157 miles from Ogden. Preliminary work commenced in February of last year and approximately half a million dollars has been invested in development work and for machinery.

Washington

Spokane—The Wilson Coal Co., of Centralia, Wash., has conveyed nearly one-fourth of its properties to a new company headed by George Dysart and known as the Sunshine Coal Co. The consideration was about $200,000. The Wilson Coal Co. still retains a large acreage of land on which there are extensive deposits of coal, but the company will not attempt to develop these lands at present, according to H. P. Wilson, secretary of the company.

The Tanum Coal Co., with property lying about 15 miles from Ellensburg, is planning to build a 1½ per cent. grade railroad from the mines to Thorpe, a distance of 7 miles. At this point connections can be made with both the Northern Pacific and the Milwaukee roads.

West Virginia

Wellsburg—It was decreed, Feb. 7, in the Circuit Court of Brooke County that the properties of the Wellsburg Coal Co. and the Wellsburg & State Line R.R. Co. must be sold to satisfy liens of contractors, material men and labor claims. The bond issues of the companies and all transactions pertaining thereto were declared fraudulent. The decree was made in the suits brought by contractors and others in 1905 after the railroad had abandoned its right of way, the coal tipples and other improvements at the coal properties it had planned to develop. The coal company had title to many thousand acres of coal and the railroad owned a right of way through rich farming country. More than $1,000,000 is said to have been involved in the suits.

Great Britain

London—The acuteness of the crisis in the British coal trade is emphasized by the prohibitive rate of 94½ per cent. asked by Lloyds on insurances against a national strike. It is reported that 800,000 miners have already handed in their notices to quit work Feb. 29. The Federation of National Transport Workers has pledged itself not to handle "blackleg" coal, so that imported coal will be landed with great difficulty. The government announces that it will take the crisis in hand although there is as yet no indication of how it proposes to attempt to break the deadlock.

The two-day conference between mine owners and representatives of the miners ended Feb. 20, without reaching an agreement. The British Admiralty has chartered two vessels to carry 10,000 tons of American coal to Gibraltar.

Personals

H. McKean Conner, of Beckley, W. Va., has been appointed superintendent of the Tennessee Coal, Iron & R.R. Co.'s Pratt No. 12 mine, near Ensley, Ala., effective Mar. 1, 1912.

C. V. Westover has resigned as superintendent of the Ludlow mine of the Huerfano Coal Co., Ludlow, Colo., to take a similar position with the Cambria Fuel Co., at Cambria, Wyoming.

C. W. Saxman, formerly mechanical engineer with the Latrobe-Connellsville Coal & Coke Co., Latrobe, Penn., has resigned to take the position of general manager of the Copper Reef Consolidated Mining Co., Globe, Arizona.

Duncan Medill has sold his interest in the Rutland Coal Co., Rutland, Ill., and resigned his position as manager of the Rutland mine to become general superintendent of the five mines near Clinton, Ind., that are owned by John Deering, of Chicago.

John W. Skeele, formerly vice-president in charge of sales of the Lehigh Valley Coal Co., has been elected president of the newly organized Lehigh Valley Coal Sales Co., which has been incorporated with a capital of $10,000,000, to take over and market the production of the Lehigh Valley Coal Co. George N. Wilson was elected vice-president and secretary of the new company, and William J. Burton, treasurer.

Dr. M. J. Shields, of the American Red Cross, intends to devote his almost entire attention to railroad first aid, in the next few months. He will visit Du Bois and Punxsutawney, and at these places and in the vicinity, he will lecture to and organize first-aid bodies among the miners. He will attend with his car the International Congress of the Red Cross Societies, meeting at Washington, D. C., between May 7 and 17, and will preside at a contest to be arranged between teams of miners, policemen, firemen, railroad men and steel workers.

James Needham, assistant general manager of the Union Pacific Coal Co., has resigned to become general manager of the coal properties of the Chicago, Milwaukee & St. Paul R.R. Co., with future headquarters probably in Chicago. Mr. Needham's appointment fills a vacancy occasioned by the recent death of W. W. Taylor, president of the St. Paul Coal Co. The duties of the position formerly occupied by Mr. Needham with the Union Pacific Coal Co. have now been divided. W. D. Brennan, superintendent of the Superior mines, becomes general superintendent of the Superior Coal Co., in addition to his former duties, and George Pride, superintendent of the Union Pacific mines at Rock Springs, Wyo., becomes assistant general manager of that company.

Obituary

George Canbee Clark, president of the Horace Clark & Sons Co., and president of the Clark Coal & Coke Co., died at his home in Peoria, Ill., Feb. 5, aged 65 years.

S. D. Conover, aged 68, died at his home in Dayton, Ohio, Feb. 8. Mr. Conover had been identified with the coal business in Dayton for a great number of years and was one of the city's most prominent business men.

Francis B. Stillman, president of the Watson-Stillman Co., manufacturers of hydraulic machinery, died recently at his home in Brooklyn, N. Y. Mr. Stillman was in his sixty-second year. He was a graduate of Yale in the class of 1874, a member of the Engineer's Club and of the American Society of Mechanical Engineers.

Construction News

Wilton, N. D. — Improvements are planned for the plant of the Washburn Lignite Coal Co., to be made during the coming summer.

Bethany, Mo.—The Cainsville Coal Mining Co. has recently given a mortgage for $250,000 to secure bonds issued to improve the properties at Cainsville.

Cumberland, Md.—The Georges Creek Coal Co. is planning to open up three additional mines on its property at Lonaconing, Md. Mr. Coale is general manager.

Barbourville, Ky.—The Edgewood Consolidated Coal Co. has resumed operations, and will equip a coal-washing plant in addition to installing other machinery.

Hooversville, Penn.—Plans are being prepared for the erection of a large tipple at Mine No. 1 of the Knickerbocker Coal Co. Construction is expected to begin in the early spring.

Pikeville, Ky.—C. H. Gorley, treasurer of the Marrowbone Coal & Coke Co., has announced that the company will rebuild the tipple, elevator, etc., that were recently destroyed by fire, as soon as insurance adjustments are made.

Milwaukee, Wis.—The Kanawha Fuel Co. has purchased 1800 ft. of dock front and will at once improve the property. Total expenditures are expected to reach about $500,000. Three new coal-handling bridges will be installed, as well as other machinery and buildings. A. S. Austin is president.

Duluth, Minn.—The Berwind Fuel Co. will build a large dock and coal-storage plant on the property in West Duluth recently purchased at a cost of $150,000. The plant will have a capacity of about 1,000,000 tons and will be equipped with modern hoisting rigs and coal-handling machinery. It is understood that in all, four large docks will be built or remodeled this year at the head of the Lakes.

Bristol, Va.—In connection with its recently announced contract to furnish a large amount of coal to New England railways, the Virginia Iron, Coal & Coke Co., of Toms Creek, expects to double its output at the Banner operation, and to do this will install additional machinery, including a number of electric motors.

New Publications

NAJPIERWSZEJ POMOCY. P. Blakiston's Son & Co., Philadelphia. 186 pp., 4x6 in.; 49 illustrations.

This book, of which the title is abridged above, is a translation into the Polish language, of the well known "American Red Cross Abridged Text Book on First Aid," by Charles Lynch and M. J. Shields, the leaders of industrial work in the American Red Cross Society. It has already been published in English, Slovak and Italian. The Lithuanian edition will soon follow.

THIRTEENTH ANNUAL COAL REPORT FOR ILLINOIS. Martin Bolt, chief clerk, Springfield, Ill. 445 pp., 6x9 in., illustrated.

This report presents with commendable thoroughness and clarity, the statistics of the coal-mining industry in Illinois for the year ending June 30, 1911. By far the greater part of the information contained in the volume is in tabulated form, and figures for previous years are given for comparison. Notes and descriptive matter are condensed and concise.

COALS AVAILABLE FOR THE MANUFACTURE OF ILLUMINATING GAS. By A. H. White and Perry Barker, compiled and revised by Herbert M. Wilson. Bulletin No. 6, U. S. Bureau of Mines. 76 pp., 6x9 in.; 4 plates, 12 illustrations.

The experiments recorded in this bulletin are dedicated largely to the proposition that since the well known gas coals of western Pennsylvania are rapidly becoming exhausted and their cost is becoming relatively high, it behooves the investigator to determine whether or not coals from other regions may not be successfully utilized in the manufacture of illuminating gas, gas coke and the various attendant byproducts.

The authors present the results that were obtained, largely without comment or inference, and state that they are to be taken as tentative and suggestive rather than as indicating conclusions in any way final. Nevertheless it is evident that not a few of the coals tested give such promise as to abundantly warrant further and more thorough investigation. Eighteen tests on 11 different coals from 10 states are reported.

Trade Catalogs

Electric Weighing Co., 180 Thirteenth Ave., New York. Pamphlet. Electric weigher for ore, coal, cement, etc. Illustrated, 16 pages, 6x9 inches.

The Hirst-Butler Electrical Machine Co., Inc., Reynoldsville, Penn. Catalog. "Little Giant" direct-connected rotary electric mining machine. Illustrated, 4x8 inches.

Best Manufacturing Co., Pittsburg, Penn. Catalog No. 103. 395 pp., 4¼x6¾ in.; illustrated. Catalog covers the complete line of material and supplies manufactured by the Best company and also additional material not manufactured by this company but usually a part of power-plant equipment. A few pages of general engineering information are included.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

While consumption has eased off considerably, in response to the warmer weather, the congestion in transportation continues unrelieved and the movement of freight is slow. Both men and equipment in the railroad service appear to have been severely overtaxed during the cold weather, and it is believed that some time will elapse before conditions are normal.

The situation at the Atlantic Coast ports continues acute, some schools and other public buildings being closed because of the lack of fuel; the movement, both rail and water has been slow, but the warmer weather promises to lift the ice embargo on water shipments. Pittsburg reports the market stronger with prices 5 to 10c. higher and mines working 80 to 90 per cent. capacity, depending on the car supply.

Transportation in the Ohio fields is still demoralized and the demand continues heavy with prices strong; the car supply is the predominating feature in Ohio. The president of the largest operating company in West Virginia states that trade conditions are now more encouraging in that state than at any time during the past two years. Bunker trade has been good at tidewater, coal scarce generally and prices firm.

In the Middle West the situation is improving and the past week has witnessed a satisfactory output at the mines and a heavy movement, particularly into Chicago. While the demand has slacked off at some points, due to the milder weather, all free coal is being readily absorbed for storage purposes; the railroads in particular are storing heavy tonnages. The market in the far West continues dull and unchanged.

Boston, Mass.

Mild weather is some relief to the distressing situation that has prevailed here for some weeks. It at least reduces consumption, and if it continues, will raise the ice embargo at a number of points. The ice in Vineyard and Nantucket Sounds has for the most part disappeared, and movement by water is that much improved. The shortage of coal, however, is most acute, and there is apprehension of trouble all along the line. It will take a long time under the best of conditions to recover from the effect of the last seven weeks of unparalleled cold weather.

Anthracite receipts are few and far between. The smaller producing companies seem practically to have gone out of business so far as concerns this market. The larger shippers have been declining orders for some weeks.

In bituminous the only change from a week ago is to higher prices for what little spot coal is available. The freight market is firm at high figures, and there is some bidding up of rates from New York to sound ports, in the anxiety to get entered for coal. All-rail delivery is the slowest yet. On one end of the roads there are upward of 20,000 cars hung up in transit, largely on account of the lack of motive power. Prices for coal at the transfer points are, therefore, on a premium basis. Car shortage is bound to be marked for weeks to come.

Water freights are strong at $1.25, Hampton Roads to Boston, $1.15 to Providence, on the largest bottoms. On barges from New York to Providence and other sound ports, $1.15 is asked.

Prices are as follows:

Clearfield, f.o.b. mines	$1.35@1.60
Somerset County, f.o.b. mines	1.40@1.60
Pocahontas, New River, Boston, Portland, on cars	4.75@5.00
Pocahontas, New River, Providence, on cars	4.50@4.75
Pocahontas, New River, f.o.b. Virginia terminals, for spot shipment	2.85@3.00

New York

Although the weather has shown some moderation, the soft-coal market continues quite firm. There has been no increase in the standing tonnage at New York loading piers and the amount of coal on hand is far below that usually carried. Demand on contract is extremely heavy and shippers are having all they can do to satisfy the requirements of their contracts.

There is some spot inquiry but considering the shortness of the supply in this market, prices have not shown the advance that would be expected under the conditions. The demand for the standard grades of steam coal is so heavy on contract that these coals are all out of the market and about the only coals now obtainable here are the ordinary grades of Pennsylvania and West Virginia steam. These are being quoted on basis of from $2.70 to $2.80 f.o.b. New York piers, which is an advance of about 10c. a ton over what these coals were being offered at last week.

Consumers generally are alive to the possibilities of a strike in the bituminous and anthracite fields the first of April and much anxiety is being shown among them to accumulate stocks for use in the event of such an emergency, but with the short car supply, slow traffic conditions and the general shortage of coal, most of them are meeting with but little success, as the companies are having all they can do to furnish contractors' coal for their actual requirements.

Philadelphia, Penn.

The retail trade in this locality still reports active business conditions. While the week started in with a thaw, this in a measure only helped deliveries, while the house holders are still insistent that their orders be filled promptly. The open weather will also have the effect of improving the deliveries of the railroads, which have been much hampered by the low temperature. The continued mild weather, however, is likely to affect the receipt of new business, although the rumors of trouble at the mines, and reports of shortage of stocks in the hands of the large operators, make every dealer anxious to keep his yard filled, and this same feeling is passed along to the consumer. No size is reported in good supply as yet, orders being filled by the wholesalers from a week to ten days after receipt. The market at this time is likely to be little affected by the weather conditions.

The wholesale dealers still continue to be deluged with orders far in excess of their ability to fill promptly. One large operator states that they are from one to two weeks behind on their orders, and constant receipt of new business gives no opportunity for the placing of any coal in stock. As it looks now, March is likely to be a busy month. February tonnage to date is far in excess of the same period for last year, and little coal will go into the storage yards from now until the first of April.

Pittsburg

Bituminous—Nothing has been accomplished yet by the joint committee appointed before the close of the Indianapolis convention to discuss the wage scale. The coal market has firmed up by 5c. to 10c. per ton. Coal is in excellent demand, partly on account of interruptions to service through the continued cold weather and partly for stocking up purposes in anticipation of a suspension of mining Mar. 31. There has been a

distinct shortage of cars during the past fortnight, and conditions are no better this week. As a rule, mines are operating as full as the car supply will permit, and operations on the whole are at 80 to 90 per cent. of capacity.

Quotations may be regarded as on the basis of $1.15@1.25 for mine-run, as against $1.10@1.15 formerly quoted, previous differentials maintaining, and we now quote as follows: Nut, $1.10@1.20; mine-run, $1.15@1.25; ¾-in., $1.25@1.35; 1¼-in., $1.40@1.50; slack, 90c.@$1 per ton at mine, Pittsburg district.

Connellsville Coke—The market for prompt coke has stiffened up a trifle in the past three or four days, and it is difficult to get the minimum quotations formerly made. Sales of scattering lots of prompt furnace coke have been made in the past week to the extent of 50 to 75 cars, at $1.85, while on Friday one lot of 12,000 tons was sold in the East at this same figure, delivery within a month.

There has been no important negotiating for coke on contract. We continue to quote: Prompt furnace, $1.80@1.90; contract furnace, $1.80@1.90; prompt foundry, $2.20@2.30; contract foundry, $2.20@2.40 per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Feb. 10 at 354,569 tons, a decrease of 5000 tons, and shipments at 3999 cars to Pittsburg, 5679 cars to points West and 912 cars to points East, a total of 10,590 cars, a decrease of 33 cars.

Baltimore, Md.

It was thought here that the rather mild weather experienced about the middle of the week would help conditions materially. Contrary to expectations it did not, and operators report that they are having as much trouble procuring the necessary equipment as they did earlier in the week, or even during the period of zero weather.

The Western Maryland has experienced all sorts of trouble in moving coal traffic during the past few days and conditions have not been much better on the Baltimore & Ohio, although the management of both roads are doing everything within their power to improve conditions.

The coke market, according to reliable reports from the trade, continues strong. The market is showing greater improvement than has been noticed for nearly a year.

Buffalo, N. Y.

It is generally impossible to get a quick delivery from most of the railroads and some of them are doing next to nothing. The weather has turned mild now, but the cars are not moving and probably will not move at all briskly for some time, as the motive power was overtaxed by the weather and the men are badly used up from cold and overwork.

There is a disposition on the part of the coal consumer to stock up now against a possible strike in April, but the shipper cannot furnish the coal. The mine output is less than it was before the cold weather set in and now there begins to be complaint that the empty cars are not coming back promptly, for the reason that they have not been taken to destination and unloaded.

Prices are nominally as before, though the premium is sometimes liberal when coal is to be had on the spot. Pittsburg quotations are $2.60 for three-quarter, $2.50 for mine-run and $2.25 for slack, with Allegheny Valley about 30c. less. Coke remains strong at $4.25 for best Connellsville foundry and $3.50 for stock.

Anthracite shippers are but a short time, some say three weeks, ahead of the consumers, though this is hard to calculate. As a rule, the retail dealer has no coal at all and the consumer has only a small supply. The only reassuring feature of this trade is that the operators announce that they are not going to advance their prices. Independent anthracite is bringing a good premium where it can be had and delivered to customers.

Cleveland, Ohio

The break in the weather this week does not seem to lessen the demand for coal. The temperature has been in the neighborhood of 34 deg. for the past two days. While the prices in the Cleveland market continue strong, the chief factor in the situation is the car supply. The railroads and larger corporations have all doubled their orders in anticipation of a strike.

Smokeless coal is variable in price, but in strong demand, and what little there is of spot smokeless, commands a price of $1.15@1.25 for mine-run.

Prices range as follows:

Cambridge	
Mine-run	$1.15
¾-in	1.25
Slack	$0.90@0.95
Ohio No. 8	
Mine-run	$1.10
¾-in	1.20
Slack	$0.85@0.90
Ohio No. 6	
Mine-run	$1.25
¾-in.	1.35
Slack	$1.00@1.05

Columbus, Ohio

Demoralization still continues on all railroad lines leading from the Ohio coal fields, and as a result the trade is in a chaotic condition. Congestion of way points and connecting lines has made it almost impossible to move much coal and reports show there is considerable suffering in Michigan and northern Indiana points. It is not the fault of the operator who is ready and willing to ship the coal if the railroads could move the cars and return the empties to the mines promptly.

As a result of these conditions prices have been ruling firm on all grades and varieties. Premiums are being paid for spot coal ranging from 10 to 25c. There is a good demand for fine coal and prices are firm.

Reports show that in many points in Michigan factories were compelled to shut down to permit the small supply of coal to be used for domestic purposes; little of this was necessary in the State of Ohio.

Production in Ohio fields was considerably curtailed because of the car shortage and railroad congestion. Many of the mines were closed down almost entirely and others only ran a portion of the time. The reports show that the output was between 35 and 50 per cent. of normal, and in some fields the percentage was even lower. The operators were willing and ready to produce a much larger tonnage, but railroad facilities were such as to make this impossible.

Retail trade has been rather active as stocks in the hands of consumers had to be replenished. Prices have reached the usual winter level.

Prices prevailing in Ohio are:

Domestic lump in Pomeroy Bend district	$1.85
Domestic lump in the Hocking Valley	$1.60@1.75
Three-quarter inch	1.45
Nut	1.20
Mine-run in eastern Ohio	1.05@1.10
Mine-run in the Hocking Valley	1.15@1.20
Nut, pea and slack	0.80@0.90
Coarse slack	0.70@0.80

Cincinnati, Ohio

Because of unusual market conditions, all persons connected with the coal trade are trying to figure some way out of the difficulty, due to inadequate transportation facilities, if not management, on the part of the railroads. Lack of equipment possibly is the real cause at the bottom of the trouble.

Most of the railroads have issued embargoes against further transportation of coal to the congested points, in the hope that they will thus be enabled to clear the yards now filled with cars of fuel. It is said that in Toledo alone there are 12,000 cars of coal awaiting delivery. Other northern points, particularly in Michigan, are said to be in much the same fix. The railroad yards in this immediate market are also well filled with cars, although it is said the railroads have adopted a policy of keeping the congestion from the largest cities as much as possible, because of the clamor that would be raised by the coal men in demanding that their cars be moved. With the cars at a more distant point, they cannot so readily ascertain just what the conditions are and cannot make their demand so concrete.

Prices now being quoted for the various grades are as follows: Smokeless lump, $2.15@2.25; smokeless mine-run, $1@1.25; splint lump, $1.10@1.95, according to the wide range of quality en-

tering this market; splint mine-run, $1.10@1.25; splint nut and slack, 65 to 95 cents.

The quotation on smokeless mine-run is almost entirely a speculative one, since it is impossible to buy that fuel and next to impossible to get the nut and slack. Wholesalers are refusing to accept any orders and are begging each other for the accommodation of a car or two to fill their contracts. Even by helping each other out as far as possible, they are having great difficulty, and sometimes are unable to meet their own requirements.

Charleston, W. Va.

Demand for coal is strong, but the car supply is holding a strong check on supplies. Prices likewise are strong and a fair increase is reported in many instances. These conditions prevail in both the Kanawha and New River districts, and while there has been a slight improvement in the car situation, it has been very slight. At the present time the mines are only operated about three days a week, which is an indication that the car supply is only half that which the mines could utilize, providing, of course, the demand was sufficient to operate at capacity.

Prices in the Kanawha and New River districts are reported as follows:

Kanawha	
Mine-run	$0.85@0.90
Slack	0.65@0.70
Lump	1.40@1.60
New River	
Mine-run	$1.15@1.25
Egg	1.60@1.80

Hampton Roads, Va.

Coal is still scarce at Hampton Roads ports and prices are firmer; none of the standard grades of New River and Pocahontas are being sold at less than $2.70 f.o.b., while some sales of nut and slack have been made on a basis of $1 f.o.b. mines. There are still, of course, considerable amounts of low-price contract coal being shipped to New England, and the U. S. Navy has been taking more coal than usual.

Bunker business has been exceptionally good and several cargoes have been loaded for the West Indies, but the European export trade has been seriously held back by the high steamship rates, the rate to Buenos Aires and La Plata being quoted at $6.72 and to Genoa or West Italy, $4.08 to $4.32.

The movement of coal from the mines has been slow on the Chesapeake & Ohio and the Virginian Railways; the Norfolk & Western has been giving good movement, but the car supply on all roads has been extremely bad.

Dumping has also been slow, owing to the frozen condition of the coal in cars. After the railroads get over the effect of the cold weather, there should be some record-breaking shipments, as the demand for coal is strong and seems likely to continue so. From all accounts stocks of coal in New England are low and all contractors are being pressed for coal, which demands they are most anxious to fill, in order to get rid of all their low priced business and to be in a position to take advantage of the better prices.

Louisville, Ky.

Due to the car shortage primarily, the price of coal in the mining regions of the southeastern part of the state has been shoved up to a point not equalled for two or three years. Outside of the fact that lack of equipment prevented the shipment of coal in quantities equal to the demand, the miners of that section have had an unusually prosperous year. The operators in the southeastern section have built up an excellent market in the North, which is expected to grow steadily. The increased railroad facilities being provided and the installation of selling agencies in the North has resulted in the Kentucky mines competing with the West Virginia output more successfully than has been expected.

Indianapolis

There has been an active week in coal mining with a satisfactory output, and the demand has kept up, notwithstanding the moderate weather. A number of mines throughout the state are advertising for miners, and full time in most all the mines is being worked. Whether preparation is being made for a cessation of mining after Apr. 1 is not positively known, although there are some evidences of it.

The Indiana mines are now being operated at nearly full capacity and that means a large output. Miners' wages are totaling more than at any time for 14 months.

There has been no increase in the price of coal nor is there likely to be unless a cessation of mining shall afford an excuse for same.

Nashville, Tenn.

Business still continues brisk in the west Kentucky coal field, even though the weather is back to normal.

The scarcity of cars is still in existence and all operators are far behind with their deliveries. The month of March will be a good one in view of the fact that the first of the month will catch the cities with practically no coal and there will be a certain tendency to do some stocking locally; there has also been, in the last few days, a number of foreign inquiries, most of which, however, are for outright purchases, commencing Apr. 1.

The demand for screenings is still large and good prices are being offered; in fact, prices will continue good from now until Apr. 1. Operators in this district are awaiting with great anxiety the result of future meetings and conferences between the operators and miners in the union fields.

Chicago

A general tendency to buy for storage against the possibility of a strike and the unusual export movement are the chief features of a steady market which has upward tendencies in several respects.

As a result of a scarcity of cars in southern Illinois only a small volume of washed coal was shipped to this market and as an outcome there has been a heavy demand for nut coal. The latter had previously occupied a weak position in the market. There has been a big demand and a small supply of smokeless and mine-run is sold at $1.25 to $1.35.

The market for screenings has been steady although the great bulk of the buying has been done by the smaller interests. Heavy orders are being received for anthracite, but the shippers have been able to satisfy the demands. There is a keen demand for coke; gas house is scarce and strong.

Prevailing prices at Chicago are as follows:

Sullivan County:	
Domestic lump	$2.87
Egg	2.87
Steam lump	$2.37@2.57
Screenings	1.97@2.07
Springfield:	
Domestic lump	$2.67@2.82
Steam lump	2.32@2.42
Mine-run	2.12@2.22
Screenings	1.92@2.03
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.22@2.32
Mine-run	2.17@2.27
Screenings	1.87@2.00
Pocahontas and New River:	
Mine-run	$3.25@3.55
Lump and egg	4.20@4.30

Coke—Prices asked for coke are; Connellsville and Wise County, $4.65@4.75; byproduct, egg and stove, $4.95; byproduct, nut, $4.75; gas house, $4.90@5.

Minneapolis—St. Paul

The retail coal business in the Twin Cities has dropped off considerably in the last three days due to the mild weather. The wholesale men are only doing a fair business because the dealer in the country is not ordering freely, as he has some coal that was ordered during the cold weather and which is now coming in.

The car situation is not exactly what it should be as there still seems to be a shortage at the mines and the docks. However, the railroads deserve a lot of credit in their attitude of trying to overcome this shortage and coal men believe they have done everything in their power to prevent the usual coal famine which has prevailed in the Northwest nearly every winter.

Dockmen say the supply of anthracite coal in all sizes is low at the docks and the opening of navigation will find the docks practically clean. Prices on dock and all-rail coal for shipment into the country are strong. Franklin and Carterville County coals are selling for $2 and up to $2.50 and the other grades of Illinois coal are selling for $1.75 up. A lot of the coal coming into the Twin Cities now is on contract.

St. Louis, Mo.

The latter part of last week brought a slump in the market on all coals, and the weather the beginning of the present week was anything but favorable to the market. The only thing that keeps the market in fair condition at the present time is the fact that the railroads are buying heavily from all fields, and that steam plants have started to stock up to some extent. The car shortage is also a factor in keeping the prices up, as the mines on the Illinois Central are working but one day a week; the Iron Mountain mines get about four days a week and the C. & E. I. from four to five.

In the Standard field the market seems to be dropping, with indications that it will perhaps be better the latter part of the present week. There is an excellent demand for screenings, but the other sizes seem to be off, and indications are that the screenings market will continue to get better, while the market on the screened sizes for the greater part of the coals will remain about as it is.

There is a good demand for anthracite, or there has been, but failure to deliver has caused many cancellations. Coke is in good demand at prices that have remained steady for the past two weeks. Smokeless is moving freely, with a good demand, and the high grade coals from the Standard field are holding their own at from $2 to $2.25 at the mines.

The prevailing prices the beginning of the week were as follows:

Franklin County	
Lump and egg	$1.85@2.00
No. 1 nut	1.75@1.85
No. 2 nut	1.50@1.65
No. 3 nut	1.25@1.35
2-in. screenings	1.00@1.10
Carterville	
Lump and egg	$1.75@1.85
No. 1 nut	1.50@1.60
No. 2 nut	1.35@1.45
No. 3 nut	1.20@1.30
Screenings	0.90@1.00
Mine-run	1.20@1.25
No. 1 washed	1.75
No. 2 washed	1.60
No. 3 washed	1.50
No. 4 washed	1.25
No. 5 washed	0.75
Standard	
6-in. lump	$1.50@1.60
2-in. lump	1.25@1.40
3x6-in. egg	1.15@1.25
No. 1 nut	1.10@1.15
No. 2 nut	1.00@1.05
Screenings	0.80@0.85
Mt. Olive	
6-in. lump	$1.50
2x6-in. egg	1.25
No. 1 nut	1.15
No. 2 nut	1.05

Spokane, Wash.

The prices of coal in this territory remain the same, with no changes expected in the near future. Local dealers are well stocked and the demand is not heavy. Warm weather is prevailing, the temperature ranging from 35 to 50 deg. and no more cold weather is expected.

Portland, Ore.

There is little change in the situation here as far as the coal market is concerned. The weather is mild and spring is rapidly approaching. This has been a mild winter all through the state and the demand for lumber has been lighter than any average previous year.

Prices remain unchanged and fluctuated little during the winter, the only increase being the usual $1 at the opening of fall known as the storage charge. Half of this charge was removed in January when it was noticed that the demand for fuel would be light for the remainder of the winter.

Production and Transportation Statistics

Norfolk & Western Ry. Co.

Comparative statement of coal and coke shipments over the lines of the N. & W. Ry. Co. for January, 1911-12, was as follows, in short tons:

Destination	1912	1911
Coal		
Tidewater, foreign	79,646	112,204
Tidewater, coastwise	204,623	248,219
Domestic	1,261,686	1,327,525
Coke		
Tidewater, foreign	12,347	4,556
Domestic	146,954	127,084
Totals	1,705,256	1,819,588

The following is a statement of commercial and company coal from mines on the Norfolk & Western Railway for January in short tons:

Field	Commercial	Company
Pocahontas	1,014,810	95,599
Tug River	131,984	35,314
Thacker	165,179	49,523
Kenova	67,526	10,070
Clinch Valley	107,966	9,977
Total	1,487,465	200,483

Foreign Markets

Great Britain

The labor situation having taken a more serious turn, many sellers are seeking higher figures for forward loading, but without finding buyers. Quiet conditions rule on the coal market today. Quotations are approximately as follows:

Best Welsh steam coal	$4.56@4.62
Seconds	4.38
Thirds	4.08
Best dry coals	4.50@4.62
Best Monmouthshire	4.20@4.26
Seconds	3.96@4.02
Best Cardiff small coals	2.78
Seconds	2.58

The above prices for Cardiff coals are all f.o.b. Cardiff, Penarth or Barry, while those of Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage and for cash in 30 days, less 2½% discount.

The following is a comparative statement of the British exports for January, 1911-12:

	1911	1912
Coal	4,956,215	5,421,175
Coke	100,017	113,871
Briquetts	166,709	148,932
Bunker coal	1,564,738	1,516,659
Total	6,787,679	7,200,637

German Empire

Fuel production of the German Empire for the years 1910 and 1911 was as follows, in metric tons:

	1911	1910
Coal	160,742,272	152,881,509
Lignite	73,516,789	69,104,867
Coke	25,405,108	23,600,362
Coal briquettes	4,990,988	4,441,239
Lignite briquettes	16,836,679	15,125,777

Financial Notes

It is expected the Lehigh Valley Coal Sales Co. will formally engage in business, Mar. 1.

Board of directors, American Coal Co. (New Jersey), have declared the regular semiannual dividend of 3% payable Mar. 1, to stock of record Feb. 29.

Eleven first-mortgage, 5%, 50-year gold bonds of the O'Gara Coal Co., dated Sept. 1, 1905, for payment at 105 and interest, are called for Mar. 1.

In the organization of the Alabama Consolidated Iron & Steel Co. there will issue: $4,130,000 6% 20-year mortgage bonds, $1,032,500 6% cumulative preferred and $4,130,000 common, for which the syndicate will pay $4,130,000 less commissions. Both classes of stock will be represented by voting trust certificates. Alabama preferred stockholders will be assessed $60 a share and will receive in exchange $60 in bonds, $15 new preferred and $60 new common. Common holders upon paying $50 assessment will receive $50 bonds, $12.50 preferred and $50 common. Southern Iron & Steel preferred holders must pay $20 cash in order to receive $20 bonds, $5 preferred and $20 common in new company. The Southern common holders will be assessed $10 and will receive $10 each in bonds and common and $2.50 of the new company's preferred.

For the 12 months ended Dec. 31 last it is understood that Island Creek Coal Co. earned a balance for its 100,000 shares of common of slightly better than $2.25 per share after making liberal charges for depreciation and after meeting the $6 dividend on the 50,000 shares of preferred. The company, had it so elected, could have shown a common dividend balance of $3 per share or better. Conditions have been rapidly mending and the last four months of 1911 showed net earnings at the rate of better than $4 per share. It is expected that 1912 will show an output 35% greater than last year with more than a corresponding increase in net due to better prices. By 1913 it is the expectation of the management that production will very nearly touch the 3,000,000 ton mark. Island Creek is already the third or fourth largest coal property in West Virginia.

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POSITIONS VACANT

Advertisements under this heading 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Wanted—An electrician for a coal mine in southwest Virginia; must be able to wind armatures, understand mining machines and be able to look after steam and electric plant; in answering state fully experience and salary expected. Va-Lee Company, St. Charles, Va. Feb. 24.

SITUATIONS WANTED

Advertisements under this head 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Position wanted as manager or general superintendent; twenty-eight years' experience in mining, and have filled positions from door boy to general superintendent; I am a graduate mining engineer, familiar with every detail in producing, washing and coking coal, including costs and accounts; married and temperate in habits; references furnished. Address Box 6, care Coal Age.

Wanted—Position—First class electrician and mechanic; expert on all types of armatures, winding, building power plants, construction work, remodeling mines, locomotives, fans, pumps, coal cutter; best of credentials as to integrity and ability. Address Box 12, Coal Age. Feb. 24.

Uptodate engineer, over 30 years' experience in bituminous mining, will accept position as engineer or superintendent for a coal company; am at present employed, but desire a change; I am married; abstainer of liquor. Address Box 13, Coal Age. Mar. 2.

Pneumelectric

TRADE MARK

THE ELECTRICALLY OPERATED COAL PUNCHER

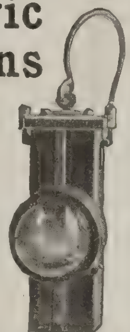
Others are using it to increase their profits

WHY NOT YOU?

Let us tell you about it.

The Pneumelectric Machine Company Syracuse, N. Y.

Hubbell Electric Safety Lanterns



Ideal for MINE Use

For general use about the mine, the officials' and Miners' Hand Lantern here shown is unequalled. It is excellently adapted for work in tunnel headings, for use with rescue apparatus or coal punching machines. Cost of operation is only about half that of any oil lamp. *Write for catalog.*

PORTABLE ELECTRIC SAFETY LIGHT CO.

14 Johnson Street, Newark, N. J.

The Mine Lamp with Lowest Operating Cost

A Mine Lamp that supplies an 18 candle power light, for 10 hours, on 6 oz. of carbide (cost, 1½ cents).

The Scranton Acetylene Mine Lamp

Has the most practical Water Control Valve of any mine lamp made. Absolutely free from grease, soot and smoke. Built for rough service, giving powerful, steady light for all kinds of work.

Price, complete. $1.00.

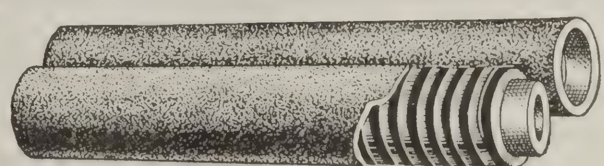
Write for Catalog.

Scranton Acetylene Lamp Company

145 Belmont Terrace, Scranton, Pa.

For Sale

A mining property and brick plant located at Ralston, Lycoming County, Pa., on the Northern Central Railway. The brick plant is complete and has a capacity of 20,000 per day. The coal property consists of about 3,000 acres of land, of which about 500 acres are underlaid with a vein of bituminous coal and shale of excellent quality for making brick. The mines are developed and in working order with a complete electric equipment; capacity 350 tons per day. Besides the power-house and other necessary buildings, there are, on the property, a church, school-house and over 70 dwellings. The two plants can be worked together economically. For particulars inquire of IRVING ELTING, President, Poughkeepsie, N. Y. or Jno. D. Allison, Sec'y and Gen'l Manager, Roaring Branch, Pa.



Acid Water Does Not Affect It

Destructive mine waters have no affect on machine made wood water pipes. The steel hooping gives the necessary tensile strength and the asphaltum covering resists acids of mine water.

Our facilities allow us to quote low prices and make prompt shipments. Send for a Catalog.

Eastern Manufacturing Co., Elmira, N. Y., U.S.A.

Save Armature Repairs!

Hess-Bright Ball Bearings save *wear* by saving *friction*. They run for years without attention of any sort, save to repack with grease every two months. Used by leading builders of mine locomotives, and may be applied to existing equipment.

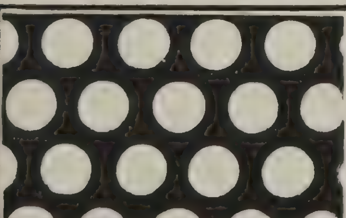
The Hess-Bright Manufacturing Company

2129 Fairmount Ave., Philadelphia, Pa.

WATER SOFTENING OR FILTRATION

FOR BOILER FEED AND ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.



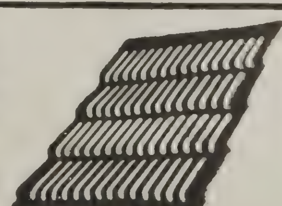
PERFORATED METALS

OF EVERY DESCRIPTION AND FOR EVERY PURPOSE

Elevator Buckets **Flights and Trough**

HENDRICK MFG. CO., Carbondale, Pa.

NEW YORK OFFICE, 30 CHURCH STREET



Moments with the Advertising Editor

A Department for Subscribers Conducted by the Service Department of Coal Age

No advertiser would hire Ananias to write his copy these days.

The time of deception is past—and the reason why the ads you read "ring true" is simply because there's sincerity back of them.

Advertising is not a gamble any more—it's a sound business investment. And the concern that O. K.'s an ad stakes its reputation on the contents of the ad.

Truly, the world do move.

* * *

Here's another way of looking at it. A concern's advertisement is an invitation to you to trade with them. And when a concern fails to advertise, their attitude may well be looked upon as a sign that they do not care enough about securing your business to even ask for it.

* * *

Advertising is a black art only in this way—it's the art of putting honest propositions before you through the medium of black ink. The only devil behind an advertisement is the Printer's Devil.

* * *

It's the reader of advertisements—not the manufacturer—who has made advertising what it is today. For the reader has shown that he wanted to be told about products that would help him in his work or his play.

He has shown that he is very much interested in new articles if the manufacturer could prove to him that these articles were of value to him. He has also shown that he is interested in improvements of old and time-worn articles—even that he is willing to throw away these old articles and replace them with the new ones if he could be convinced it was worth his while.

But there is one thing that the reader demands—and that he demands more and more every day. And this is it:

That the advertisement be just as clear as possible; that the way in which it is written be simple, brief and stick directly to the point. When he is reading an advertisement of valves, he does not care to be told a little incoherent anecdote concerning the Shah of Persia and his favorite Fatima.

In the early days of advertising the man who could talk in the floweriest language about the article he wished to sell, usually gathered enough shekels to plant several flower beds. But that was the period when the reader who answered an advertisement considered getting "stung" as part of the fun. That period of advertising, fortunately, did not last long.

Today, it's confined to the circus and an occasional patent medicine ad. The *influential* advertiser now is the one that sticks strictly to Facts and its twin sister, the Truth. And the reason is that the reader makes this form of advertising—and this form alone—pay the best.

* * *

The fellow who boasts that he never reads the advertising pages of his paper is like the fellow who boasts that he never takes a bath. Both require strenuous treatment, and both are looked upon askance by the rest of us normal beings.

* * *

Don't blame a concern because it cannot tell you *everything* in one advertisement. You can't crowd a week's supply of water into one boiler, all at once; you've got to feed it in instalments.

Follow this golden rule: "What you don't see, *ask for.*"

* * *

There's an awful lot to learn in the big business of coal mining and the advertisements in COAL AGE are doing their part to help you learn it.

Do you read them *always* and *thoroughly?*

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 21.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, MARCH 2, 1912

Ten Cents per Copy.
U. S. and Mexico, $3 per Year.
Canada, $4; Other Countries, $5.

Leading Articles in This Issue

AUTOMATIC WATER HOIST, DL&W. COAL MINE
SCRANTON, PA.

COAL AGE

Vol. 1 NEW YORK, MARCH 2, 1912 No. 21

WHETHER or not there are periods of seismic unrest which are conducive to mine explosions, there is no doubt of there being at present a period of world-wide labor unrest which is likely to cause a destructive upheaval in the international coal situation.

Belgium is struggling in the throes of a serious, although local strike. British miners and operators have split principally because of the owners' refusal to concede a minimum wage contract, and unless the government can persuade the miners to return to work pending a further discussion of the questions at issue, the mines of Great Britain will be closed indefinitely. The momentary quietude in Germany is largely due to her desire to capture the British trade, which will be thrown open to her in case of a suspension at the English collieries.

When asked the cause for such disturbed conditions, most of us point to the average advance of 27 per cent. in ten years in the price of such necessities as bread, eggs, meat, milk, etc. We are told that wages must be raised correspondingly. But a look into the question shows that district engineers and mine foremen in the anthracite field a dozen years ago, received from \$80 to \$100 per month, which compares with \$110 to \$150 paid for the same work today. At that time firebosses received \$60 to \$75; at present, several large companies pay these men as high as \$90. The anthracite miners' wages have not been advanced materially since the award of the Strike Commission in 1902. But their annual earnings today are 25 per cent. greater than they were a decade ago. Bituminous miners have profited in a like degree. It is evident, therefore, that wages all along the line have recognized the general increase in prices of common articles.

Without belittling the importance of the actual higher cost of living, we suggest that at present, most of us specify as necessities many things formerly considered luxuries. Advances in all art or science, from better transportation to phonographs and moving pictures, are educative in character. We don't so much miss what we haven't had, but once we partake of better things, it's hard to plebeianize our tastes again. Too often we forget that a 40c. slice of roast beef will put more strength in our good right arm, than a half-dozen frogs' legs at \$2 a portion. It seems that only the rich man knows that happiness and health can't be purchased at so much per pound.

There are, however, other causes than the "cost of living" to account for the present labor situation in our coal industry. Things become rusty from disuse; an arm not exercised becomes paralyzed and degeneration sets in. A few weeks ago, German imperialistic newspapers declared that only a great war would unite the people of that country, make them loyal to the throne, and save the nation from Socialism. The assertion was based on the truth that "although a faction will fight within itself, you can generally count on a united front against an enemy from without"

Less than one-fourth the miners in this country are in good standing in the Union; the leaders figure that a strike might bring a majority into the fold. They have planned for several years to better their position at this time, and contracts in all fields were made to expire simultaneously. It was hoped that the country would be in a prosperous condition so that in case of a general strike, the men could find temporary employment in other industries and the public would contribute to maintain the strike as was the case in 1902.

However, fate has ordained otherwise, and conditions are not propitious for carrying on a successful contest. The people realize that coal owners have had hard sledding for years—only in exceptional cases have operators made fair interest on their investment. It is therefore common knowledge that any wage advance must be added to the price of coal. Labor is not scarce and the men could not secure work to tide them over a suspension. A simultaneous strike therefore in both the hard-coal and the soft-coal fields seems out of the question. Support must come from within the Union, so the men in one field will be compelled to support those who are idle in the other branch of the industry.

For several years, the bituminous states have received principal attention; during each suspension, the unorganized fields (chief enemies of the union) have secured new markets, and were benefited directly by the strike. Without attempting to prophesy, it is probable therefore, that trouble this spring will occur entirely in the anthracite field. The operators are better prepared than they were ten years ago, and with general business quiet as it is today, things don't look particularly encouraging for the miners' side of the controversy.

The Trinidad District in Colorado

By F. W. Whiteside*

The second and concluding article on the coal operations of southern Colorado. The mining and haulage systems are described, together with some notes on a new, convertible, steel, coal- and cattle-car which is being adopted by some of the Western roads.

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The different types of the crossover dumps are commonly used, among them the Phillips, the Wilson, and the Mitchell. The Hansen-Hayes tipple which is receiving such favorable consideration in the East, will undoubtedly come into use in this territory in the near future, although, so far as the writer knows, none have been installed in this district as yet.

Owing to the number of operators in the field and the consequent amount of competition, the preparation of coal for the market has become one of the fine arts.

Preparation of the Coal

The ordinary shaker, revolving and stationary screens are used. With the first named, from two to four sizes are made and loaded directly into railroad cars. Both the diamond-head bar and the perforated-plate are used, the latter having preference, as it produces a more uniformly sized coal with less dust and slack. There has been some diversity of opinion regarding the use of the square, oblong, circular or eliptical perforation for the screening plate. Each has had its adherents, but it now seems settled that the best preparation is obtained from the circular perforation and, almost without exception, all new screens are so equipped. The customary inclination given to screens of this type is 14 degrees.

The revolving type is ordinarily used to supplement the shaker or stationary screen in the preparation of slack and of the finer sizes for the washer or market. It will be found either under the tipple or up in the top of the washer. It would seem unfortunate that such conditions as heights and capacities make its use difficult on the tipple as a substitute for the present screening arrangement, as there is so little vibration connected with its operation and the resulting product is of such high quality. Both woven-wire and perforated-plate are also used, the former giving the best results. The screens in use in the district vary in size from 3 ft. 6 in. to 7 ft. in diameter and from 8 to 22 ft. long. The ordinary working pitch is about 5 degrees.

The stationary bar-screen is the natural pioneer and when properly constructed and operated, gives satisfactory results. The usual difficulty, in connection with the use of this screen is that its capacity is overcrowded. Usually an entire pit car of coal is dumped in a single mass which holds together as it slides down the bars. There is not enough obstruction in its path to turn over the lumps on the bottom, so the slack rides down on top and is delivered with the lump coal into the car. By the use of a suitable feeding device the coal is delivered upon the screen in small quantities and ample opportunity is given the finer sizes to pass through the bars. A feeding device is also of wonderful aid in prolonging the life of the box-car loader. Many of the larger mines load mine-run and engine-lump almost exclusively for railroad use. This is particularly hard upon the box-car loader unless the product is fed into it slowly.

The bar screens in this district measure from 4 ft. 6 in. to 7 ft. in width, from 16 to 24 ft. in length and operate on a pitch of 28 to 30 degrees.

Mine and Railroad Cars

In order to make a convertible car, the Western railroads are, many of them, building a steel frame drop-bottom cattle-car with side and roof doors. These cars are used for the transportation of stock, especially cattle, in the shipping seasons and for coal and coke the balance of the year. In the designing of a number of the newly constructed cars, the builders have lost sight of the need of a standard height for all car floors, side doors and roofs. As a consequence a box-car loader, set for a sandard height car floor is oftentimes too low to enter the side of the box- or cattle-car, on account of the excessive height of its floor. It is unsafe to raise the loader as the next car may have a low door which will not permit it to enter. It is true that there are certain makes of loaders which permit of vertical adjustment, but they are not always suitable for the loading conditions of a given mine. It seems unfortunate that a certain standard of height cannot be maintained for all coal-carrying cars.

Double-inlet Sirocco Fan Installation at the Hastings Mine

Pit cars of both wood and steel are used. The selection of the material being dependent upon the several governing conditions about the mine. Wood cars are used more numerously than steel, probably on account of their smaller first cost and the ease with which they are repaired. One of the largest operators in the field has recently taken a new stand in this matter and placed a large order for steel cars, believing that with a long haul there will be much less leakage of coal than with the wooden car.

There is considerable diversity as regards dimensions of the cars used in this district, due to the different heights of coal, pitches of the seams and capacities of the mines. The range is from 7 to 10 ft., end to end of bumpers and from 2 ft. 6 in. to 4 ft. in height above top of the rail. Both roller-bearing and plain wheels are used, besides at least a dozen different patent wheels. All tracks have a 3-ft. gage.

Railroad Yards and Scales

The 100-ton, 74-ft. standard track scale is most generally used for weighing empty and loaded railroad cars, while

they are standing under the tipple. The shorter and lighter scales are gradually passing out of use. The increased weight of railroad cars and their proportionately increased capacities have brought this about.

The railroads are now installing concrete and steel scales, the only wooden portions being the coping and deck. During the past year the Victor-American Fuel Co. installed four, 74-ft., 100-ton scales with concrete foundations and steel construction throughout, including the coping and deck. It is their practice to place all scale tracks on a 2 per cent. grade to enable the loaded cars to start readily in the most unfavorable weather. In order to attain this grade a tapering plate girder was fabricated which measured 36 in. at the high end and 18 in. at the low. Resting on the top of each girder, is a 2-in. oak plank, running the full length of the scale, to serve as a cushion; upon this is laid the steel deck, covering the scale and finally the track rails, which are securely bolted through deck and cushion into the girder. These scales have given satisfactory service.

Delagua Tipple, Equipped with Crossover Dumps and Three Car Feeders

A View at Primero, Showing Typical Miners' Dwellings

Power Plant, Tipple and Washery at Hastings, Colo.

The usual practice of landing the empty railroad cars at the upper end of the yard and then dropping them by gravity to the tipple and on to the loaded storage tracks is generally followed. There are usually from two to four loading tracks under the tipple and the gradient varies from 1 to 2 per cent. It is customary to provide a sufficient number of derailers to take care of runaway cars. The size of the yard is made as nearly proportional to the tonnage as possible: the usual allowance being a foot of track per ton of production for both the empties and loads.

System of Mining

Both the double- and triple-entry systems of mining are in use. In point of numbers there are probably more mines in the district employing the former. Ordinarily, entries are driven 12 ft. wide, although this standard may vary as much as two feet. Crosscuts are driven as often as necessary to keep good air up to the working faces, being generally placed at intervals of 60 to 100 feet.

The room-and-pillar method of mining with numerous modifications is used, there being no mine in the district employing the longwall method. The accompanying map of the Gray Creek mine of the Victor-American Fuel Co. may be taken as typical of mining practice in this district. Numerous geological disturbances will be noted among the more important of which is a broad and regular dike, crossing the Main South entry nearly at right angles between the 5 and 6 West Entries and a well defined and persistent fault with a throw of 14 ft. to the east and south of the shaft.

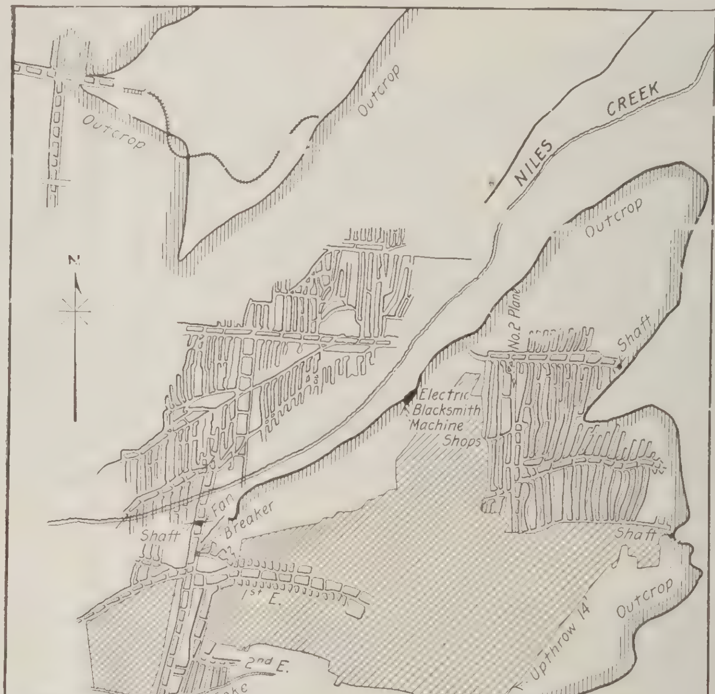
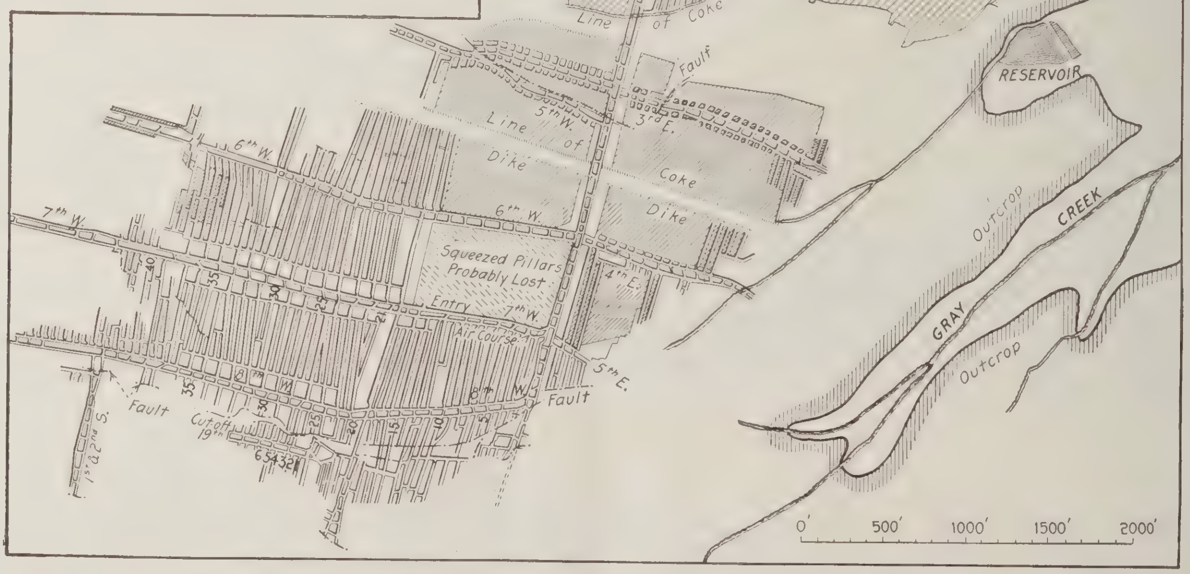
The original practice in the majority of mines in this district was not to pull pillars on the advance until the boundaries were reached in any particular section. When a mine was started on the retreat a great number of rooms and entries would be found so badly caved that enormous expense was incurred to put them in shape for the pulling of pillars and often large blocks of valuable coal were lost, as will be noted on the accompanying map. Added to these difficulties a serious squeeze often occurred.

In later years the old practice has, to a large extent, been abandoned and a number of systems devised by which the pillars may be pulled as soon as possible after rooms are finished without doing injury to the permanent haulageways. This arrangement has the advantage of permitting the concentration of a large number of men in a small area, besides simplifying the ventilation and haulage. The panel system, with certain modifications has a number of followers, who claim excellent results from its use.

Rooms are, whenever possible, driven either on the strike or on some angle up the pitch. The usual width is from 22 to 25 ft., although some are driven as narrow as 18 ft. and others as wide as 30 ft. Unless the amount of cover is excessive the pillar is approximately the same width as the room. The practice of driving long rooms, 600 to 700 ft., has been generally discontinued and the average length of rooms is now from 300 to 400 feet.

Methods of Shooting

The coal is removed from the solid both with and without powder. Several operators have experienced considerable difficulty in preventing the use of dynamite which so badly shattered the coal that the percentage of slack ran high. This practice has been finally discontinued. Black and permissible powder are used exclusively except when in grading hard rock is encountered. Then dynamite is resorted to. The shots are fired by regular shotfirers employed for that purpose.

Map of the Victor-American Fuel Co.'s Gray Creek Mine Showing Typical Faults and Dikes

The number of mining machines in use in this district, at present, is not large, but steadily increasing, especially where mining is carried on in low coal.

The holes for shooting are bored by hand. Considerable experimental work has been done with the hydraulic cartridge. This device is a modified form of the hydraulic jack and could it be made to work successfully in all these coals, would be a great boon to miner and employer as well. It is a well-known fact that in certain coals, it has proved a decided success, but there seem to be others, in this field, which, on account of their elasticity and toughness, do not yield readily to the cartridge. It is probable that with a few simple modifications it can be made to do the work successfully in all coals.

Ventilation

In addition to its many other advantages the hydraulic cartridge will cut down the proportion of slack at least 25 per cent. As mined today the slack in ordinary mine-run varies from 35 to 60 per cent., the percentages lying mostly between 45 to 50.

The ventilation of the mines is handled in practically the same manner as in other coal mines the country over. The main haulageways usually carry the fresh air into the mine, while the back entries, or air courses, carry the return air. The air is split whenever a given area can be better served by so doing. Overcasts are used much more frequently than undercasts. They are ordinarily built of old rails, brick and cement, making them both cumbersome and expensive. Cylindrical pipes of extra-heavy galvanized-iron for this purpose would be light, comparatively cheap and much more easily han-

dled. Probably something along this line will eventually be adopted.

Brattices and doors are usually made of wood, but since the terrible fatalities of the past two years, in which so many lives were lost, the wooden door has been giving way to an interchangeable steel one and the old style brattice to one built of rock or brick laid up with cement mortar. So-called noncombustible brattice cloth is used, but, as this material looses its noncombustible property in time, great care must be exercised to protect it from fire.

Mine Lighting

In all mines where electric power is used, the main haulageways and partings are lighted with incandescent lamps. In nongaseous operations, the miners all use the lard-oil pit lamp.

Instruction and First-aid Car of the Victor-American Fuel Co.

The storage battery electric lamp would appear to be the future mine light. A local man, V. Patton, has perfected and patented a device, by which, in the event of the insulation wearing through or any other accident happening to the lamp whereby an arc would be made, the current is automatically cut off.

The operators have been experiencing great difficulty in teaching the ignorant miner the proper care and use of his safety lamp. It often happens that he becomes dissatisfied with the amount of light his lamp is furnishing and keeps turning up the wick until he has the gauze so badly smoked that the lamp is unable to burn. He then proceeds, if possible, to open the lamp. It has become necessary, in a number of cases, to subject the offender to fine or imprisonment in order to check the practice. The new lamps now purchased are magnet-locked, which will eventually obviate this trouble.

The Dust Problem

The Trinidad district is located in a rather dry, arid country. There is a small sub-surface water flow which is not, however, of such extent to make pumping a serious problem except in a few cases. In all mines in pitching seams considerable water finds its way to the lowest levels from which points it must be pumped to the surface. All other parts of the mines are dry and inclined to accumulate dust unless careful sprinkling is maintained. This is now being done in a systematic and thorough manner, the dust being washed from the timbers and sides of the passages and the floors thoroughly saturated at regular intervals. The operators now employ a large number of private inspectors, who give every detail, affecting the safety of the men underground, their most careful attention.

There are approximately 14,770 men employed in and about the coal mines of Colorado of which number, 5550 are working in the mines of the Trinidad district. The wages paid are good, when the class of labor obtainable is considered. A good miner earns as an average about $125 per month after powder, light, hospital and rent deductions are made; the more inexperienced will make from $70 to $90. The wages of drivers and other company men are in proportion.

Miscellaneous Details

As a usual thing the operator furnishes the miner's dwelling house, charging him a small rental. In some cases a small charge is also made for water, but usually it is furnished free with his house. His fuel and light are given him at cost plus from 10 to 20 per cent. He is provided with medical and hospital attendance by the payment of a small fee. The sanitation of his dwelling is regulated and inspected. His children are obliged to attend school until at least 14 years of age. This is the law and it requires the combined efforts of the officers and the operators to enforce it, as the miner would often take his boys underground as soon as they are strong enough to handle a shovel. Taken altogether the miner is happy, contented and prosperous and his condition is improving every year.

Great attention is being paid, by the larger operators especially, to first aid and rescue instruction. A proficient instructor is in charge who looks after all rescue and first aid apparatus and who gives instruction upon these subjects to regular classes composed of miners and company men generally.

Regular rescue crews are maintained which are held in readiness to go to the assistance of any mine in this or neighboring districts which may need them. A number of heroic men have thus given up their lives in the service of the unfortunates in other mines than their own. The U. S. Government car, in charge of Prof. Roberts, spends a great deal of time in the district and is doing most excellent work.

In 1910 the total coal production of the state of Colorado was 12,104,887 short tons of which amount, 5,595,664 tons were mined in the Trinidad district. There are 3164 beehive coke ovens in the state, although in the year 1910 some of them were not working. The Trinidad district has 2960 ovens of which number 2400 were burning during that year, in which time, the total coke production of the state was 1,190,901 tons and of the district 1,095,922 tons.

Matanuska Coal Field

The high-grade coals of the Matanuska Valley, Alaska, are the subject of a timely report just issued by the United States Geological Survey. The Matanuska coal field is the area to which Secretary Fisher recommended that a Government railway be built, and the Geological Survey report, with accompanying detailed maps, showing the areas underlain by coal strata, the most feasible routes for railway approach, and other specific and authoritative information, constitutes a valuable contribution to the present Alaska fuel problem.

The report is issued as Bulletin 500—"Geology and Coal Fields of the Lower Matanuska Valley, Alaska," by G. C. Martin and F. J. Katz. The accompanying maps show the geology, structure, and position of the coal beds and the report gives detailed measurements of the individual coal seams and analyses of the different grades of coal.

The maps, which are on the scale of a mile to the inch, will enable the constructing engineer to lay out the most feasible railroad route and will also provide the coal miner and operator with an adequate base for planning the work of prospecting the individual coal beds through drilling, shaft sinking, or tunnel driving.

Notes on Underground Fires

By James Ashworth *

Instances of fires caused by criminal negligence, carelessness and the disregard of rules and mine regulations. Lessons taught by mine disasters. Rescue apparatus. Spontaneous combustion in mines. Humidity. Microscopic examination of coal. Effect of mine temperature. Direction of air current. Iron pyrites in coal. Manner of handling mine fires.

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Mine fires naturally result from a large variety of causes. Many, and indeed the majority of mine fires, are the result of criminal negligence of the rules and regulations made to safeguard the lives of miners; many more arise from the gross carelessness of miners or the mine officials.

The worst case of criminal neglect of rules that ever came under my personal notice occurred in a mine in which safety lamps were used and no open lights permitted. On one of the main roads in this mine there was a blower of gas that had been in continuous active operation for a considerable time. It was the duty of one of the mine officials to inspect this blower, after the miners had left the mine, each day. On making his round of inspection one afternoon he was startled to find the blower of gas had been ignited and was burning fiercely. Fortunately he was able to extinguish the flame before any serious damage had resulted. It was never discovered who was responsible for the ignition of the blower, as a subsequent investigation and search of the miners did not reveal any matches or lamp keys in their possession. Evidently someone had disobeyed the regulations of the mine, either by carrying matches or by tampering with the safety lamp.

A notable instance of gross carelessness on the part of the miner is found in the disastrous and fatal fire that occurred at the Hamstead colliery, in England, sometime since. In this colliery the miners used common tallow candles, which were stored at the bottom of the downcast shaft, in a large box. It was the custom for each miner to cut off his daily supply of candles from the bunch that was kept in this box. In the present case a miner, instead of cutting his supply of candles from the bunch, burned the wick or cord holding the candles and dropped the bunch back in the box and closed the lid. When the fire was discovered later it was burning fiercely, having ignited the woodwork about the pit bottom. As a result of this fire a large number of lives were sacrificed.

The fan at this colliery was not reversible, and the accident aroused great interest in the question of whether the ventilating fan at a colliery should not always be so constructed that the air current in the mine could be reversed on short notice. The question of reversing the air current in a mine, while the men are at work, has never been seriously debated and is still unsettled. Many claim that the cure would be more dangerous than the disease, because the men remaining in the mine and ignorant of the changed circulation would be trapped and suffocated.

The terrible disaster at the Cherry mine in Illinois in November 1909, by which 259 lives were sacrificed, was the result of combined carelessness and negligence. The fire was started by a car of baled hay that was pushed too close to a burning torch at the side of a track. It was bravely fought for some time by the men at the bottom of the shaft; but these men failed to send word in to the workers in the mine, in time for them to make good their escape. Many of these men were trapped, their escape being cut off by the smoke and gases of the fire. The ventilating fan at the Cherry mine was reversible, but the reversing of the air current, which was done later, cost the lives of some of the rescuers.

The Cherry disaster taught many useful lessons, among these may be mentioned the danger of an unprotected light on the shaft bottom; the need of greater caution in the handling of combustible material being taken into the mine; the danger of reversing the air current; the need of greater fire protection at the shaft bottom; and the need of fire drills. The rescue of twenty-one men from this mine, after a period of eight days, teaches that it is unwise to assume in any case that all of the miners in the mine are dead or beyond rescue. There should always be hope till the absolute truth is known.

I will mention but one other instance, which occurred recently in the old Hednesford colliery, England, and which shows the criminal neglect on the part of the mine management to establish a proper system and supervision of the underground workings. At this colliery five men lost their lives by suffocation caused by the smoke of a fire that started in a cabin on the intake road. It is supposed that a boy when trimming his lamp in the "shukey" (underground cabin) set apart for that purpose, threw a burning wick on the floor and did not take the trouble to extinguish it. The cabin was located about thirty yards from the bottom of the downcast shaft. When the fire was discovered the flames had traveled along the oil-saturated floor and ignited some cars loaded with coal that were standing ready to be hoisted up the shaft. A workman nearby seeing the flames made an attempt to extinguish them, but failed to do so and went for assistance. The overman who first arrived ordered the opening of the separation doors leading to the upcast shaft. This short-circuited the smoke and gases of the five and kept the most of it from entering the mine, where about one hundred men were at work. A little later the under-manager arrived and ordered the doors to be closed again. Most of the men working inside had escaped, but five men, including one brave fellow, Thomas Stokes, who volunteered to rush through the smoke to warn the inside men lost their lives. When the flames were finally extinguished but one pony out of twenty in the mine was found alive.

This last instance points several lessons. An astonishing feature is the fact that during the excitement no one thought of stopping the fan. Among the lessons to be learned are the need of more thorough supervision underground; the need of better fire protection and fire fighting apparatus underground; and the building of all shanties and underground enginerooms and pumprooms of incombustible material, as far as practicable.

Use Of Rescue Apparatus

In England, it appears to be customary for a certain group of collieries to combine together and maintain a central rescue station and brigade. In the instance just mentioned an early call was made on the station for help. At the time the call was made the principal part of the available force of the station was away, having been called to assist in extinguishing a fire at the Jammage colliery. In response to the second call, however, a few men were sent with rescue apparatus. At the inquest, referring to the use of rescue apparatus it was pointed out that even if the apparatus had been on the ground it would have been of little use because there was no means of bringing the men through the smoke.

Here is an object lesson revealing the fact that, in all cases, the rescuers should each carry a second apparatus in addition to the one worn, to enable them

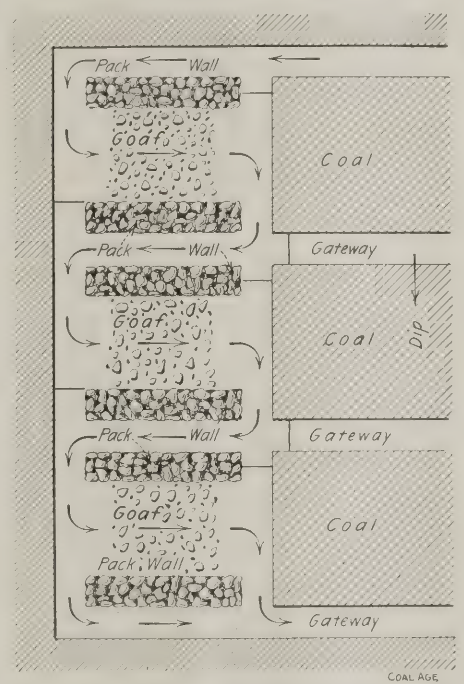
to bring out men that may be found alive. The importance of this was demonstrated at the Bellevue disaster in Alberta, Canada, December 7, 1910, when two men, although they had never worn a Draeger apparatus before, were safely brought through a considerable length of airways filled with smoke and gases. For this purpose it is evident that the apparatus should not be heavy or cumbersome. Many of the forms of apparatus in common use are poorly adapted for mine work, on this account. Mine-rescue apparatus should be so simple that a novice, who has never worn the apparatus before, can put it on and use it successfully. An important point in rescue apparatus is that it shall not have any small apertures that can become suddenly clogged. This has in some instances caused the failure of the apparatus with fatal results.

Spontaneous Combustion

A large majority of underground fires are undoubtedly due to spontaneous combustion, resulting in what are generally known as "gob fires." These form a very important class of mine fires. Such fires have always been a great source of trouble in mining and their origin is still a matter of speculation with a large number of mining men, whose opinions differ widely as to the exact cause and the best remedy to be applied. The truth of this statement is evident from the numerous references to the subject in papers contributed, from time to time, to scientific journals and institutes. Quite recently, at an inquiry in regard to the cause of an explosion, a mine inspector suggested the following points might well be investigated; namely, (1) the affinity of oxygen for the various coals, shales and rocks; (2) the heat conductivity of such coals, shales and rocks; (3) the relative inflammability of such coals and shales; (4) that analyses of the various coals and shales be made, and the gases contained in them ascertained; (5) the structure of various coals as shown by the microscope; (6) the hydroscopic moisture content of various coals; (7) the fineness of the particles of crushed coals; (8) the shape of such particles; (9) the temperature at which oxidation becomes destructive; (10) temperature and humidity of the air in various parts of mines taken every four hours of the day. This classification suggests, at least, how much there is yet that may be learned in regard to the spontaneous ignition of coal.

Humidity In Mines

The writer firmly believes, as the result of his own experience of many years in mines where gob fires were a perpetual trouble and danger, that the humidity of the mine and the mine atmosphere represents the chief factor of safety. It may be generally stated as a fact that will be accepted by all, that if it were possible to make the air in mines practically dry there would be no gob fires. This, however, is a practical impossibility, in mining. But, owing to the increase of the heat and the temperature in deep mining, and the difficulty the miners experience in working in a moist, warm atmosphere, it is necessary in deep mines to maintain, as far as possible, a drier condition of the air current. In other words, it is important to avoid humidifying the mine air as much as possible. This has led some to think that a seam of coal that is subject to spontaneous combustion at a moderate depth, might be less susceptible at a greater depth. This, however, is not the case, since there is always sufficient moisture in the air of mines to make combustion possible, and the increased heat favors combustion.



Showing Proposed Direction of Air Current to Prevent "Sweating" in Mining on Deep Pitches

I would suggest that the daily and systematic use of the hygrometer throughout a mine subject to spontaneous combustion is of the greatest practical value as a means of indicating, (1) any increase or decrease in the heat of the air currents; (2) and most important, any abnormal rise in the water-vapor content. The latter observation gives the earliest indication of any tendency to spontaneous combustion and the development of gob fires, in mine workings.

No experiments have been made, as far as my knowledge goes, to discover what effect hygroscopic water has on the liability of coals to take fire spontaneously. We are aware, however, that the higher the percentage of hygroscopic water in coal the more easily the coal disintegrates; and this would naturally increase the rate of oxidation rapidly.

As an illustration of the influence of moisture to produce spontaneous combustion, I recall an instance narrated by an engineer, then president of a society of mining engineers but now deceased. He was explaining why he substituted fan ventilation for furnace ventilation, in a mine. He stated that the mine was very subject to spontaneous combustion. At week ends and holidays it was customary to slow down the furnace, with the result that moisture condensed on the refuse thrown back in the gob. He observed that this moisture still remained when mining was again resumed, and before it dried up it was covered by fresh refuse. He stated, in conclusion, that he considered this moisture was the primary cause of the spontaneous combustion and frequent occurrence of gob fires in his mines. As a test, a fan was installed and kept running at a regular speed throughout "play days," with the result that the moisture was reduced and there were fewer cases of spontaneous combustion in the mine.

Microscopic Examination Of Coal

In passing, I desire to refer to a suggestion from a scientist, a Mr. Lomax, who has recently made a close microscopic examination of different coals. Mr. Lomax has produced some marvelously fine slices of coal for examination and for lantern purposes. These slices show that coal is not all black, and the resinous parts are easily distinguishable. He suggests that a further examination may prove of great value to mining by showing why one coal dust is more explosive than another, and also why one coal is more susceptible to spontaneous combustion than another. It has long been held by authorities that the fineness and the shape of the particles of crushed coal resulting from the natural pressure and movement of the strata, influence the tendency of the coal to spontaneous combustion, the reason being based on the ground that the finer the coal is crushed the greater the extent of surface exposed to oxidation, and the more rapid the oxidation the greater the heat developed.

In some deep coal mines the natural heat of the strata often ranges from 90° F. to over 100° F. While no actual data has been thus far produced to show that such increase of the mine temperature assists to any great extent the spontaneous combustion of the coal, yet there is a growing suspicion that it does exercise an undesirable influence in this regard, especially where the enfolding

strata are highly bituminous. Recent experiments have shown that tar is distilled from coal at a low temperature, and this fact may materially increase the liability to spontaneous ignition of the coal. It is reasonable to suppose that the high temperature and moist atmosphere, in many deep mines, greatly increase the risk from spontaneous combustion.

In the mining of an inclined seam of coal subject to spontaneous combustion the direction of the ventilating air current is important. See Fig. 1. Instead of the usual ascensional system of ventilation I would suggest that in this case the air current should be entered at the highest point in the mine and from thence conducted downward, especially if the mine is being worked on the longwall system. In making this suggestion I have in mind the effect of the deposition of moisture on the waste stored in the gob, to which I have previously referred, as assisting the disintegration of the fine coal and increasing the tendency to spontaneous ignition of the coal. It will be remembered that the capacity for carrying moisture in the air current increases with the temperature. If the cool intake air enters at the highest point of the workings its temperature gradually increases as it is conducted to the lower workings. Its vapor-carrying capacity is therefore increased regularly, and no moisture will be deposited in the face of any of the working places. On the other hand, if the cool intake air enters at the lowest point of the workings, this being the hotter portion of the mine, its temperature is raised and, as the air proceeds upward, it is cooled and deposits its moisture, from time to time, at the face of each working place. It is this deposition of moisture on the refuse or waste that greatly facilitates spontaneous combustion.

Effect Of Iron Pyrites In Coal

In cases where iron pyrites is found in the coal the dampness deposited from the air current undoubtedly assists in the disintegration of the coal and encourages spontaneous combustion. In all the mines in which the writer has had serious difficulties with gob fires, iron pyrites has been present as a factor, and the point I would like to urge is that the greatest immunity from this serious danger is to be found in maintaining a dry (unsaturated) condition of the air current. An unsaturated air current will thus continue to absorb or take up moisture. There may, of course, be serious objections to this in the working of a mine generating explosive gas, especially where the mine has a tendency to become dry and dusty. The successful mine manager will have all of these conditions in mind and consider the influence of each.

Handling Mine Fires

The safest and most effectual, and in the long run the least costly way of dealing with a gob fire is to dig it out, whenever this is practicable. With present-day appliances this is not as dangerous work as it would have been years ago, when no oxygen apparatus was in use except the simple apparatus of Denayrouse, which consisted principally of an air-pump, but was often of great value. In many mines it is the custom to build clay walls or banks of sand and flue dust, so as to keep out the air and isolate the fire. In other cases, masonry walls or stoppings are built in the airways, as near as possible to the seat of the fire. In mines generating firedamp the work of isolating a mine fire by building stoppings is always attended with more or less danger. It is important that the work be done promptly.

The most recent disaster caused by the sealing off of a fire occurred in the mining of a coal field of deep inclination. A fire had started in the gob, but was not considered to be in a dangerous condition, and the management decided to first place dirt packs in the roadways and later to build masonry walls or stoppings. The places selected for the stoppings were at some distance from the seat of the fire. When the dirt packs were partly completed there occurred what is described as an "explosion," though no one appeared to have been burned; however, six men were asphyxiated. Unfortunately, at the present writing, there is no information available as to whether the so-called explosion was caused by the gases from the fire or by the firedamp generated in the inclosed space, or both combined; or whether the effect was simply a heavy fall of roof that drove the smoke and gases out onto the men and asphyxiated them. Only one man out of the six escaped alive. The account does not state in what stage of construction the stoppings were at the time of the disaster, nor to what extent the circulation of air had been stopped, and therefore no inferences can be drawn.

In the general discussion of underground fires, however, and without reference to their inception or surroundings, the question is open to argument as to which road should be closed first, the intake or the return airway. Speaking from personal experience, and that a most dangerous experience in this class of work, when seconds of time were important, the return-air road was plugged first, though the intake was not long behind. As a general rule, this course should be adopted, because as soon as the return airway is plugged the smoke is driven back onto the fire and thus forms on the return side—the most dangerous side of the fire—a barrier of gases containing too little air and too much carbon dioxide to be explosive. Besides all this, the intake air is forced backward by the products of the combustion, and the building of the intake stopping is then accomplished in safety.

The use of water to extinguish a gob fire will later do more harm than good, unless it can be applied in sufficient quantity to completely drown the fire. The better plan is to use water, if at all, in sufficient quantity only, to cool the heated matter as it is being dug out.

Underground fires wherever they occur, and from whatever cause they arise, are always dangerous and require the most prompt decision and determination in their treatment. For this reason the mine that is equipped with adequate apparatus for fighting such fires will be most assured of success. No set of rules could be drawn that would fit all conditions, and therefore the best remedy in the extinguishing of an underground fire is a cool head to direct the operation.

The Big Stick for the Operator

A correspondent in the *New York Times* under the euphonic *nom de plume* of "Gentleman Janitor" writes as follows:

I will begin by saying that my subject is coal, furnace coal for the hot-air furnace. I am one of three house owners who compose an organization known in our Brooklyn neighborhood as gentlemen janitors. Why? Because we look after our furnace requirements mornings and at bedtime. Each has "a man" who fills in between times and puts out ashes.

We three know just what sort of coal we pay for at the rate of $6.75 a ton just now, though every April it is Brooklyn's custom to lay in a winter supply at the short price of $6 a ton. All householders who employ "a man" for the entire care of a furnace know not what they pay their money for. But we gentlemen janitors do, and we know that fully an eighth of every ton of furnace coal (egg size) is made up of offscourings from the coal regions of Pennsylvania—slate, a few real stones, slag, and iron ore. The grate of my furnace I have to rake out below fully three times a week, and sometimes the slag has to be dug away, in the form of a mat that forms over the grate. What remedy have we? A Congressional investigation? My complaint applies to all the dealers, or to four, anyhow.

GENTLEMAN JANITOR.

Brooklyn, N. Y., Feb. 19, 1912.

[Why go to Pennsylvania for coal experts when we live so near Brooklyn?]

Coal Mine Ventilating Equipment

By W. M. Weigel*

The relative advantages of pressure and exhaust fans under certain conditions of mining are here indicated and a discussion of reversible fans serves to point out the dangers as well as the benefits that may attend their use. Fan drives are considered and also the details of building construction. The sixth of a series of articles on mechanical ventilators.

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The Sullivan fan like the two makes of high-speed fans mentioned in a previous article, has a large inlet as compared with the diameter of the wheel and has short blades, usually 42 in number, curved forward in the direction of rotation. Every third blade is larger at the center or back of the fan wheel and projects into the inlet space, as is indicated in Fig. 2. The distinguishing feature of this type of fan is the arrangement for changing the fan from an exhauster to a blower or vice versa. Instead of using doors or dampers for this purpose the whole hood or casing is revolved about the fan shaft as a center.

This hood is shown in Fig. 1 in the position required for blowing and in Fig. 3, it is shown adjusted for running the fan as an exhauster. It is turned by means of a hand wheel and a pinion that engages a gear segment on the hood.

Fig. 1. Ten-foot Sullivan Fan, Blowing Position

When blowing, the air passages on either side of the fan are open to the atmosphere on top and the wings on each side of the discharge chimney serve to close the openings between the fan drift and these passages. When exhausting, the wings then close the openings at the top of the side chambers and at the same time allow a free passage from the drift to the fan inlets. The air current may easily be reversed without stopping the fan. This type of fan is made in sizes from 6 to 20 ft. in diameter and is always built with a double inlet.

Pressure vs. Exhaust Fans

Ordinarily, a fan may, with equal facility, operate either by blowing air into the mine or exhausting it from the mine. The construction of the fan wheel is practically the same in either case, the only difference being in the arrangement of the casing with regard to the discharge and inlet openings. The discharge of the exhaust fan is usually directed upward and the chimney or stack enlarges towards its outlet to the atmosphere. The discharge of a blowing fan is usually taken off in a horizontal or slightly downward direction, and is only enlarged enough to make it equal in size to the connection with the mine opening. The power required to force an equal amount of air through the mine is the same with both systems.

Whether the exhaust or the blowing system should be employed will depend to a great extent upon the conditions of the mine and the methods of working. In American practice, the working entrance, whether shaft or drift, is kept unrestricted, or, in other words, it is made the downcast or intake when an exhaust fan is used and is made the upcast or outlet in case a blowing fan is employed. The reversal of this practice requires doors or air locks in the main operating openings, and these devices are a source of delay and annoyance. When the working shaft is the downcast, accumulations of ice, if the shaft is at all wet, are liable to cause trouble during cold weather. On the other hand, if the blowing system is employed and the intake is wet, trouble quite as serious may arise from the choking of the air shaft.

With the exhaust system, the atmospheric pressure in the mine is a little less than that outside. In case the fan stops the pressure in the mine will rise, tending to hold back the gases discharged from the coal and waste places. With the blowing system, if the fan stops, the air pressure will fall slightly, having the effect of a fall in the barometer, and allowing greater quantities of gas to flow into the working portions of the mine and haulage ways.

Where the blowing system is employed, the return airway is used for haulage and if the mine is gaseous this arrangement may not be advisable on account of the danger from drivers' lamps, or sparks from the trolleys of electric locomotives. On the other hand, hauling on the intake, which is customary with the exhaust system, befouls the air before it reaches the miners, and allows the dust from the haulage ways to settle where it is most dangerous. When hauling on the return, the dust and foul air are immediately removed from the mine without reaching the working face. In general then, where the mine gives off gas in any amount and is not dusty, an exhaust fan should be employed. If the mine is dusty and not gaseous a blower is to be preferred. If both dusty and gaseous, the case will usually have to be decided by determining which of the two conditions is the more dangerous, keeping in mind also the system of haulage that is to be employed.

Reversible Fans

With a suitable arrangement of doors or dampers and connections with the mine, any fan may be operated either as a blower or as an exhauster. The Sullivan fan is reversed by rotating the housing as previously explained. In general, making a fan reversible requires that the inlets and discharge be connected with both the mine opening and the atmosphere, the course of the air being determined by the position of the doors or dampers in the several passages.

In Fig. 4 is shown an arrangement of doors and stack damper that permits reversing a fan, primarily designed for use as an exhauster. In this arrangement the doors and dampers are connected by reach rods and toggles so that

the positions of all are changed at the same time and by one operation.

A reversible blowing fan for a slope mine is shown in Fig. 5, and the method of converting it into an exhauster is clearly indicated. When blowing, the side doors of the airway are in the dotted position, and the end of the spiral casing is in the position shown by the solid lines. When exhausting, the side doors are in the position of the solid lines and the movable part of the spiral casing is dropped down as shown by the dotted lines.

Many mines are now equipped with reversible fans, and such an installation has several important advantages. However, reversal of the air current, unless of such frequent occurrence as to render its operation entirely familiar, should be permitted only on the order of some competent person in authority. Otherwise the consequences may be disastrous. Just what effect a reversal of the air is going to have in a particular mine should be carefully studied out, so that in case of emergency (and reversible fans are usually employed for such cases) the right thing may be done.

In the event of a mine fire or explosion, the reversal of the current may serve to draw the smoke and gases away from the outlet best calculated to facilitate the escape of the men underground and thus be the means of saving life. On the other hand, when the location or extent of an accident is unknown, or the effect of reversing the air not previously determined, such a procedure may operate to cut off the means of escape, and add to the catastrophe.

Reversible fans may be employed for other than emergency purposes. If a mine has considerable natural ventilation the direction of which is opposite in summer and winter, the fan can be made at all times to operate with the natural currents and this is always a desirable feature, other things being equal. If a mine makes a large quantity of gas and there are considerable areas of gob or worked out portions for its accumulation, the fan, running as a blower during the day or working shift, will tend to hold back the gases in these places and prevent their overflow into the workings; then at night when the men are out, by running the fan as an exhauster the pressure may be decreased and the accumulation of gases drawn off and carried out of the mine by the air current, at a time when their presence in the main airways offers the least danger.

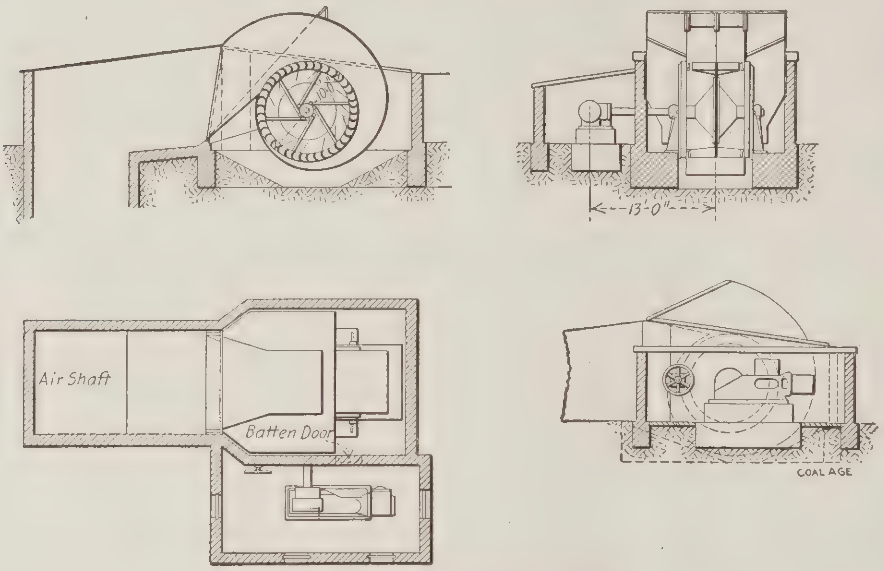


Fig. 2. Sullivan Fan and Fan House

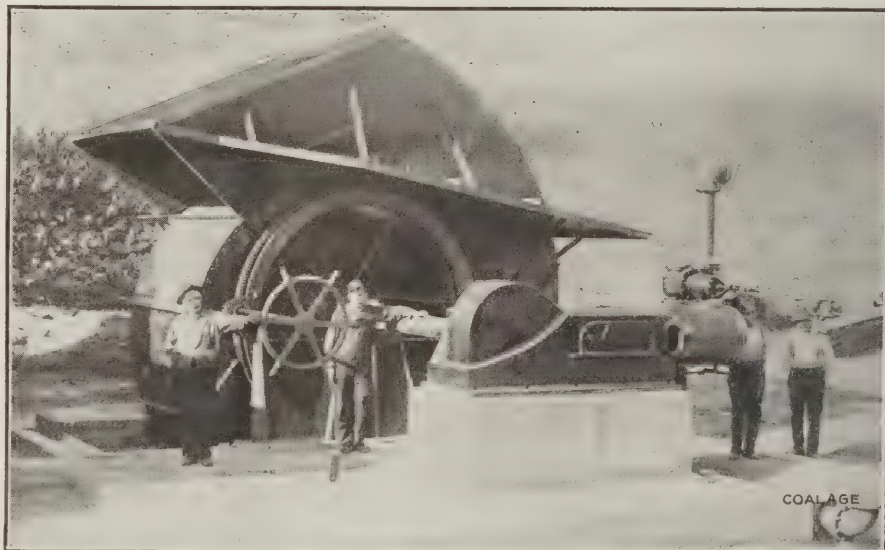


Fig. 3. Sullivan Mine Fan, Position for Exhausting

Location of Fans

The ventilating fan is found in many instances to be placed close to the inlet of the mine and sometimes directly in front of or over it. This arrangement should be avoided where there is any liability of an explosion, for in such an event the fan is almost sure to be wrecked. However, where there is no possibility of danger from this source, that is, where the mine is wet, and there is absolutely no gas, the fan at a drift mine is most conveniently placed directly in front of the airway. When the airway is a shaft, the fan should be kept at some distance from the opening if there is any chance of subsidence or caving.

By placing the fan to one side of the inlet and connecting it to the mine opening with a passage having a right angled turn, it is rendered reasonably safe from destruction, and may be further safeguarded by placing large explosion doors where the fan drift turns off from the entrance to the mine. For a shaft mine, the doors should be directly over the shaft and in the case of a drift or slope they should be set squarely in front of the entrance.

These explosion doors are preferably made double and as light as possible, using thin steel plate or lumber. With a blowing system, they should be weighted just sufficiently to overcome the maximum ventilating pressure required. With an exhaust fan the air pressure is sufficient to hold them closed. The doors should be made as nearly air tight as can be without causing them to stick in the frame.

Frequently these doors are not large enough to be of value in case of emergency. Their area should be at least equal to that of the shaft or entry, and greater if possible. The force of an explosion will tend to blow open the doors and save the fan, as the main explosive effect will travel in a straight line if given a chance, or until some powerful obstacle intervenes. To insure safety the length of the fan drift between the

turn at the explosion doors and the fan should be at least 4 to 6 times the width of the mine entrance. That is to say, if the airway is 10 ft. wide, then the fan should be placed not less than 40 ft. to one side.

Fan Drift Construction

Formerly fan drifts were, as a rule, light constructions of wood, the idea being that the force of the explosion would blow them down and protect the fan, but the danger from fire was a constant menace and it was difficult to keep them air tight, so present practice tends toward the use of steel plate, or masonry of brick or concrete. Steel construction for this purpose consists usually of plates 1/8 in. to 3/16 in. thick, well riveted at the seams and held in place by angles or tee bars bolted to the foundation. All should be kept well painted inside and out.

The floor of the drift may be of concrete and foundations along the sides should be carried well below the frost line. The floor should slope to a drain pipe connected with the outside, as the precipitation of moisture is often quite heavy in the drifts of exhaust fans. If the fan drift is of brick, the walls should be not less than 9 in. thick, preferably 13 in., and for high walls 18 in. The roof may be a brick arch but this construction is expensive and steel plates anchored to the brick walls or reinforced concrete is usually employed.

Concrete makes an ideal construction. It is as cheap or cheaper than brick, is more durable and requires less attention than sheet steel. The walls may be made thick and without reinforcing steel but perhaps a better and cheaper method is to use some one of the various systems of reinforcment adapted to walls, as danger of cracking is thus avoided. The roof may be made of the same material. Entrance to the fan drift should be arranged for near the fan by means of a double door or air lock. Fan-shaft journals, inside the drift, should be provided with a pipe for oiling from the outside.

The fan foundation should be substantial and carried to a sufficient depth, as the operation of a large fan is attended with considerable vibration. Brick or cut stone may be employed in its construction but concrete is usually better as well as cheaper, and is easily molded to form the lower part of the casing. In placing the anchor bolts, enough space should be left around them to allow for slight discrepancies between measurements made on the ground and the material furnished by the manufacturer.

The fan and casing are generally left uncovered, but a house must be built over the engine or motor and preferably this should be of brick, concrete, or other fireproof construction.

Every precaution should be taken to insure the safety and reliability of the surface ventilating equipment, as upon it depend largely, not only the continuous operation of the mine but the lives of the men underground.

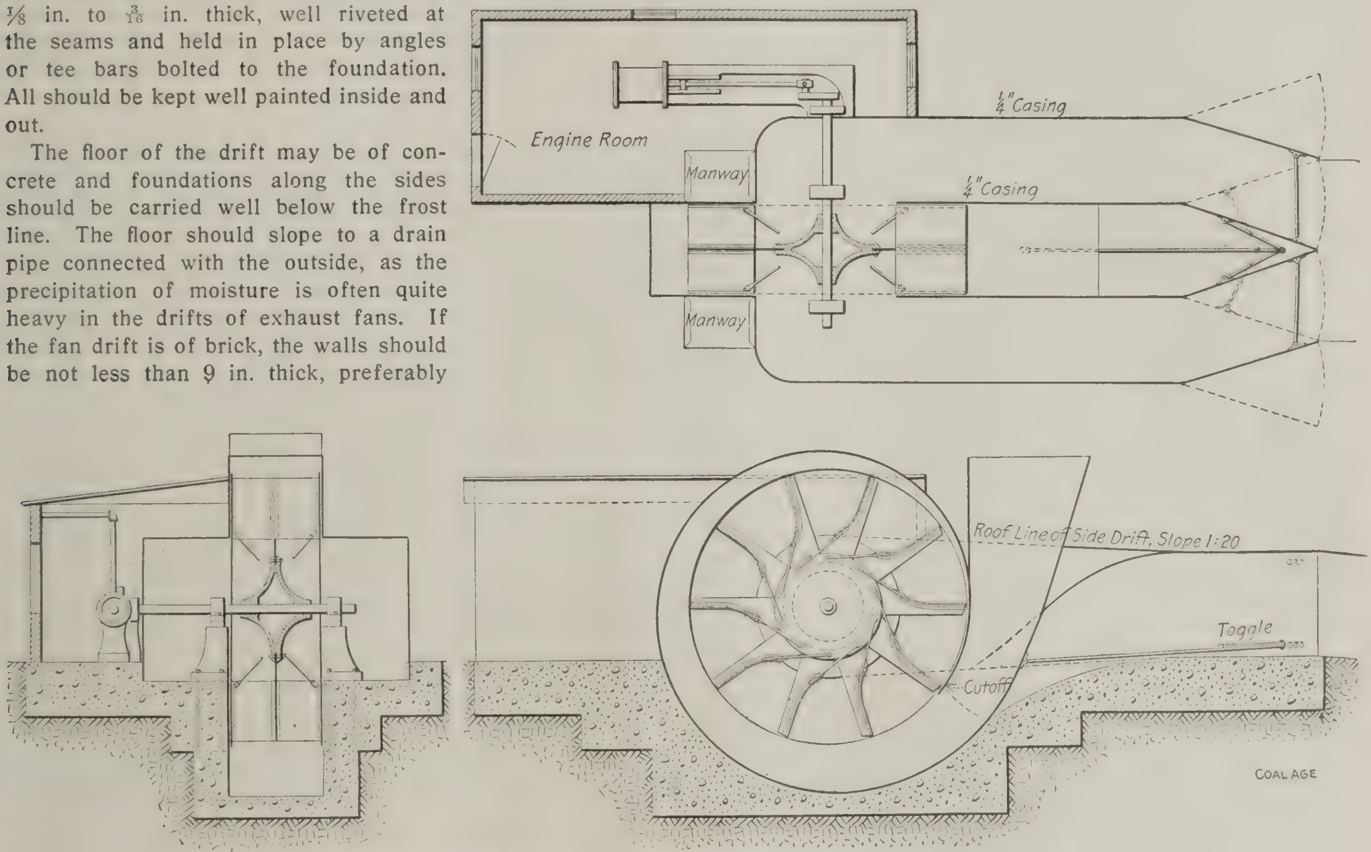


Fig. 4. Double-inlet Reversible Beard-Stine Fan and Fan House

Motive Power

Almost any available motive power may be employed for driving fans. Steam engines or electric motors, however, are the almost universally adopted means as gasoline or gas engines are as yet somewhat unreliable for the isolated localities in which fans are often placed, and water power is rarely found at hand.

Fans of large diameter and slow rotative speeds are best driven by direct connection to steam engines. As a large fan runs at practically constant speed and load, the most favorable conditions are presented for the economical operation of its engine. Direct connected corliss engines are used for many large fans where the speeds do not exceed 100 r.p.m. If higher speeds are required, then the fan may be belted to the engine or a high-speed engine employed.

Rope drives instead of belting are sometimes made use of in England and Europe, but not in the United States. As the fan and engine are usually located at some distance from the main power plant the engines are rarely run condensing. Moreover, water for condensing purposes may not be available at less cost than the saving made by using a condenser. The disadvantages of a belt drive are loss of power in transmission and the requirement of greater space, necessitating a larger building. There is also an increased chance of stoppage due to failure of the belt.

Often two engines are installed, one on each side of the fan. One engine operates the fan while the other is disconnected. Then, if the first should break down, the second can be connected in a few minutes and no serious delay oc-

curs. Such an installation, however, increases the first cost of the plant.

Electric motors are either direct connected, belted or geared to the fan shaft. Direct connection is to be preferred, but such an arrangement is as a rule, only possible with fans of high rotative speeds, such as the multivane and disk types. Slow speed motors can be built for the larger fans but their increased cost usually outweighs the benefits derived. Because of the small amount of attention they require, polyphase induction motors are admirably suited for driving fans.

Speed regulation may be obtained with a steam engine simply by throttling or by adjusting the governor. With an electric motor the speed may be varied by any of the means generally employed for this purpose, but operating at speeds less than normal is usually attended with loss of power in the controlling resistances.

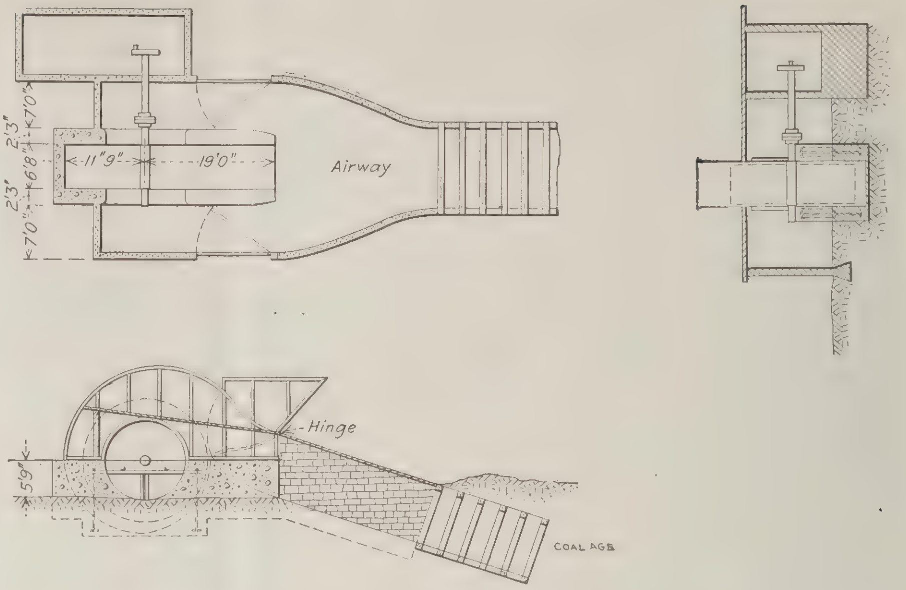


Fig. 5. Reversible Jeffrey Blowing Fan, Slope Mine

A Difficult Piece of Shaft Sinking

Special Correspondence

As supplementary to the article, "Use of Grout in Shaft Sinking," in Coal Age of Feb. 24, an account is here presented of a shaft-sinking operation in which cement grout was successfully used to combat an immense inflow of water. A large emergency pumping plant is also described in this connection.

The construction of the Catskill Aqueduct is deservedly attracting widespread attention. It is easily understood that many important problems necessarily have to be solved when it is proposed to carry an enormous supply of water from a mountain district to a point 100 miles distant, conducting it across a score of valleys, some of them several miles in width, as well as across so deep and broad a river as the Hudson. The part of this work that is of greatest interest to the mining profession is the shaft and tunnel construction.

The aqueduct may be said, if one speaks broadly, to parallel the Hudson River. Consequently, the route cuts across the tributary streams. These are creeks or brooks of no especial importance, so far as size goes. However, they mark the position of valleys, some of which are a number of miles in width. One of the largest is the valley of Rondout Creek. In crossing at this point, the aqueduct drops far below the surface of the ground and the bottom of the creek, and thus makes the 4½-mile passage from one side to the other.

A Deep Shaft through Water-bearing Strata

A vertical shaft at each end, and a third, located at an intermediate point, will remain as permanent features of this work. In addition, five other shafts were sunk to the tunnel grade in order to facilitate construction. One of these, No. 4, is 500 ft. deep and 10x22 ft. in horizontal section. Eighteen months were required to put down this shaft, and it was flooded six times. The strata passed through were as follows:

Glacial drift	6 ft.
Helderberg limestone	226 "
Binnewater sandstone	39 "
High Falls shale	92 "
Shawangunk grit	134 "
Total	497 ft.

The trouble with water came, no doubt, almost altogether from the sandstone and the shale. But the water made its presence felt long before these strata were reached. A 4-in. test hole had been put down on the site of the shaft, and when, in sinking, a depth of about 80 ft. had been reached, a sudden inrush of water came through this hole, half filling the excavation. The emergency pumping plant had not yet been delivered; so the contractors were caught unprepared. However, by the use of an air lift and a couple of sinking pumps, the water level was lowered to a point near the bottom. A nipple was then driven into the hole and casing attached. The purpose was to fill the hole with cement grout. In order to carry out this plan, a

Looking Down into Construction Shaft No. 4

1-in. pipe was put down to the Shawangunk grit; that is, to the 363-ft. level. The water was now permitted to return. Pressures were thus equalized and currents prevented. The grout was made in the proportion of one part cement to one part sand and poured down the 1-in. pipe, this latter being withdrawn as the grout filled the hole.

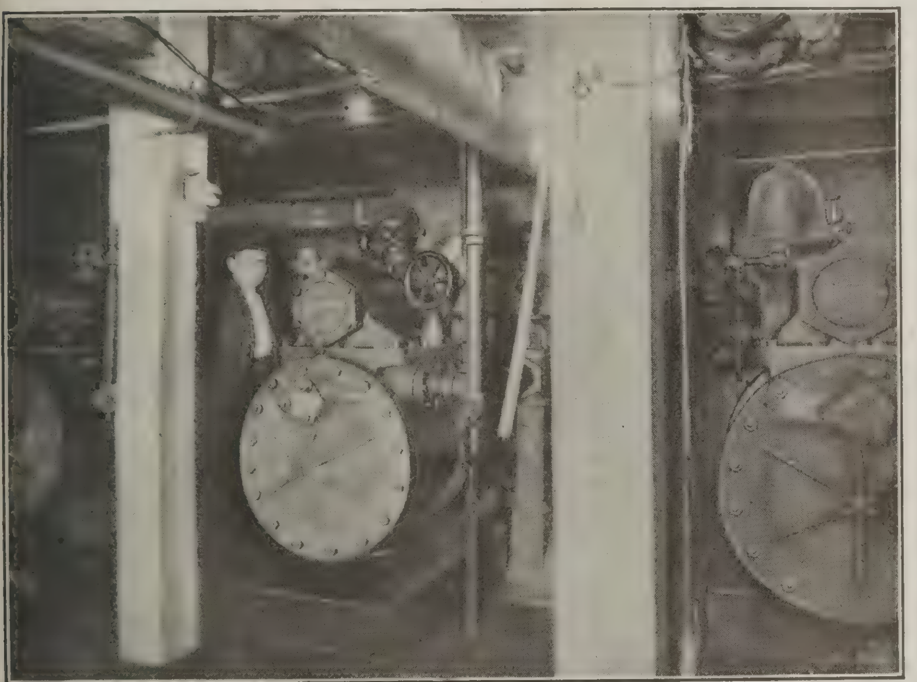
The problem of this one hole was solved as indicated, but the T. A. Gillespie Co. who were doing this work began to entertain fears as to whether the ordinary methods of shaft sinking would prove successful. It was understood that there was in the strata below, a great deal of water under considerable pressure. With subsequent events in mind, it is not difficult to see that a special pumping chamber in the side of the shaft should have been provided before permitting the excavation to pass out of the limestone. This arrangement was made later, but the delay was the source of much trouble. Excavation went on, and the sandstone was penetrated. At the 200-ft. level, the amount of incoming water was only about 225 gal. per min. However, during the drilling of the sump, an additional 600 gal. per min. came in suddenly through one of the drill holes, with the result that the shaft was flooded again.

After some trouble, the shaft was unwatered, only to be flooded three times more in as many weeks. Nearly all this water came in through bore holes that were probably in no case over two inches in diameter. When the fifth unwatering had been completed, the conditions below were known to forbid further progress without taking special precautions. In fact, it had been ascertained that there were large crevices a short distance beneath the bottom of the excavation running up to 8 in. in size. One of the largest of these crevices was distant only a foot and a half. As compared with the 2-in. bore holes, they promised plenty of trouble.

Grouting Up the Crevices

It was now proposed to deal with the water question by means of grout. Four special machines were set up at the mouth of the shaft. A 2½-in. pipe was led down the shaft to the bottom, where a 2-in. hose carried the grout to the point of use. At the beginning of operations, the grout gave some trouble by leaking back. It would come in through the spaces around the pipes and through cracks in the bottom. This difficulty was successfully met by mixing finely ground horse manure with the grout. The manure produced a clogging effect. Some grout was wasted, but success was eventually obtained. In this procedure, a total of 2900 bags of portland cement was consumed. When the grout had hardened in the crevices, a few more holes were drilled, and water having a head of 65 lb. was found 14 ft. below. These holes were soon grouted up, only 60 bags of cement being required.

Sinking was not at once resumed, however. It was deemed advisable to deal further with the question of the water. The Shawangunk grit was now about 100 ft. further down, and it was proposed to grout up the intervening water-bearing strata. Accordingly, six diamond-drill holes were put down to the grit; half were of the size corresponding to a 1-in. core; and half corresponding to a 2-in. core. With a pressure of 275 lb. per sq.in., these holes were grouted up with 175 bags of cement. No one knew whether the small quantity of grout required meant that the problem was a small one or that it had been only partially solved. It would seem that a thorough application of the method of grouting ahead of the excavation should have been employed sooner; that is, before the water-bearing strata had been penetrated.



Emergency Pumping Plant at 300-ft. Level

Emergency Pumping Plant

Sinking was now begun again, and prosecuted until a depth of 320 ft. was reached. Several collecting rings had been arranged, and a number of sinking pumps installed in the shaft. The working space was much restricted and, moreover, it was difficult to secure easy, certain and adequate pumping capacity by the use of sinking pumps alone. It was determined to construct a pumping chamber off to one side at the 309-ft. level. This chamber was made quite large; 10 ft. high and 17x24 ft. in horizontal dimensions. Beneath its floor was provided a sump 5½ ft. deep and 16x22 ft. in area, having a capacity of 14,500 gal. Three 24x10x20-in. horizontal condensing pumps with a combined capacity of 1050 gal. per min., furnished by the Cameron Pump Works, New York, were installed in the special chamber and supplied with steam by three 100-hp. boilers set up at the mouth of the shaft. This arrangement was greatly facilitated by using pumps of the condensing type.

Before the installation of this powerful pumping plant was complete the sixth flooding of the shaft took place. Subsequently, no especial difficulty was encountered in connection with the water. More grouting was done, but, with one exception, none of the seams required more than 100 bags of cement. When the grit was reached, one hole gave trouble and required 348 bags of cement to stop the flow. The amount of water pumped from this shaft was 86,181,000,000 ft.-gal., and the total amount of portland cement consumed in the grouting operations was 971 barrels.

Use of Grout in Shaft Sinking

R. C. Johnson calls attention to an error made in publishing his article "Use of Grout in Shaft Sinking," in Coal Age of Feb. 24. On page 641 the phrase reading "200 gal. of water per hour" should be "200 gal. per minute." It will be noted that this puts a somewhat more favorable aspect on the possibilities of the scheme in question.

In order to avoid accidents, drivers should ride on the front end of cars on a downgrade. The practice of riding between cars should be prohibited, also the dangerous habit of sitting on front bumpers and allowing the feet to drag over the rails.

Another Explosion Test at Bruceton

Editorial Correspondence

This most recent experiment conducted by the engineers of the Bureau of Mines resulted in furnishing quite satisfactory proof that a stonedust barrier will stifle the flame of an explosion and prevent disaster spreading through the entire workings of a mine. Also interesting notes on flame velocity and maximum explosion pressure.

On Saturday, Feb. 24, at noon, the Bureau of Mines conducted an experimental dust explosion in the federal mine at Bruceton, Penn. The arrangements for the test were under the direction of Chief Engineer George S. Rice. The mine was exploded without mishap or delay and the results were gratifying.

At 7:30 o'clock Saturday morning, the government engineers, accompanied by invited guests, left Pittsburg on a Baltimore and Ohio train arriving at the mine, 14 miles out of the city, before 9 o'clock. The forenoon was spent by those present in examining the mine and observing the arrangement of the experimental recording machines. Every detail of the preliminary preparation was carefully explained by the representatives of the mining bureau.

Steel Gallery in the Foreground. The Smaller House on the Right Near Side Portal Shelters Fan and Is Uninjured. A Body of Flame and Smoke is Seen Escaping from Main Portal in Rear

The accompanying sketch shows a rough plan of the mine and the location of the seven recording stations. The first two stations which are shown on the left side of the main entry looking into the mine, have been practically completed and are larger and better equipped than the other five stations located on the right side of this same main entry.

The Recording Instruments

The principal data sought by the Bureau of Mines were the flame speed, and the maximum pressure of the explosion. In order to determine the velocity of the flame, each station is equipped with a circuit-breaker, consisting of a strip of tin foil, which latter is so arranged that it is readily melted by the heat of the explosion. After the tin foil is melted and the circuit is broken, a commutator switch comes into play, and a mark is recorded on a chronograph located in the recording station just above the mine and about 800 ft. distant.

The records of pressure are secured by means of a crusher manometer, which instrument has been adapted from similar instruments that are now used by the U. S. Navy in determining the maximum pressure of big guns. These manometers are also connected with the magnet of a recording chronograph.

The chief defect in the system, as at present arranged, is that the testing apparatus situated in each of the seven stations, is so connected in series that in case one of the stations fails to record,

all the remaining stations on the way out also fail to furnish a record. It seems that this can be avoided and I understand it is the intention of the Bureau engineers to remedy this fault by having a separate chronograph for each station, or by having the drum on the chronograph wide enough so that an individual record for each station can be secured.

Gas Samplers

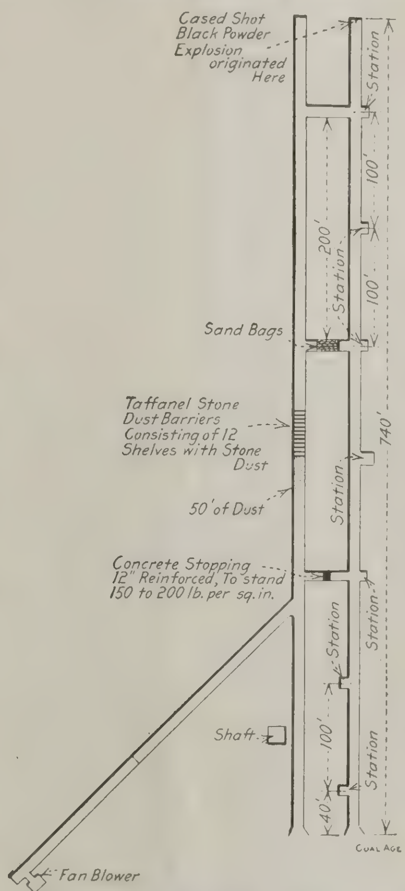
In addition to the recording instruments just described, the mine was equipped with a British coal gas sampler, and two gas samplers built in the experimental station at Pittsburg. The principle on which all these gas collectors work is based on the suction idea, and is expected to furnish the experimenters with a true sample of the afterdamp that follows an explosion.

The gas sampler built by Mr. Burrell at the Pittsburg station, is a simple apparatus consisting of a gas cylinder identical with those fitted on oxygen breathing apparatus, and supplied with a glass bottle and an automatic valve. The gas cylinder is so arranged that a vacuum exists inside and the force of the explosion as it passes, breaks the glass bottle fitted to one end of the cylinder, afterdamp rushes into the tank, automatically closing a valve and thereby confining itself. These samples are only in the experimental stage and as yet have not been perfected or proved.

J. W. Boileau, Coal Expert, and A. C. Beeson, Chief Engineer Pittsburg-Buffalo Co., Getting a Handout After the Explosion

The Stone-dust Barrier

Possibly the most interesting result of this test was the action of the Taffanel stone-dust barrier that was located on the airway between the first and second crosscuts. (See sketch.) This barrier consisted of twelve shelves, on which stone-dust was piled. It is a fact that when the explosion occurred, no flame was seen to escape from the steel gallery that leads off from the air course to the fan. The accompanying photograph of the explosion, is rather convincing proof that the barrier stopped the flame. Practically no smoke is coming from the steel gallery while the smoke, dust and gas is seen belching from the mouth of the main entry. An examination after the explosion had occurred showed that the coal dust just inside the stone-dust barrier had been coked and that the dust placed on the outbye side of the barrier showed no signs of having been fired.



Rough Plan of Bruceton Mine, Showing Location of Recording Stations, Stone-dust Barrier and Concrete Stopping

This is not certain proof of the efficiency of the stone-dust barrier, but is fairly good evidence that stone dust may be useful in preventing the spread of a dust explosion.

The sand bags, placed in the second crosscut, were partly dislodged. The 12-in., reinforced-concrete stopping, located in the first crosscut, and designed to withstand a pressure of from 150 to 200 lb. per sq.in., was not injured. However, a stopping of this type and having no greater width, we believe could hardly withstand the pressure accompanying an explosion originating in a large mine and traveling a longer distance.

In the explosion set off at this same mine last fall, only 1 lb. of coal dust was used for each lineal foot of entry length. In this most recent test, 2 lb. of coal dust were used in each foot of entry charged. It is evident, therefore, that in this latter case, the coal dust was in considerable excess and that is a probable reason why there was so little flame emitted from the mouth of the main entry.

Results Obtained

It is the purpose of the Bureau of Mines to issue a bulletin giving the results of observations obtained at the test. In advance of final and complete information, we are permitted to say that the recording instruments showed a probable pressure of from 150 to 200 lb. per sq.in. The flame velocity was approximately 2000 ft. per sec. Only 4 of the stations recorded.

That this test was directed along proper lines and is a step in the direction that will net valuable results, no observer present at the explosion can doubt. Personally, I was most interested in the action of the stone-dust barrier. I feel sure that if I was in charge of a dangerous mine tomorrow, I would install stone-dust barriers at selected points, without waiting for any more definite results.

Snapshot of J. A. Holmes—Taken at the Instant the Switch Was Thrown in to Fire the Shot at Coal Face

The flame velocity and especially the maximum explosion pressure are good things to know so that we can properly gage the size and strength of air-stoppings; however, next to the seemingly satisfactory action of the stone-dust barrier, the matter of greatest interest was the change in the amount of coal dust used, and the altered character of the explosion. I did not see the first explosion, but am told that this initial test showed more flame, undoubtedly due to the fact that the coal dust present (1 lb. per lineal ft.) was nearer the maximum explosive limit.

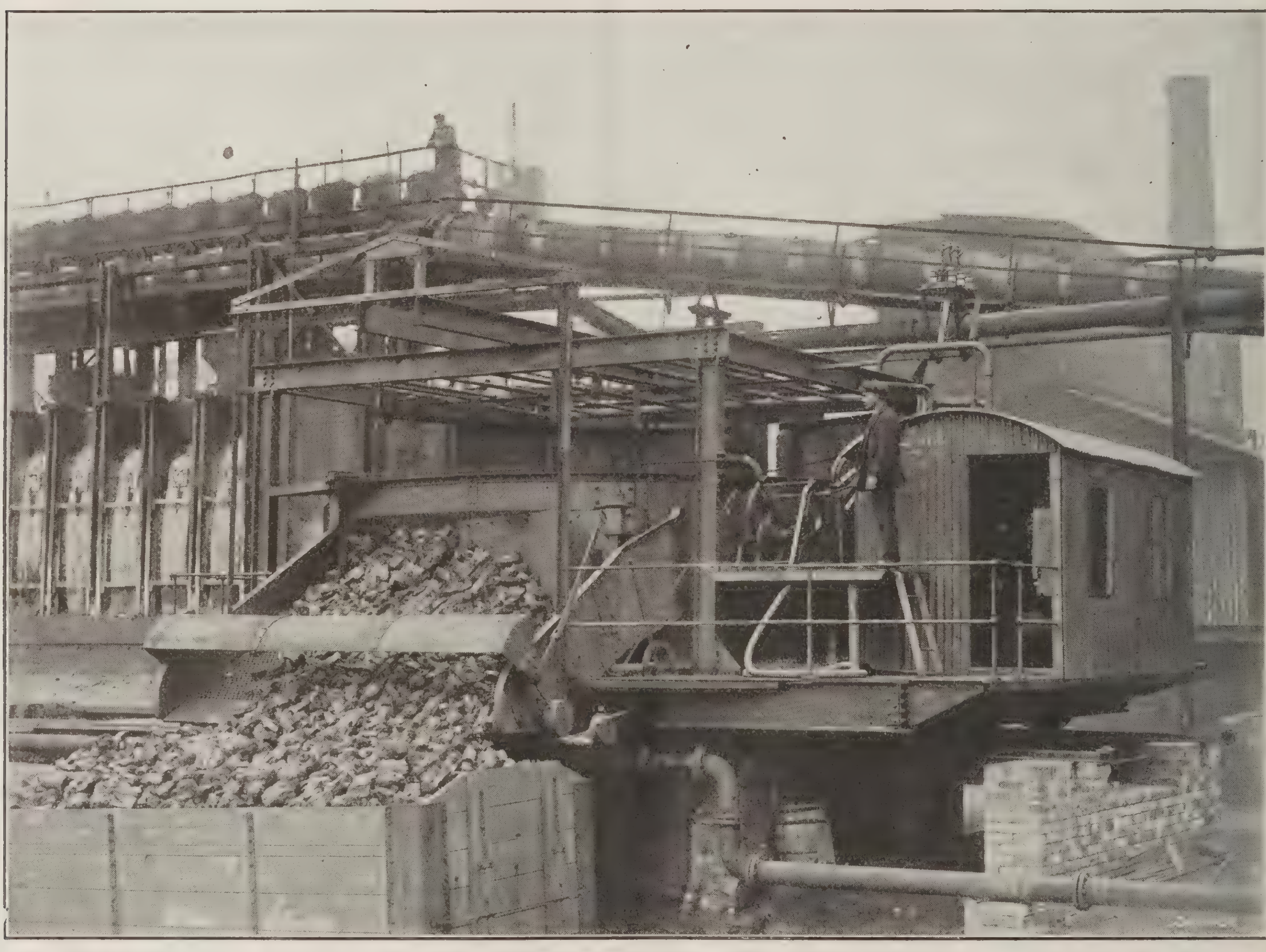
A Retort Coke Quencher and Loader

By A. Goodall*

Description of an apparatus for quenching and loading coke from retort ovens in one operation. A number of plants are in successful operation in England and it is claimed the machine will effect a considerable economy in labor.

For many years efforts have been made to reduce the cost of handling coke as discharged from retort coke ovens. Various forms of benchwork have been devised, and several kinds of mechanical apparatus tried.

The problem is not altogether easy, because of the variety of conditions to be met. The coke must be quenched as it leaves the ovens, or it will damage the railway cars, but it must not be quenched to such an extent that it contains a large percentage of moisture. The breeze and small must be removed before loading, and there must be facilities for loading anywhere along the entire length of the bench, or beyond if required.



Machine Discharging Coke in Railroad Cars

The problem would be simplified if a car could always be placed opposite the particular oven to be discharged. This cannot be done in the ordinary course of working without much cost and inconvenience. Goodall's Patent Coke Quenching, Screening and Loading Machine has been designed to meet all these conditions, and in practice shows a saving of quite two-thirds of the labor usually expended in performing the same operations by other methods.

*2105 Tioga St., Philadelphia, Penn.

Description of the Machine

The machine consists of a large frame running on wheels on rails placed in the position usually occupied by the bench or quenching floor. The frame carries the motor and gearing to propel the machine along the rails in either direction and to revolve the table and drive the shaking screen. On the center of the frame there is a footstep bearing, and at a reasonable diameter a ring of rollers for carrying a revolving horizontal table, which is of stong construction, and covered with cast-iron perforated plates.

This table is surrounded with a ring of plates fixed to the frame and having cast-iron lining plates which are renewable. There is a slot or opening with guide plates, in this ring opposite the center for guiding the coke on to the table; this is of cast-iron and so constructed as to form a quenching box or hood. This box has slots in the sides through which the water from perforated pipes sprays on to the hot coke, as it leaves the oven and before it reaches the revolving table.

Directly opposite this opening, there is a large door in the casing. This door is controlled by a winch in such a manner, that when the door is closed the inside of the casing is a complete ring, but when opened, the door projects inwards and acts as a scraper or ejecter in removing the coke from the table as the table is revolved. The *modus*

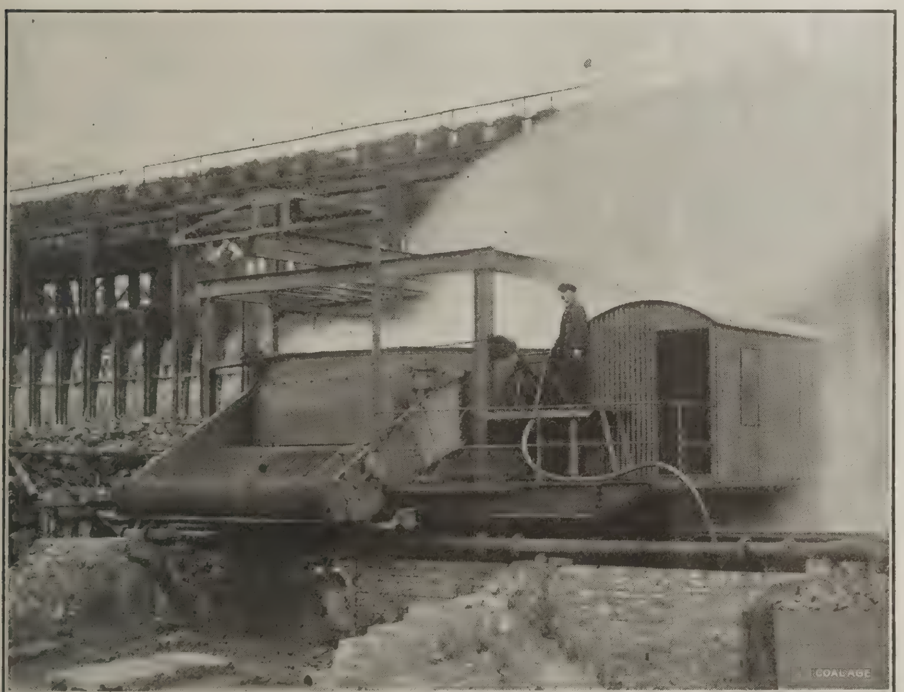
operandi is clearly shown in the accompanying sketch, which shows the door open ready to discharge the coke.

Construction of Machine

Under this opening, or doorway is arranged a shaking screen, fixed at such a working slope that the coke as it is ejected from the table, is effectively screened, and passes therefrom into the car. A receptable or hopper below the screen receives the screenings and can be emptied into the breeze car as required. Moreover the breeze can be further separated from the small, where there is a sale for such. In addition to the quenching hood, there is arranged above the revolving table, pipes to further quench the coke as it lays on the table and a small hose for spraying any odd pieces of hot coke, is also provided, thus ensuring the coke being properly and effectively quenched.

The revolving table is constructed of mild steel girders thoroughly braced and riveted together and carrying perforated cast-iron floor plates. The mild steel plates forming the case round the outside of the revolving table are lined with cast-iron plates so that with the exception of the screen plates all the wearing surface which comes into contace with the coke is of cast-iron.

The machine is driven by a 20-hp. motor, or it can, if required be fitted with a steam engine and boiler where electric power is not available. The different speeds for propelling the machine along the track, the revolving of the table, and the operating of the screen are obtained by worm- and spur-gearing all enclosed in suitable gear boxes, the main gearing being steel and mostly machine-cut. The travelling wheels are manganese steel and are in pairs on the Bogie principle, two of these being driven direct by means of spur-gearing. The whole of the gearing and opening platform is enclosed in a corrugated iron cabin and the machine is fully equipped with switches for power and light, lightning arrestors, controller, resistance, etc., for the proper and economical working during all hours. From tests that have been made, it has been found that the power required to deal with a charge of 7 tons of coke, was equal to 2.52 kilowatt-hours.



Quenching the Coke Preparatory to Loading

Method of Working

The method of working the machine is as follows. The machine is propelled along the rails, and the slot or quenching hood is brought opposite the oven to be discharged. The oven door is now removed and the pushing of the oven commences. When the nose or front part of the cake of coke has entered the quenching hood, the valve controlling the water supply to the hood is opened, and the water sprays on both sides and the top of the coke, during the time it is travelling through the hood. In the meantime, as soon as the coke has entered on the table a short distance, it is revolved, and by this revolving of the table, the bottom part of the coke is carried away as it were, and gently and evenly distributed over the table.

The coke if required, can be further quenched by means of the perforated pipes above the table. Immediately the ram or pushing rod is withdrawn, the machine is removed from the front of the oven to allow the oven door to be reset and the oven to be recharged without waste of time and loss of heat. After a reasonable time for steaming and drying, the coke is ready for loading into cars. All surplus water and dirt drains away immediately through the perforations in the floor plates of table, and so avoids over saturation of the coke.

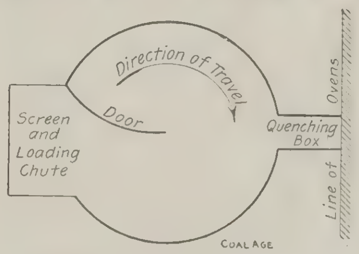
The machine is now propelled to the car, or other receptable which requires loading, either along the front or beyond the battery of ovens. The table is revolved in the required direction and the discharging door or ejector operated by the hand winch, by which means the coke is gradually fed on to the screen, and so on into the car. The small coke is received in a hopper under the screen which is emptied into a car placed in any convenient position, as required.

Operating Costs.

The same operation is repeated, as the ovens are burnt off and it has been found by practice, that one machine can effectively deal with 60 ovens and that the coke is put into cars in the best marketable condition.

These machines are in successful operation at a number of large plants in England.

The cost of operating the first machine installed as against handling the coke



Method of Operating

by the usual methods, at the Weardale Steel, Coal & Coke Co.'s plant at Spennymoor, England was 3.88c. against 15.23c. per ton; these figures are the average obtained from about 7 months operation. The cost of repairs to three of the Weardale Co.'s machines during a period of four weeks where 14,000 tons of coke were handled was $28.43 which includes both labor and material.

These come out most favorable owing to the plain and simple construction, and the few moving parts which are also of slow motion, large in size and heavy in design.

Further in the case of new ovens, a great deal of costly work in the building of the quenching floors, can be saved by the use of this machine. Indeed it might well be, that the saving in the floor alone would pay for the machine in new installations. There is also the advantage that the whole of the quenching, screening and loading is carried out at one operation.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Tests for Carbon Dioxide

The following is an extract of a paper written by T. Bryson for the *Colliery Guardian,* of London, England:

"For the estimation of carbon dioxide little or no knowledge of chemistry is required, when a suitable method of analysis is adopted. The principle of the usual methods is that of producing carbonates by the action of carbon dioxide on the hydroxides of alkali metals.

"The formation of carbonates by the action of carbon dioxide upon the hydroxides may be illustrated by the following equations:

$$2\,KOH + CO_2 = K_2CO_3 + H_2O.$$
$$Ca\,(OH)_2 + CO_2 = CaCO_3 + H_2O.$$
$$Ba\,(OH)_2 + CO_2 = BaCO_3 + H_2O.$$

"The first of these changes is the one that takes place when carbon dioxide is

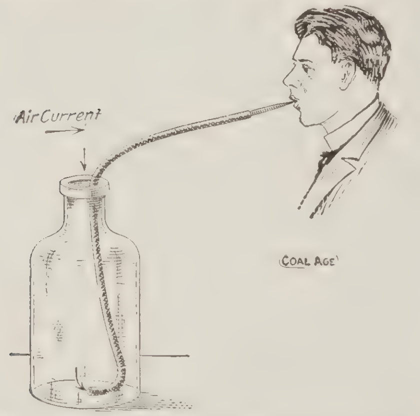


Fig. 1. Filling Bottle for Angus Smith Carbon-dioxide Test

absorbed by potassium hydroxide in such appliances as Dr. Haldane's, Hempel's, Orsat's and Bunte's. The second is the change which takes place in Dr. Angus Smith's apparatus when CO_2 is absorbed by a decinormal solution of lime water, and the third equation illustrates the change which takes place when mine air containing carbon dioxide is passed through a solution of barium hydroxide, as in Lunge's apparatus.

"Any of the above methods may be adopted for the estimation of CO_2, but since the form of an apparatus and the space occupied by it are of such importance in mining, several of the appliances are only suitable for laboratory purposes, and only a few are of any use underground.

"In mining it is not absolutely necessary that carbon dioxide should be estimated to a great degree of accuracy, and, consequently, an apparatus such as Dr. Angus Smith's may be used.

"The outfit required for this test consists of one 8-oz. ground-glass stoppered bottle, one 5-oz. ditto, four ½-oz. bottles with corks, one ½-oz. pipette, and a hand bellows or piece of rubber tubing for taking samples of air. A supply of lime water of decinormal strength, colored by the addition of a little of some suitable end-point indicator, completes the outfit.

"To make a test the small bottles are filled with the colored solution, and a sample of mine air is charged into the 8-oz. bottle, by means of the hand bellows, or sucked into the bottle by the observer, who uses the rubber tubing in the manner shown in Fig. 1.

"When the sample has been obtained the contents of one small ½-oz. bottle is emptied carefully into the bottle containing the air to be tested. If the solution is decolorized, the air in the bottle contains over ¼ per cent. of CO_2. By using all four bottles of lime water, an approximate test up to 1 per cent. may be made, and, fortunately, this number is rarely exceeded in testing air from mines of today.

"Lunge's test is one by which a much closer approximation to the actual amount of carbon dioxide in the air may be obtained, and it requires a person using it to have a little more knowledge of physics and chemistry than the last test, but nothing more than is usually obtained by attendance in a class in physics and chemistry of mining.

"Fig. 2 illustrates the apparatus, which consists of a rubber bulb of known volume (= 60 cc.), and a 5-oz. bottle with the necessary fittings of tubes and cork. The solution, in this case, is a decinormal solution of barium hydroxide, to which are added a few drops of phenolpthalein, for the purpose of indicating the end-point in the reaction between the CO_2 and the $Ba\,(OH)_2$.

"To prepare the apparatus for the test, 48 cc. of distilled water and 2 cc. of decinormal $Ba\,(OH)_2$ are put into the bottle, the bulb is compressed and the cork adjusted. The bulb is now allowed to fill and then it is slowly compressed to pass the air being tested through the solution, which becomes decolorized when the required amount of CO_2 has been passed through. The number of compressions are noted, so that the volume of air can be calculated. To neutralize the $Ba\,(OH)_2$, according to the law of definite proportions and the equation already stated, 0.0091 gram of CO_2 will be required. The volume of this weight of CO_2 is calculated at normal pressure and temperature and corrected for changes of pressure and temperature, after which the percentage of CO_2 in the air being tested

$$= \frac{\text{volume of } CO_2}{\text{volume of air}} \times 100$$

In examining the air of a particular mine periodically, there will be no need to make the slightest calculation after, say, three or four tests have been made and the results plotted in square paper. It would only be necessary to note the number of compressions required and consult the graph to obtain the percentage of CO_2."

For those whose knowledge of analytical chemistry is slight, it may be stated that a normal strength of lime water is 28 grams of lime (CaO) per liter, whereas a barium hydroxide solution of normal

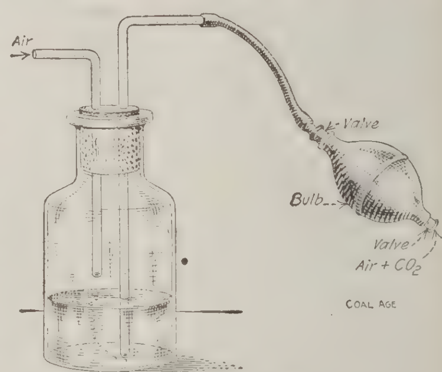


Fig. 2. Passing Measured Air Into Bottle—Lunge Test

strength would contain 85.7 grams of the metallic alkali per liter. Decinormal solutions would, of course, be one-tenth as strongly concentrated. The end-point indicator is a chemical which will change its color when the solution in which it is dissolved changes its condition from alkalinity to acidity, or *vice versa.*

Precautions in Dry Mines

In his annual report for 1911, George Blacker, of inspection district No. 1, Wyoming, gives the following notes on fire protection in the dry mines of that state where stoppings frequently inflame:

"A source of danger requiring attention is the careless practice, in which miners indulge, of allowing their powder cans to lie where they are exposed to naked lamps and the sparks which fly from the same. The mine foremen are

likewise blamable for this condition of affairs and should insist when hiring a miner that one of the conditions of his employment shall be that he use a box in which to keep his powder, paper and squibs. I observe with much satisfaction that in Rock Springs, all such boxes are being covered with tin, and rendered impervious to fire.

I am pleased to note a steady increase in promoting safety from fires, which in the past have wrought havoc in coal mines throughout the country. The air bridges, when constructed of wood, are being incased with sheet iron and made as nearly fireproof as possible, and the newer ones are being built of concrete."

Strong vs. Weak Stoppings

Mr. Blacker is a strong advocate of indestructible stoppings, as will be seen in the following extract. The question, however, is not so simple as he regards it. Weak stoppings allow the lateral extension of an explosion and permit the spread of the gaseous products of combustion along unforeseen channels. However, the existence of strong stoppings favors the extension of the explosion *along* the airways and leaves the ventilation unimpaired, thus the vitiated air spreads from the seat of the catastrophe as far as the current travels. It may be pointed out that where the explosive violence is not hedged in by strong stoppings on either side, the force of it is reduced, the coal dust on which it feeds tends to fall and the temperature of the blast is reduced by the large quantities of cool air with which it is admixed. Thus the travel of the explosion is shortened. The subject is an open one and the following note expresses Mr. Blacker's convictions on the matter:

"It is high time that the antiquated methods heretofore employed in the building of stoppings with common boards, wood blocks, boney, brick and stone, or any material which will burn or be blown out, be abandoned, and that modern methods be applied which are free from any of these objections. An explosion is rarely general, that is, its force rarely extends to all sections of the mine, then why is it that the miners working in that portion of the mine which is not affected by the force of the explosion, are suffocated? Is it not because the stoppings are too frail to withstand the force of the explosion and are therefore blown out, and before they can be rebuilt, even temporarily, and the current partially restored, the deadly afterdamp like an assassin, waylays and destroys the miners This being true, as all must admit who are familiar with scenes in the mine after an explosion, then what is to be thought of the management of those who are directly in charge of such a mine, who see stoppings blown out like paper by an explosion and the deaths of scores of men far away from the point where the blast originated or extended and who nevertheless will immediately rebuild those stoppings in the same manner as formerly? Does not such an action seem like a crime?"

Explosions

Speaking on "Some Coal-dust Explosion Problems," James Ashworth, of Vancouver, Can., at a recent meeting of the South Wales Institute of Engineers, made the following remarks, which it may be anticipated will not meet with general approval, as he himself regretfully admits.

"Experiments and the demonstrated facts of colliery explosions, have led me to conclude that it is the fresh dust largely produced from the attrition of coal during transit, which is the most dangerous element in the origination and propagation of an explosion in a modern coal mine, and also that no pioneering cloud of dust is required, except to extinguish the flame. For some years I have held the opinion that this new dust, just as fast as it is produced, is floated away in its own balloon of gas; that this is its actual condition was practically demonstrated by Prof. Phillips Bedson's experiments. These proved that the gas content of each particle of coal was greater than the cubic contents of the particle, and therefore that the gas was under pressure. Consequently when exposed to the air, the coal dust more or less quickly dissipates its store.

Fresh vs. Old Dust

Again, to quote Prof. Bedson, when a particle of coal dust has exhausted its occluded gases, these are principally replaced by oxygen, because the nitrogen is filtered out by the smallness of the pores of the coal dust, and, as the resulting oxidation makes the dust heavier, it thus naturally settles on the timbers and the rough sides of the roadways of the mine. This course of reasoning brings me to the conclusion that the principal factor in a coal-dust explosion is the gas escaping from the coal dust floating in the air, while the dust itself is but a secondary cause. The dust on the roadways and the "pioneering" cloud of dust take a secondary place, and are the great source of the large volumes of carbon monoxide which are formed in every explosion of a coal mine.

There is another phase of the subject, in which I have so far had little support from other students of explosive phenomena--viz., demonstrations of detonation and percussion. At Altofts there were at least three demonstrations of enormous force, and the records published may be searched through without any explanation being found, and it would appear as if no special value has been attached to these occurrences. I refer to Nos. 13, 21 and 25. In the case of No. 13, two lengths of sectional boilers, each 15 ft. in length, were blown to pieces, the bottom parts being completely flattened out. The most important point to note is that this "burst" was not at the end of the gallery, but 60 ft. back from the end (the downcast). Experiment No. 21 produced a still more noticeable feature, viz., of an explosion within an explosion outside the end of the downcast. Why an explosion within an explosion? In experiment No. 25, three lengths of boiler shell were literally torn to pieces, and again there was the flattening of the bottom plates. The end boiler shell was not torn to pieces, and the effect was in this respect similar to No. 13. Were not all these effects demonstrations of detonation? If the force were not caused by detonation, what caused the noise to be heard at a distance of seven miles?

No Cure But Care

Assuming that it is proved that detonation or percussion may be a feature of any modern colliery explosion, it then follows that zones, whether of water or stone dust, are not of the least practical value. Watering by sprays or otherwise and dampening by steam is perfectly useless as a means to control the extension of an explosion after it is once initiated, and are only useful for sanitary purposes. I believe a dry mine to be safer in every way than a damp one, and that an excess of dust will smother out an explosive flame. The experiments which have been made for the purpose of proving that stone dust could restrict the extent of an explosion are entirely misleading to this extent, viz., that they have not been made under conditions representing a roadway in a mine where, under normal conditions, the air is carrying along its regular quota of the finest and freshest dust, and which is being continuously produced. This dust alone is calculated to carry an explosive flame over a stone-dust zone. In conclusion, as neither a stone-dust nor a watered zone can restrain a detonative or percussive effect, it follows, in my opinion, that at the present time there is no known means of controlling the extent of an explosion, except by preventing its initiation."

It might be added to Mr. Ashworth's remarks, the statement that he has for many years been of the opinion that a fall of rock could generate an explosion of coal dust simply by the air compression which it would cause. He does not regard it as necessary that the extension of an explosion shall be limited by the travel of the flame or of the heated products, but views it as possible that compression, percussion and detonation may extend the explosion from many disconnected centers.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

Nine times out of ten the character of the chip is largely determined by the soundness of the block from which it is cut. According to such reasoning, it is easy to understand why John H. Jones has sufficient business acumen to justify the Pittsburg-Buffalo company in carrying a million dollar policy on his life.

While the four Jones brothers, John, Tom, Dave and Harry, have stuck close to their knitting and not only cornered "Miss Opportunity," every chance, but handcuffed the old lady, whenever she ventured near, there's no gainsaying the fact that "Daddy" Jones, father of them all, built the body of the ship and headed her nose toward the Island of Promise. And while the old vessel wasn't an ocean greyhound, she had a steady keel and was mighty seaworthy.

Half the energy of life is wasted in not knowing which way to steer first, and the fact that the Jones boys had their compass set and their early course mapped for them, made the going a bit easier, but it shouldn't detract from their proved skill as navigators in a squally sea. Furthermore, there's a lot of people who can convert a sailing vessel into a fishing smack, but ony a few who can make a turbiner out of the same old ship.

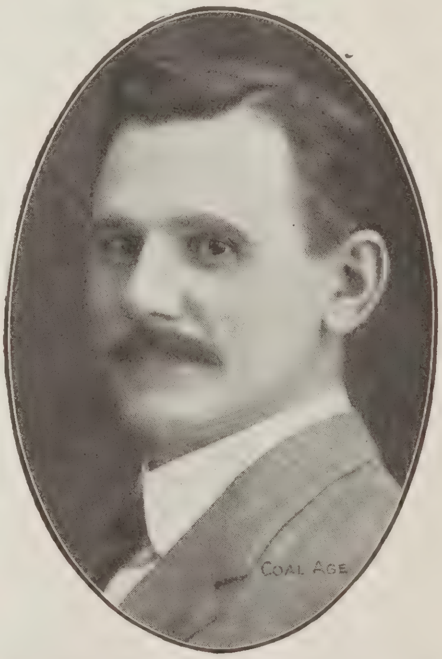
If James Jones, founder of the business success of the present family, had any two qualities o'ertopping all other virtues, they were *energy* and *perseverance*. These two attributes of character can accomplish much without talent, but the latter can do no more without them than an engine without steam. However, the elder Jones had ability as well, and the common sense to concentrate these essentials on one unwavering aim.

From that day, back in 1858, when "Daddy" Jones landed in New York, there is no evidence to prove that he knows how to go backward. Starting first at Frostburg, Md., he arrived shortly after at Pittsburg, where he secured employment as a blacksmith. This work was followed by a change to mining, which occupation was pursued until his retirement from active business a few years ago.

In the meantime, while the elder Jones had been building and enlarging his interests, John H. had busily occupied himself in making good on his own account. At 10 years of age he worked in and around the mines, and at thirteen, he left school and took charge of shipping and loading coal at his father's properties.

At sixteen, young Jones returned to school, but he was soon in harness again, and the following year filled the position of mine boss at his father's colliery. Upon the formation of the Catsburg Coal Co., by his father, John H. was elected secretary, treasurer and general manager. About this same time he went into business for himself, shipping coal to Cincinnati, New Orleans and other river points. He also secured an interest in the Rostraver, Ivill and Catsburg Coal Companies, acting as general sales agent for all these concerns while still handling his own business.

In 1896 when "Daddy" Jones consolidated with the boys, and also took over other properties, the interests of John formed no small part of the new company, and he was appointed manager of



the combined operations. In 1899, the Jones interests were sold to the Monongahela River Consolidated Coal and Coke Co., and the four Jones brothers devoted themselves to the incorporation of the Pittsburg-Buffalo Co., electing John H. president.

Mr. Jones is also president and a large stockholder of the Federal National Bank in Pittsburg. He is vice-president and director in the American Sewer Pipe Co., director in the National Fire Proofing Co., and many other financial and industrial institutions. His home life is ideal, and when the day's work is finished, you'll find John H. on his magnificent estate at Johnetta, Penn., riding a favorite horse or chumming with the kids. If I wasn't the son of my own father, I would rather be that of John H. Jones than any one else I know.

There are many sidelights on the character of this man, but three things appear to me to stand out most prominently. First, there is concentrated energy, coupled with decision and promptness of execution. Every movement indicates the man alert. When John begins to move, and that's pretty much all the time, something commences to happen. There's no fuel burned up in unnecessary switching.

A second quality that John H. has developed to overflowing measure, is tact, the open eye and very life of the five senses. It has enabled him to cut all the knots he couldn't untie, and has permitted his performing disagreeable duties after robbing them of their sting. Talent is weight, tact is momentum; the former is inherited, the latter can be acquired. In the case of our friend John, we are inclined to the belief that his pleasing manner is an acquisition of his personal getting. "Daddy" Jones was of the old school. His son is of the new type of business leader. The sort of man that causes the unsophisticated to believe that all you have got to do is to hold out your hat to him, and it will be filled with gold. But here's a tip: Don't spend any money you're going to filch from John H. Jones until you've delivered the goods, had them O.K.'d, and the coin is in the bank.

In closing this sketch, I must mention a third characteristic of our subject, and that's loyalty to a purpose or a friend. The exercise of this quality begins in his home and extends to the limits of his business. Its Tom, Dave, Harry, John H., Jr., and the whole family that Mr. Jones is plugging for, rather than for the President of the Pittsburg-Buffalo Company.

His employees are next to him in kin, and when asked what line he wants his boy to follow, you'll get one reply: "I want him to devote himself to the betterment of our men; the building of more comfortable houses; the beautifying of our mining towns and the provision of sanitary and more enjoyable surroundings." He has never forgotten the hours of labor spent underground and on the wall of his office is his fireboss certificate dated Feb. 7, 1888, and issued to him when he was 21. It's his close contact with the men and their work, that has enabled him to develop mines that are considered the model operations of this country.

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Of this issue of Coal Age, we will print 7000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Afterdamp

Not long ago, Jan. 6, we had occasion to comment on a definition recently substituted for the original meaning of black-damp. A misrepresentation of the meaning of the word "afterdamp" is almost as common. For a long time there has been a tendency to make afterdamp merely the unscientific appellation of carbon monoxide; the former word meaning if it means anything, the mine air after an explosion.

We are by no means clear what after-damp really contains. Nor will we get close to its real constituents so long as we continue to collect it for examination by pouring water out of flasks and permitting the mine air to enter in its place.

Perhaps we will never know by taking samples after a mine explosion what gases are created in such disasters. And for this reason; that it is probable, even likely, that a large portion of the gases may be soluble distillates resulting from hte heat of the blast. These dissolve with rapidity and are precipitated. One large resultant product of an explosion is water. The hydrogen of the methane unites with the oxygen of the air so that water vapor is formed. This is the vehicle through which eventually the soluble distillates will be deposited on the roof, walls and floor of the mine as soon as the temperature has been reduced sufficiently to make such an action possible.

It is probable, therefore, that he who would make such a determination must be on the ground shortly after the disaster, and the way to find the true resultants of such a conflagration is by an experiment, in laboratory or mine, the product being collected not by displacement of natural water, but of some other fluid which does not dissolve the gases—mercury for instance.

It has been suggested that by the use of two water flasks connected by a siphon, a more correct approximation might be obtained than with a single flask. By raising the sampling bottle, the water passes to the other and the first bottle is filled with air. By lowering it below the second bottle, it is filled with water and the air is expelled. These actions frequently repeated will saturate the water with soluble gases, and if the temperature and pressure of the water is not changed, this fully saturated fluid will permit eventually of the taking of a sample of air, which will represent the more soluble constituents of the air as well as the less soluble. But this process is slow, time presses in taking such a sample and perhaps a non-absorbent liquid would serve the purpose better.

It has been noted that water dissolves and glass absorbs carbon monoxide. We may overlook these absorbencies, but not the solubilities of ammonia, hydric sulphide, sulphur and carbon dioxides and nitrous oxide. K. B. Lehmann states that exposure to 0.25 to 0.45 per cent. of ammonia causes illness and danger to life in from a half hour to an hour; 0.1 to 0.2 per cent. of hydrogen sulphide causes rapid death, while 0.05 to 0.07 per cent. will cause illness and possible death within an hour; 0.04 to 0.05 per cent. of sulphur dioxide is equally distressing within a like period. These bodies are very soluble in water. At the temperature of the mines, water will dissolve about 1000 volumes of ammonia, four volumes of hydric sulphide, 67 volumes of sulphur dioxide, 1½ volumes of carbon dioxide and one volume of nitrous oxide.

From these statements it will be seen that highly important gases may exist in afterdamp outside of what are commonly called higher hydrocarbons, and these are not unlikely to evade collection by the current methods. The higher hydrocarbons, and perhaps the bisulphide of carbon, are possibly other causes of toxic action.

Afterdamp is sometimes termed "choke-damp", because it causes choking. This spasm of the windpipe is probably due to the presence of other gases than the monoxide and dioxide of carbon.

We are told that a wet rag is of avail to keep out afterdamp, yet there has been published in Coal Age an article (Dec. 23, 1911) to show of what little avail it may be in keeping back the simpler compounds of carbon. At best, the rag would absorb its fill of carbon dioxide in 3½ sec. and its possible monoxide retent in less than one second. Nevertheless it is generally thought that the wet rag is of value. Perhaps the reason for its efficiency is to be found in the fact that among the compounds it excludes may be unrecognized bodies of highly dangerous character and great solubility.

In a recent article, Edwin A. Chance (Jan. 27) said that: "A case has been reported in which several men lost their lives on entering an atmosphere containing 0.0023 per cent. of monoxide and 4.874 per cent. of carbon dioxide. The oxygen percentage was not stated." He ascribes their death to the combined effect of the two gases. Would it be unreasonable to inquire whether it was not due to a third or to a combination of many toxic gases? In fact, if the gas was collected as Mr. Chance advocates in our issue of Dec. 30, what chance was there that any higher soluble gases would be apparent in the analysis, which by the way appears to have been a somewhat incomplete one?

If we continue to have faith in the dampened rag and conclude that explosion products have the contents generally claimed, then indeed we must assume a "dialysing" action in the wet rag, or that the rag caused a remarkable reduction in breathing, or that some other action existed, the nature of which all orthodox chemists will deny.

We would not be dogmatic and assert that the arguments given are absolutely conclusive, but they open a field for investigation and bid us beware of thinking that the true afterdamp is the insoluble residue of the air after an explosion.

Coal Dust Heterodoxies

We print this week in our Current Coal Literature, the interesting remarks of James Ashworth, on the explosion of coal dust. And this we do because we are advocates of an open forum, because no shade of opinion which might conceivably be right should be supressed by any public organ till that opinion has been heard and duly weighed.

There is little need to decry the gaseous skin or pellicle theory which Mr. Ashworth restates, because this theory of the cause of an explosion was discussed in full in our editorial on "Methane in Coal Dust Explosions," contained in the issue of Feb. 17. What little show of validity may possibly clothe this consideration is of little use in assisting to bolster up a detonation theory, with which he concludes his remarks, and perhaps Mr. Ashworth regards the two alleged phenomena as without bearing, the one on the other. If coal dust can be detonated, what need is there to show the presence of a methanized envelope around each particle?

But, perhaps, it might be well, here and now, to point out that if a skin coat of gas is to be found on every particle of recently formed coal dust, and if that coat is the cause of dust explosions, then why is it that flour and lycopodium ignite with such explosive violence? Are these also enveloped in like pellicles of explosive gas?

The pellicle theory, here held to be a heterodoxy, is of different character to that theory largely, and we believe not unreasonably, held: That all solid hydrocarbons—coal, cotton, flour or lycopodium—are not in themselves explosive and that the gas alone given off by them when they are exposed to heat is the source of the violence which accompanies combustion. This is another proposition, a hard one to combat and a hard one to prove; with it we have no quarrel and for it no valid defense. At present writing it is a theory unproved but inherently likely.

The theory of detonation advanced by Mr. Ashworth is interesting and doubtless original with him. It has been found that detonating substances contain within them enough or almost enough of such elements as would permit of complete internal combustion. Detonation causes an atomic loosening, whereby elements contained in the unstable compound are freed instantaneously. They are then able to combine at once with other elements, also just freed, the mutually attracted elements being intimately disseminated within the detonating body. But Mr. Ashworth says that coal dust detonates. We do not believe that he is of the opinion that a molecular rearrangement takes place *within* the coal particles, but that molecular combinations take place with the external air of such a violent nature that "detonation" will rightly be applied to them. An internal detonation could not be the result of combination with oxygen, the most usual action of detonating bodies, because within the coal particle not much oxygen is to be found. Moreover, Mr. Ashworth is of the opinion, as are most theorizers, that stale dust, though more thoroughly impregnated with oxygen, is less explosive than the dust which is fresh. We do not know the nature of the detonation he would hypothecate. Whichever it may be, there may be such a detonation, but probabilities do not favor it.

Such unstable theories are used by Mr. Ashworth to back his statement that sprinkling and the use of steam are alike of no value. An assumption such as this, hard as it is to prove true, should not be permitted to sweep aside clear knowledge that moistening is of advantage. We are not clear, however, to what extent moistening can be perfected nor are we sure of the scope of its ability to immunize, but that it is of value and to be pursued in all mines where the temperature is not excessive and the roof not affected, is our firm and unwavering conviction.

The Death Toll of Mining

We have to dig so many million tons of coal every year to keep our mills and factories running, to heat and light our houses, to drive our locomotives and serve base culinary ends. And in that digging and extracting some lives are lost. The fewer lost the better, but the coal must be won. And so we think that the more tons we can win for each poor unfortunate killed or maimed, the more happy we should be. It would, therefore, seem that we should look with disfavor on the making of comparisons by percentages of men employed. If tomorrow a sufficient amount of coal could be mined by half the usual number of men, though the maimings and killings per employed man were raised a few per cent. by the exchange, we would have cause to rejoice, because the army of slain would be all but divided in two. We could not reasonably repine because by an erratic method of reasoning the percentage of slain had risen a few tenths.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Three Mining Questions

In reading COAL AGE, each week, I have been much impressed with the way it brings us in touch with practical mining men—I think, more so than any mining paper or book I have ever read. It is interesting and what we want. There are three questions or matters to which I would like to refer; they are as follows:

Controlling or Preventing a Mine Squeeze

A mine adjoining ours had, at one time, a squeeze. We knew nothing of this till some of our rooms drove up and broke through into their old works. Now, our rooms are falling in on an entry close by; these rooms are "on ribs" (drawing pillars).

I should say our mine is worked in coke-region style, leaving 10 in. of roof coal up to support the drawslate, which overlies the coal and is soft and brittle.

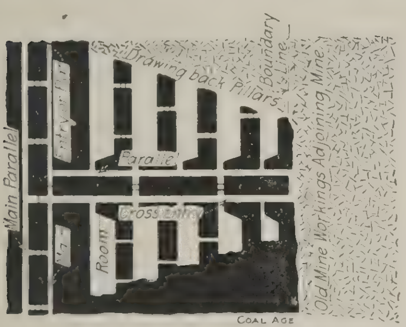


FIG. 1. PILLAR WORKINGS AFFECTED BY SQUEEZE. ROOMS IN SOLID COAL.

The coal is underlaid with 3 in. of slate, beneath which is 6 in. of fireclay. In the rooms "on ribs," the posts were set on the slate floor; but after starting the ribs (drawing pillars), the posts sunk through the slate and clay to solid bottom. The bottom, in the roadways, heaved; the caps above the posts were broken and the rooms squeezed. Cross-bars that were set to hold the roof were quickly broken.

A section of our mine is shown in Fig. 1, and the old workings of the adjoining mine on the right. Where the squeeze was first heavily felt was in the rib workings of the rooms driven off the parallel. As shown in Fig. 1, there were rooms, at that time, being driven off the cross-entry; and I thought to stop these rooms on the entry until the ribs of the rooms on the parallel were all out. Would this be wise, or is there any way by which I can save this coal? I did not like to stop the rooms unless it was absolutely necessary, as I am short of places.

I would appreciate any suggestions that would show a way to get out this coal without a large expense. Should the line of fracture (line of pillar workings) be, as shown in Fig. 1, against the heading, or should it lead away from it? I have my own idea in regard to preventing or stopping a squeeze, but would be glad to hear how others would do the same.

Electric Pump in Mine

I have a pump run by electricity. The pump is located in the mine 1200 ft. from the water, and discharged through a pipe line 2000 ft. to the surface; 2-in. pipe being used for both suction and discharge. It is necessary to run this pump night and day to handle the water. Would it be wise, as I could easily make the change, to use a 3-in. pipe line and set the pump nearer the water? Let someone answer.

The Fireboss Question

The new bituminous-mine law (Art. 5, Sec. 1) seems to indicate that the firebosses at any mine or in any portion of a mine may be taken off and not employed, provided there has no gas been found in such mine or portion thereof for one year previous to the law being passed, or a year after.

I wonder if those who made this law thought that gas was the only danger that had to be provided for. I consider a nongaseous mine, having a shallow cover or depth below the surface, which has allowed the gas to escape as fast as generated, is often a dangerous mine and liable to dust explosion or heavy roof-falls. Such mines, though containing little or no gas, should be as carefully examined by a fireboss as the mine where gas has been found "in sufficient quantities to be detected by an approved safety lamp"; and it is important to do this before men are allowed to enter the mine, each shift.

T. E. RICHARDS.

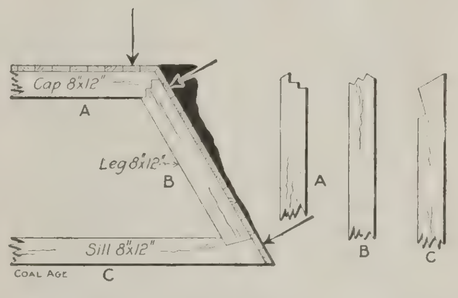
Pittsburg Coal Co., Brownsville, Penn.

[Art. 5, Sec. 1, of the bituminous mine law, requires the mine foreman to employ a fireboss, in any mine or portion of a mine in which explosive gas has been generated within one year previous or shall be generated after the passage of the act, in quantities, etc. The requirement applies to all mines or parts of mines that have generated gas, *at any time*, from a year previous to the passage of the act and is unlimited in its continuance.—EDITOR.]

Timbering for Side Pressures

Referring to the recent letters on timbering for side pressures, I wish to state that I have given mine timbering my careful attention for over 30 years, and that this problem is a hard one to solve. The accompanying sketch shows a method I have found to give excellent results and good service when properly set.

The sill, cap and legs should be cut so that all parts will have an equal bearing, and the timber can be cut for any degree of inclination of the posts desired. The arrows indicate the points at which the timbers should be blocked for the purpose of taking the first weight; timbers should not be blocked in the center, since that is the weakest point.



The improper setting of timbers is the most expensive piece of work in the mine; it not only endangers the lives of the men and shortens the life of the timbers set, but also makes the cost double, since it usually has to be immediately replaced. After the timber is in place it should be given some attention, especially up to the time it has taken the full weight expected for it. Some slight weakness often develops at this time, which can be easily and cheaply remedied by giving it prompt attention.

Derwent, Ohio. J. W. Q. MILLER.

The Mine Foreman's Trouble

I believe "The Foreman's Trouble," as given in COAL AGE, Dec. 23, 1911, p. 354, is hardly fair to the manager or operator of mines. The statement is made that the operator reminds the superintendent at every opportunity that he must keep down expenses. This is the most natural thing for an operator or manager to do.

Imagine for a moment the manager

sitting in his office twenty or a hundred miles from the works for the earnings of which he is held accountable, and the bills for supplies piling up before him and more requisitions coming in daily for more material, some of which he cannot imagine why or where it is needed; and here comes a rush order for some special high-priced oil to be rushed to the mines at once, while his records show that enough oil has been purchased to last a month longer. He wonders how they find room to set the posts that last month's records show were used; and why enough lumber or material is charged for stoppings to build four times the number the last survey showed would be necessary; and how enough iron rails were purchased to lay more tracks than they have in use.

He figures a little and finds that the pit-car oil used the last month amounts to one quart for each car dumped, and here is a letter saying that they are out and inclosing a requisition for more oil.

Reports show more troubles: Machinery broken down, boilers blistered or bulged, pumps out of order, etc. In the mine, several places are reported drowned out; the daily output or production of coal decreases, the cost of labor goes up. The drivers average 30 cars a day, while the length of their haul shows they should easily handle 50 cars. Twenty-five per cent. of the stock is reported disabled and not working; and a requisition asks for two more mules to take the place of those disabled. The bills for supplies are for iron, lumber, machinery, pipes, pumps, buckles, nails, fuse, rubber and duplicate parts of engines; yet with all these supplied the output is 200 tons a day less than should be expected; and it appears to this manager that the trouble lies with the mine superintendent or foreman.

The review of the last month's accounts decides the manager that he must take up the matter vigorously with the superintendent. A few cold facts are dictated and that official is informed briefly that "expenses are too high, and that he must get busy and either reduce his expenses or put out more coal."

The superintendent orders the mine foreman, master mechanic and other bosses, depending on the size of the plant, to lay off any spare men and economize in every way as much as possible. The men in charge may be competent men; the mine foreman and superintendent may have each established a record and proved their ability with other companies, and the manager, being a shrewd business man, is confident they can make good. Still, with all this, the results obtained do not show adequate efficiency in the management of the mine.

The foregoing is not an unusual case, and the blame may rest equally on all concerned in the management, yet each one generally thinks he is doing his duty, and the blame is on the other fellow. I would suggest, first of all, that much good may be accomplished by starting at the lower end and striving to increase the efficiency of each man; having a direct talk with each one and with each and all of the bosses and assistant foremen, separately; and urging the boss driver to enlist his men in an effort to increase the output of coal.

Mr. Mining Engineer, consult with the inside foreman, and mix his practical ideas with your theory; they will generally mix to some extent, and a sensible, broad-minded foreman may help you to secure better results where local conditions necessitate a change, and the cost of haulage, pumping and ventilation in the mine will be reduced. Helped by your suggestions, he will have more confidence in himself, take more interest in his work, and be more loyal to you than if you ignore him, and give him to understand that he plays about fourth fiddle, and that he is only employed to fulfill the law's requirements and that you may be able to lay the blame on someone else if the inspector should complain about the condition of the mine. Remember, *it is easy to establish confidence, and likewise easy to destroy the confidence of the men in your charge.*

Harmony and coöperation on the part of all, in a mine, will do more good than a sackful of orders and complaints from the head office, when that office does not know why the results are poor, except as calculated from a mass of figures and reports often changed so as to convey an idea different from what really exists.

Better all get together and consult as to where the real trouble lies, and be ready, each one, to see some fault of his own that was laid to another. How often have we all passed by work that, while it belonged to another to perform, we could have done it ourselves and by so doing have helped to improve conditions and reduce expense and waste. For instance, a laborer may be sent to level off a pile of dirt, and in doing this he covers up some good material, possibly a good carwheel, or pipe, or piece of iron, because he was not told to move them. If you see it, have him move them, or do it for him, yourself. The carpenter or blacksmith, or any better-paid man may see it, but never lift a hand or offer to prevent it. Consider a tipple boss or shopman working beside a car of cement loaded to go to the mine, and making no attempt to cover or move it in case of an unexpected rain. One pumper tramps all day over a coil of packing, because the other man left it there. A few shovelfuls of dirt, moved in two minutes, may save thousands of gallons of water running into a mine, only to be pumped out again.

A workman can and often does lose a half-hour's time looking for the boss, to tell him a drain is overflowing, when he could have prevented it in 10 min. But, of course, there are things that belong to the other man, and it is not our business to interfere ..ll we are told. Such is usually the case where the system of *kicking the next man* is in use; but coöperation on the part of bosses and men will tend to prevent it. We are each a part of the system that transforms coal into the money of which we all have our share; just as truly as the cogs of a wheel each help to transmit the power from the engine to the load. Remember that the cogs must work together to move the load, and not pound on the ends. So do not pound at either end, in the office or in the mine; but all push together and coöperate to prevent loss and waste. Teach the man next to you, and pass it on to the man with the pick. It will promote loyalty and give better results.

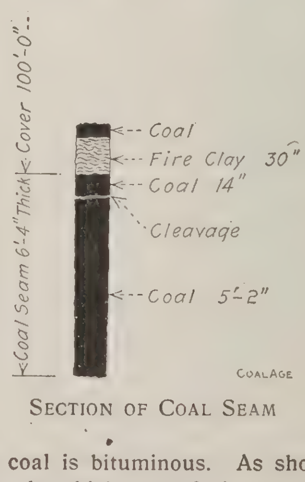
Some well-educated mining men lack ability to organize and coöperate with the men they depend on for their own success. We are glad to see *some* of our superiors come, because we feel they have helped us and they inspire us. We feel more confident, and our troubles are not as large as they looked before when they come. But the other kind of mine official leaves us with a discouraged and depressed mind; our duty seems harder and the load heavier. We wonder why our high-salaried friend does not approve of our work, or show us a better way, and as he disappears we feel the break in the intellectual machinery that is depended upon to get results. We are reminded to "cut costs and put out more coal," and this reminder comes by letter.

MINE FOREMAN.

Uniontown, Penn.

Method of Working a Coal Seam

I would be glad to see in COAL AGE the expression of the opinions of readers as to the best method of working a mine under the following conditions:



SECTION OF COAL SEAM

The coal is bituminous. As shown in Fig. 1, the thickness of the seam is 6 ft. 4 in.; and there is a distinct cleavage in the coal, 14 in. below the roof line. Above the coal is 30 in. of fireclay, and a thin stratum of coal overlies the clay.

The general custom has been to drive the entries 9 ft. wide. The fireclay above the coal weathers and falls when exposed to the air; and the 14 in. of coal next to the roof does not stay up very well. Assuming that the clay cannot be used for making clay products, what is the best way to support the entries and how should this coal be mined? The coal is strong enough so that steel I-beams could be used without legs, if desired, to support the roof.

CHARTER SUBSCRIBER.

Lexington, Ky.

Another Cost Sheet

I note in your issue of Jan. 13, an article by John A. Garcia, on cost sheets and daily reports.

There is one important omission in these forms, and I desire to bring it to your attention. I attach the blank, used by the Consolidated Indiana Coal Co. Items (B) and (C) in the third column of that blank originated in our office. To the information regarding the total cost at the end of each day is added a statement regarding the expenses incurred on previous days of the same month.

The form published by Mr. Garcia is incomplete, because it shows only the expenses on the date which it bears. On idle days and Sundays, more or less expense is incurred, and on our blank this is carried forward, so that the foreman can ascertain not merely the ratio of cost to tonnage on a single day, but the true ratio which he is obtaining over the larger period of time. Under the item which I have marked (*A*), we show the expenses on the date under consideration; under (*B*) the expenses incurred during the portion of the month previous to the date of the sheet, and under (*C*) the expenses on all coal to date, omitting coal used under the boilers.

By requiring each foreman to study these sheets every day, we give him the advantage of immediate touch with his work. This constant reminder has considerable advantage over the delayed report, which Mr. Garcia exhibits in Fig. 2. You will note that earnings and profits are treated on a like basis in the lower right-hand corner.

CARL SCHOLZ,
General Manager,
Consolidated Indiana Coal Co.

Chicago, Ill.

CONSOLIDATED INDIANA COAL COMPANY

Daily Estimate of Expenses and Local Earnings of Mine No............at.............................Date....................191..

	No.	Hrs. Wkd.	Rate	Amt.	Per Ton
Superintendence					
Hymera office..					
Asst. superintendent......					
Local office.....					
Top boss.......					
Pit boss.......					
Night boss.....					
TOTAL.......					
Engineering Corps					
TOTAL.......					
Mining					
Machine: Runners, day...					
Machine: Helpers, day...					
Machine: Runners, ton....					
Machine: Helpers, ton....					
Machine: Loader..					
Hand: Miners...					
Hand: Miners...					
TOTAL.......					
Haulage					
Stablemen.....					
Boss driver.....					
Drivers........					
Track layers....					
Spraggers......					
Greasers.......					
Couplers.......					
Jackmen.......					
Motormen.....					
Trip riders.....					
Team drivers...					
Switchmen.....					
TOTAL.......					
Inside labor					
Fire boss.......					
Dead work, day.					
Dead work, night.					
Timber men....					
Room boss.....					
Electrician.....					
Electrician's helpers......					
Jerrymen......					
Loading rock...					
Cleaning roads..					
TOTAL.......					

	No.	Hrs. Wkd.	Rate	Amt.	Per Ton
Hoisting and loading					
Engineers, day...					
Engineers, night					
Firemen, day..					
Firemen, night.					
Engineers' helpers..........					
Trimmers......					
Weighmen.....					
Cagers top.....					
Cagers bottom..					
Dumpers......					
Slate pickers....					
Car droppers....					
Unloading rock.					
Screen cleaners.					
Track weighmen					
Car sealer......					
Dockers.......					
Check pullers..					
Box-car men...					
Car pinchers....					
TOTAL.......					
Ventilation and drainage					
Pumpers.......					
Bratticemen....					
Water haulers..					
Pipemen.......					
Fan operations..					
Trappers......					
Gasman.......					
TOTAL.......					
Outside labor					
Blacksmiths ..					
Blacksmiths' helpers.....					
Carpenters.....					
Watchmen.....					
Teamsters.....					
Bit sharpening..					
Roustabouts....					
Ash wheelers...					
Cleaning up....					
Unloading timbers......					
TOTAL.......					

Summary	Amt.	Per Ton
Outside Material: Rents—Material..........		
Outside Material: Lubrication...............		
Outside Material: Feed used................		
Outside Material: Repairs..................		
Outside Material: Supplies used............		
Inside Material: Explosives used...........		
Inside Material: Lubrication...............		
Inside Material: Props and timber used.....		
Inside Material: Rails used................		
Inside Material: Mine cars.................		
Inside Material: Repairs...................		
Inside Material: Supplies used.............		
Superintendence...............		
Engineering corps.............		
Mining.......................		
Haulage......................		
Inside labor..................		
Hoisting and loading..........		
Ventilation and drainage.......		
Outside labor.................		
Loss and damage..............		
General expenses..............		
Rolls and deficient work.......		
Yardage and room turning......		
Total operating expenses (A)....		
Brought forward this month (B)		
Total operating expenses to date (C).......................		
Production today..............		
Less boiler coal.................		
Net production today..........		
Total output to date...........		
Hours worked today...........		
Days worked this month........		
Days idle this month..........		
Additions and Betterments: Labor...............		
Additions and Betterments: Material.............		
Additions and Betterments: TOTAL...............		

Local earnings	*Expenses*	*Revenue*	*Net Earnings*
Retail coal.............			
Rents..................			
Material...............			
Explosives.............			
Fuse..................			
Blasting paper.........			
Insurance..............			
Smithing..............			
Store commissions......			
Other commissions......			
Miscellaneous (itemize)......			
Total local earnings.....			
Brought forward this month........			
TOTAL TO DATE.......			

In computing "costs per ton" boiler coal tonnage of each day must be subtracted from the daily output.

Correct:...
Mine Clerk

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

To Prevent Accumulation of Ice in Shaft

What is the surest and most practical means of keeping a very wet shaft clear of ice in winter? Is there any reasonable method of warming the air before it enters the shaft, or in any other way preventing the shaft from freezing in cold weather? Some have advised reversing the air current every 12 hr., but any one familiar with the conditions knows that it takes the return-air current a much longer time to thaw a body of ice than is required for that ice to form when the mercury is low; and, instead of keeping the downcast shaft clear, this method only tends to render both the downcast and upcast shafts dangerous from the accumulation of ice. Cannot some of the readers of COAL AGE suggest a plan that will be at once feasible and practicable; and that will rid the mines of this annoyance and danger.

THOMAS H. DEVLIN, SUPT.,
Assumption Coal and Mining Co.
Assumption, Ill.

No practical method has ever been devised, to our knowledge, of warming a cold air current before it enters the downcast shaft. To prevent the formation of ice in wet hoisting shafts, in winter, the best plan where this can be done with safety is to make the hoisting shaft the upcast. This plan, however, involves either making the main haulage roads the return airways for the mine, or the use of double doors on the main roads, at the shaft bottom. In a gassy mine, it will generally be unsafe to haul coal on the main-return airways; and it is never practicable to obstruct the main roads with doors.

Owing to these conditions it is generally impossible to prevent the formation of ice in a wet hoisting shaft, in winter, in a gassy mine where haulage is performed on the intake. As stated by correspondent, the alternate, daily, reversing of the air current is not practical, in most cases; and besides causes annoyance and is often impossible to arrange without making special provision for same at the shaft bottom.

The only seeming remedies, in a gassy mine, to avoid the danger of large accumulations of ice, in wet downcast shafts, in winter, is to install suitable water rings, at different levels in the shaft, which will collect the water and render the shaft much drier; or to install at certain levels a system of pipes to be heated by exhaust or live steam, and which could be utilized as occasion would demand. The practise of exhausting steam into the shaft would hardly be applicable to a downcast hoisting shaft owing both to its annoyance and inefficiency. A wet shaft should always be made of ample dimensions to avoid serious troubles, later, in the operation of the mine.

Difference between Carbon Dioxide and Carbon Monoxide

Why is it that carbon dioxide (CO_2), which contains two atoms of oxygen, will not support combustion, but extinguishes the flame of a lamp; while carbon monoxide (CO), which contains only one atom of oxygen, not only permits lamps to burn, but is itself explosive, having the widest explosive range of any of the common mine gases?

Dayton, Tenn. TWO SUBSCRIBERS.

Carbon dioxide is the product of the complete combustion of carbon in oxygen (air), which means that the process of oxidation has reached the limit. The carbon, in other words, has taken up all the oxygen it is capable of absorbing; and the resulting product is fully satisfied or complete. The oxygen thus absorbed is not available for oxidizing any other substance; it is not free, but is tied up in a fully saturated compound (CO_2).

On the other hand, carbon monoxide (CO) is the product of the incomplete combustion of carbon in oxygen (air). In this case, the process of oxidation has not reached the limit; the carbon has a capacity to absorb more oxygen, and would have done so had the supply not been limited.

The difference between these two gases, in respect to their effect on the flame of a lamp, is not that one contains available oxygen that would support flame and the other does not. Neither of them contains any available oxygen. One of these gases, however (carbon monoxide, CO), is not a saturated compound, while the other (carbon dioxide, CO_2) is fully saturated. The former, therefore, is combustible and the latter incombustible.

When carbon monoxide is present in the atmosphere surrounding a lamp flame its combustion, in contact with the flame, adds to and assists the combustion of the flame. The flame burns more brightly than in pure air, owing to the heat developed by the combustion of the gas in the air that feeds the flame.

On the other hand, if the feed air is diluted with an incombustible gas, as carbon dioxide, the effect is to absorb the heat of combustion in the flame, and reduce the temperature and dim or extinguish the flame. Precisely the same effect, in less degree, would be produced if the feed air were to be diluted with nitrogen. The extinctive effect of carbon dioxide is much greater than that of nitrogen, however, because its power to absorb heat is 90 times the heat-absorbing power of nitrogen.

Weight Falling in Shaft

Would there be any difference in the velocity attained by two weights of 1 ton and 1 lb., respectively, falling down a shaft 200 ft. deep? Assuming each weight falls clear, which will strike the bottom first?

Dubois, Penn. INQUIRER.

If it were possible for these two weights to fall in a perfect vacuum, their velocities would be equal, at any instant, throughout the fall; and they would strike the bottom at the same time. This is true, because there is no resistance to retard the falling bodies; and the force of gravity acts equally on each particle of their mass. In other words, under these conditions, there being no resistance, each particle is equally attracted and falls with equal velocity. In a vacuum, a feather falls with practically the same velocity as a lead ball.

Falling in a shaft, however, the resistance of the air, which is approximately in proportion to the surface of the falling body, increases less rapidly than the mass of the body or the attracting force that pulls it down. On this account, the greater weight meets with relatively less resistance in its fall in air, than the less weight. Its velocity, for the same instant, will be greater and it will reach the bottom of the shaft sooner than the lesser weight.

The question is often asked, "Does a man weigh any less when standing in a rapidly descending elevator or cage; or does he weigh any more when the cage in which he is standing is being hoisted rapidly, than when the same man is standing on the ground?" Since *weight* is the product of *mass* and *gravity,* and neither of them change, the man will weigh the same whether rising or falling; but when the velocity of the moving cage is being changed, increased or decreased, the pressure of the man on the floor is changed accordingly.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions for Beginners

Ventilating Pressure

Ques.—(a) What is meant by *ventilating pressure,* in mine ventilation? (b) What is the *unit of ventilating pressure?*

Ans.—(c) Ventilating pressure is the pressure producing the circulation, or the difference between the intake and return pressures in a mine, exerted over the entire sectional area of the airway. It is this total pressure in the airway (pa) that pushes or moves the air against the resistance of the mine.

(b) The unit of ventilating pressure or *unit pressure* is the pressure exerted on a single square foot of the sectional area of the airway. It is this unit pressure, or pressure per square foot, in a mine or airway, that is measured by the water gage. Each inch of water gage corresponds to a ventilating pressure of 5.2 lb. per sq.ft. in the airway, at the point where the reading is taken.

Ques.—Show how each inch of water gage corresponds to a pressure of 5.2 lb. per sq.ft.

Ans.—Weight always causes an equal pressure on the base of support. For example, the weight of 1 cu.ft. of pure water (Fig. 1) is practically 62.5 lb. and this causes a pressure of 62.5 lb. per sq.ft. for each 12 in. depth of water. If the water is only 1 in. deep, the weight is $\frac{62.5}{12} = 5.2$ lb., which causes, therefore, a pressure of 5.2 lb. per sq.ft.

An important principle to be remembered is that water always rises to its own level no matter what may be the shape or size of the containing vessel. If the water gage shown on the left of the box, in Fig. 1, were attached to the bottom of the box the inch of depth of water in the box would simply balance the 1 in. of water shown in the gage. This shows clearly that a pressure of 5.2 lb. per sq.ft. is required to balance or produce 1 in. of water gage. The depression of the water in the left arm of the gage represents this pressure.

Ques.—What is meant by the expressions *atmospheric pressure, barometric pressure,* sea-level pressure? Explain briefly the cause of each pressure and how it is different in different places and at different times. What is meant by normal pressure in speaking of the atmosphere?

Ans.—Atmospheric pressure is the pressure due to the weight of the atmosphere pressing on each square unit

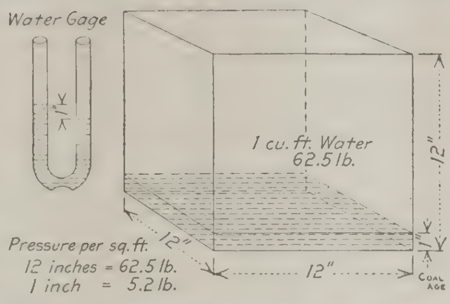


Fig. 1. Showing Pressure Per Square Foot Due to 1 Inch of Water Gage

of the surface of the earth. This pressure is commonly given in *pounds per square inch* or per square foot.

Barometric pressure refers to the pressure of the atmosphere expressed in *inches of mercury.* The weight of a cubic inch of mercury (standard 32° F.) is a trifle less than ½ lb. Roughly, 30 in. of mercury weigh 15 lb.

Elevation above Sea Level (Feet)	Mean Observed Temperature (Fahrenheit)	Weight of Air (lb. per cu.ft.)	Atmospheric Pressure: Lb. per sq.ft.	Lb. per sq.in.	Water Column Maximum Density (Feet)	Mercury Column (Inches)
25,000	0°	0.0327	802.2	5.571	12.85	11.343
20,000	8°	0.0393	981.2	6.814	15.70	13.874
15,000	17°	0.0472	1198.5	8.323	19.17	16.948
10,000	27°	0.0561	1455.4	10.107	23.30	20.582
5,000	41°	0.0659	1760.3	12.224	28.20	24.890
1,000	55°	0.0744	2041.1	14.174	32.70	28.861
Sea Level	60°	0.0764	2116.2	14.696	33.90	29.925

Air Column—1 Ft. Square

COAL AGE

Fig. 2. Showing Effect of Elevation on Temperature and Density of Air, Atmospheric Pressure and Height of Water and Mercury Columns Supported by Atmosphere

Sea-level pressure refers to the common or ordinary (normal) pressure of the atmosphere at sea level, which is roughly 15 lb. per sq.in., or 30 in. barometer.

All atmospheric pressure is due to the weight of the air column above the place where the pressure is measured. This pressure, therefore, decreases as we ascend above sea level, and increases as one descends below sea level, as is true in many deep mines.

Atmospheric pressure changes slightly during each day, being greatest about 10 a.m. and p.m. and least about 4 a.m. and p.m.; there is also a slight change according to the season of the year, being greater in winter and less in summer, in the northern hemisphere. The greatest fluctuation, however, is due to local storms, the storm center being an area of low barometric pressure.

The normal pressure is an average for any place, for the year. It is what the pressure should be under normal atmospheric conditions. Fig. 2 shows an imaginary air column one foot square in section. Starting from sea level, different elevations are marked on the left of the column; and, on the right, the corresponding mean observed temperatures, weight per cubic foot or density of air, the pressure per square foot and per square inch, and the water column and mercury column such pressure will support against a vacuum.

Ques.—What is meant by *absolute pressure?*

Ans.—Absolute pressure is the pressure above a vacuum.

Ques.—Explain the difference between ventilating pressure and absolute pressure.

Ans.—Ventilating pressure is the excess of the intake pressure over the return pressure, for the entire mine or any section of the mine. Absolute pressure is the total or actual pressure borne by the air or gas. When a mine is ventilated on the blowing system the absolute pressure on the air in the fan drift is equal to the atmospheric pressure *plus* the mine ventilating pressure. In case the fan is exhausting instead of blowing, the absolute pressure on the air in the fan drift is equal to the atmospheric pressure *minus* the mine ventilating pressure. In each case, it is necessary to reduce the mine pressure to lb. per sq.in., or else estimate the atmospheric pressure in lb. per sq.ft.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The employers' liability and workmen's compensation commission has made public the text of a bill representing the results of its deliberations during the past year. The bill applies chiefly to railroads, but it is intended subsequently to extend the provisions further and to attempt to make them a basis for uniform state legislation; that is, if the measure is adopted, as it probably will be. The proposed bill is therefore of general industrial significance. As offered by the commission it provides that:

"Every carrier engaged in interstate or foreign commerce by railroad shall pay compensation in the amounts specified in the bill to any of its employees who, while employed by such employer in such commerce, sustains personal injury by accident arising out of and in the course of his employment and resulting in his disability, or to his dependents in case of death.

"That the remedy thus afforded shall be exclusive, and that all existing common-law and statutory remedies, so far as future cases are concerned, shall be abolished." And that:

"This compensation is to be paid in every case specified irrespective of negligence, except where the injury or death is occasioned by the willful intention of the employee to bring about the injury or death of himself or another or when the same resulted from his intoxication while on duty."

Fixed schedules of compensation for death and personal injury are submitted, together with numerous rules, conditions and provisions for various contingencies.

Cost of Carrying Coal to Panama

Extensive inquiries into the cost of carrying coal to the Panama Canal by government vessels have been undertaken by Secretary Meyer and the results thereof supplied to the House Committee on Interstate and Foreign Commerce, in order that members may be able to judge of the relative cost of supplying coal at the canal by government agency and by private enterprise. The statements which are now before the committee show that in the case of the "Cyclops," one of the newest and best of the government colliers, the combined cargo and bunker capacity is 12,500 tons, maximum speed 14 knots, economical speed about 10 knots and cost $822,500.

Based on the cost of operating the "Cyclops," the annual operating expenses of the proposed canal colliers would be approximately $196,000 and allowing 15 round trips annually, the delivery cost per ton of coal would be about $1.14.

There is little doubt that these proposed colliers could deliver coal at Colon more cheaply than could private merchant ships. In comparison with the estimated cost of $1.14 per ton, the following freight rates by steamer to points in the West Indies and Caribbean during 1911 are compiled from the W. W. Beattie & Co.'s Coal Trade Freight Reports:

From Norfolk to	Low	High	Average
Havana, Cuba	$1.30	$1.85	$1.57
Matanzas, Cuba	1.30	1.85	1.57
Cardenas, Cuba	1.50	2.25	1.87
Cienfuegos, Cuba	1.50	2.25	1.87
Port of Spain, Trinidad	1.75	2.50	2.10
St. Lucia	1.65	2.30	1.97
St. Thomas	1.40	1.90	1.65
Barbados	1.75	2.50	2.12
Kingston	1.40	1.90	1.65
Curacao	1.15	1.70	1.42
Vera Cruz	1.60	2.25	1.92
Guantanamo	1.50	2.20	1.85

Assuming that the canal will require 3000 tons of coal per day at first, the gain from employing government colliers would be $788,400 annually, and when the business of the canal shall have increased to equal that of the Suez Canal the annual gain would amount to about $2,102,400. This estimate is based on an initial canal traffic of five ships per day, each ship taking 500 tons of coal, and ultimately a traffic of 15 ships per day. It is assumed also that the canal power and lighting plants, the Panama R.R., etc., will use at least 500 tons per day.

Charges for Dumping and Trimming

The Interstate Commerce Commission has rendered an important decision in the case of the New England Coal & Coke Co. vs. the Norfolk & Western Ry. Co. *et al*, in which it holds that:

1. Trimming, or leveling coal in the holds of ships, is a necessary service in connection with the transportation of coal by water, and, where performed by the rail carriers, it must be regarded as a part of the delivery. Whether or not defendants legally might be compelled to render such service, when they undertake so to do any charge therefor is subject to regulation by this Commission.

2. The charges of 3c. per ton for trimming and 4.5c. per ton for dumping and trimming are not found to have been unreasonable. The charge of the Virginian Ry. of 4.5c. per ton for trimming alone is found to have been unreasonable to the extent it exceeded 3c. per ton. Reparation is awarded.

Alabama

Birmingham—It is understood that the differences between the state and the Sloss-Sheffield Steel & Iron Co., regarding the agreement for mining coal with state convicts, have been satisfactorily adjusted by a few slight amendments to the contract. One of the provisions of the contract was the expenditure of about $10,000 in improvements of various kinds at the mines. These improvements are well under way. They have to do with enlargements of barracks and the installation of a more extensive sanitary system.

Colorado

Denver—The government has brought suit to recover the patent to 160 acres of coal land in Huerfano County and $100,000, said to be the product of the land. The Beacon coal mine is located on this property, which has passed through the hands of a half dozen owners since original entry was made six years ago. The government maintains that the land was obtained by fraudulent entry.

Representatives of the Denver Trades and Labor Assembly, the Direct Legislation League and other bodies interested in having the state operate and control coal mines, have agreed upon the form of the bill to be presented to the people for their approval at the next election for members of the general assembly. It provides that all land, bearing coal which is now owned by the state or may later be acquired, shall never be sold. An administrative board is provided for and is empowered to engage in the business of mining coal and selling it to the consumer.

Illinois

Chicago—A sweeping investigation of conditions governing the distribution of coal cars at mines in Illinois, Indiana, Kentucky, and Ohio will be made by the Illinois State Railroad and Warehouse Commission during the next few weeks with a view to establishing some uniform rule covering such distribution in this section of the United States. The Inter-

state Commerce Commission and the different railroad commissions of the states mentioned will be invited to participate in the investigation and subsequent hearing, at which it is proposed to establish a uniform rule.

The Illinois Central R.R. Co. has apparently overcome the dissatisfaction in several of the mining towns on its line that was caused by the failure of the railroad to furnish cars enough to enable the mines to work more than one day per week. Every coal-mining town on the road has now received orders for company coal, which is being stored in the open fields around the mine tipples.

Litchfield—A deal was consummated recently by Chicago and New York capitalists that consolidates four of the leading coal mines in Montgomery County and places them under the control of one company. The four mines involved are: Taylor Springs, Kortkamp and the two Witt mines. It is probable that the new company will take over the mines at Nokomis, also in this county.

Murphysboro—Fire, Feb. 18, destroyed the plant of the Knickerbocker Briquet Co., one mile from Murphysboro, and adjacent to the Harrison mine, of the Big Muddy Coal & Iron Co. The loss was $100,000. The plant was erected three years ago, being the only one of its kind in the high-grade coal field of southern Illinois, and is owned by A. G. Kupfel, of New York.

Witt—Burnwell mine No. 2 was closed down for several days recently by an accident to a hoisting cage. The bridle chains broke and the cage fell from a point within 20 ft. of the top of the shaft to the bottom, a distance of about 500 ft. Coal was being hoisted at the time.

Indiana

Princeton—Drilling operations are being carried on in this vicinity by the Princeton Coal Co. to determine the value of the No. 4 seam, which lies 50 ft. below the surface. If the seam proves to be as expected a new mine is looked for in the near future.

Vincennes—It was announced recently that the Martin-Howe Coal & Mining Co., of Chicago, will enter the new coal field that is under development near Bruceville. The Martin-Howe company is interested in the Freeman and Tecumseh mines at Bicknell. The property this company intends to develop is two miles southeast of Bruceville.

Iowa

Des Moines—Union miners of Iowa will meet in annual convention here on Mar. 14. They will come prepared to demand a raise in wages of 10c. a ton and of 20 per cent. for day work. The operators will refuse to meet that demand, and as a result it is predicted that the mines of Iowa will all shut down on Apr. 1 until a new wage scale is agreed upon. Railroads and other large consumers of coal in the state are already preparing for the shutdown by storing large quantities of coal as rapidly as possible. Representatives of the miners and operators will meet in wage-scale conference on Mar. 21, one week after the opening of the miners' convention.

Kansas

Columbus—Owners of business buildings in Weir City have applied to the district court for an order to restrain R. L. Thorp from mining coal under the streets and certain lots of the city. The applicants allege that if the mining operations are continued there is reason to fear that buildings will be jeopardized. While extensive mining operations have been carried on within the municipal limits since the field was developed, this is the first time the city has attempted to stop them or to collect the value of coal removed.

Pittsburg—The coal fields in Kansas, Missouri, Oklahoma and Arkansas are operated by firms belonging to the Southwestern Coal Operators' Association. The operators and the miners in this field signed a two-year contract, which will expire Mar. 31, but the contract contains a provision that the mines must continue in operation for the period from the expiration of the contract to Apr. 30, while the miners and operators are negotiating a new contract.

Kentucky

Louisville—Local coal operators are interested in the organization of a new coal company which will have a capital stock of $2,000,000, and which will carry on operations on a large scale in the newly opened Harlan County fields. The Kentucky Mutual Coal Corporation will be the title of the new organization, and will be composed of New York and Kentucky capitalists. The proposed company will take over the holdings of a number of smaller concerns in southeastern Kentucky and will conduct coal operations on a large scale. The full details have not been perfected, but it is expected that all plans will materialize within the next few weeks.

Greenville—Coal operators in western Kentucky are complaining of the rating placed on their output by the Illinois Central R.R. Co. This assumed output forms the basis for car distribution by the railroad and greatly reduces the number of cars that are to be furnished the mines in western Kentucky, the number to all mines on this division, with possibly two exceptions, being reduced. The matter of the right of the railroad thus to fix the output of the mines by limiting the supply of cars furnished will be called to the attention of the Kentucky railroad commission, and also to the interstate commerce commission.

Missouri

Huntsville—The coal washer that has been under construction for a number of months at the old No. 10 plant of the Northern Central Coal Co. has recently been completed and tried out with satisfactory results. The washer was built at considerable expense and embodies uptodate methods and modern machinery.

Ohio

Toledo—Over 12,000 cars of coal were found Feb. 18, to be tied up in the blockade at Toledo, owing to the inability of the Michigan lines to handle the cars. The Pere Marquette declared an embargo on coal. The value of the hard and soft coal tied up at Toledo was estimated at about $3,000,000. Every available storage switch and sidetrack between Columbus and Toledo is filled with loaded cars of coal, and it is said that thousands of tons of coal are northward bound from the southern Ohio and West Virginia fields.

Cleveland—Arrangements have been made by a Cleveland coal shipper with a firm which owns a large fleet of boats, to float in the neighborhood of 400,000 tons of coal. The contract does not call for any specific rate, but the freight will be charged at the going rate. This makes more than 650,000 tons of soft coal that have been contracted for recently.

Columbus — Considerable interesting evidence was adduced at the hearing of the interstate commerce commission in Columbus recently in the case of the New Pittsburg Coal Co. which challenged the lake rates from the Hocking Valley. The present rate is 90c. and an effort is being made to have it reduced to 75c. or less.

There is a division of sentiment on the probability of a suspension at the expiration of the present wage scale. Some of the operators and jobbers profess to feel that the miners will agree to work pending a settlement of the scale but others are inclined to believe that such a course is improbable. The miners usually have gone out pending a settlement of the scale and there is nothing at this time to indicate a change in that custom.

Oklahoma

Lehigh—A serious fire started in the No. 5 mine of the Western Coal & Mining Co., near here in the morning of Feb. 22. The workings lie about 300 ft. below the surface and the number of men at work at the time is variously estimated at between one and two hundred. Most of the men escaped through an abandoned shaft about two miles from the main entrance to the mine. Thirty cars of coal

that were standing in the workings are reported to have added materially to the flames. Last advices state that 8 bodies have been removed and one man is still unaccounted for. It is believed that these comprise all the casualties. A score of men were entombed, and later rescued. Rescue parties from the government station at McAlester were rushed to the scene and immediately began exploration of the workings near the mouth of the pit.

Pennsylvania

Bituminous

Butler—The Sharon Coal & Limestone Co. which has been operating in this section for some time, recently secured leases on a number of acres of coal land in Mercer and Slippery Rock townships. The company has expended considerable money testing for coal on these properties. The total amount of land leased so far is 671 acres but it is expected that additional leases will be made in the same neighborhood.

E. W. Eisler, of Butler, who has taken up a number of options on coal land in Middlesex township, recently purchased the H. W. Flick farm in that township, paying $12,000 for its 99 acres. This farm is centrally located in the property held by Mr. Eisler and it is expected that active development of his holdings will commence during the present year.

Somerset—Interests affiliated with the Western Maryland R.R. Co. are understood to be negotiating for the Brothers-Valley Coal Mining Co.'s plant near Berlin. The plant is one of the largest in this section and would give the Western Maryland a big tonnage. Now that the Western Maryland's tracks are going down rapidly, agents are in the field trying to option coal lands, and everybody is waiting for spring to give the signal for considerable activity.

Connellsville—The number of active ovens in this region has been increased by the firing of 50 at Mt. Braddock, 40 at Dexter, 80 at Elizabeth, 25 at Griffin and 10 at La Belle; total, 205; and decreased by the blowing out of 25 at Grace, 10 at Cyrilla, and 12 at Eleanor, total, 47, making a net increase of 158 ovens.

Pittsburg—A large delegation appeared before the rivers and harbors committee of Congress, in Washington, Feb. 19 and advocated the extensive improvement of the Allegheny River in order to facilitate shipping.

A party of more than 40 officials, employees and guests of the Pittsburg branch of the U. S. Bureau of Mines, went to Bruceton, Feb. 24, for the second of a series of explosions at the government's experimental coal mine there, to determine the best means of preventing mine disasters. The tests were in charge of Chief Mining Engineer G. S. Rice.

Anthracite

Scranton—A federal grand jury, at Albany, N. Y., Feb. 21, returned indictments against the Delaware & Hudson Co., charging violation of the commodities clause of the interstate commerce law. There are 30 counts in the indictment, which is the beginning of a campaign by the government to force the railroad to give up the ownership of its coal mines.

The conference between representatives of the anthracite operators and miners, held in New York, Feb. 27, lasted about 15 minutes. The miners' demands were presented and taken under consideration by the operators. A meeting of representatives of the operators will be held, Mar. 5, and a committee appointed to confer with the miners. A joint conference will be held, probably Mar. 13.

The Delaware & Hudson company is building a new breaker at its "Gravity Slope" mine, near Winton, Lackawanna County.

Wilkes-Barre—Coal companies in this section expect, during March, to store at their various collieries a large quantity of steam coal for their own use. They anticipate, if there is no strike following the expiration of the existing agreement, that there will at least be a suspension of work for some weeks, during which time the miners' leaders will conduct negotiations with the operators before finally reporting to the men their decision regarding the situation.

Virginia

Bristol—It is reported that H. K. McHarg, Jr., a wealthy capitalist of Radford, Va., has bought a controlling interest in the Empire Coal Land Corporation, a concern which owns several thousand acres of Wise County, Va., coal lands, a large part of the properties lying along the Kentucky border.

West Virginia

Wheeling—The Herbert Collieries Corporation, which has its principal offices, in New York, and is engaged in mining coal on leased lands in Fayette and Raleigh Counties, West Virginia, filed a voluntary petition in bankruptcy, Feb. 24, giving liabilities of $244,083 and assets of $168,898. The assets, the petition states, include leases of mines in West Virginia valued at $150,000, stock in a mine store at Herberton, W. Va., worth $10,000, and debts due aggregating $6398. The mines operated by the corporation were leased from the McKinley Fuel Co. by Preston B. McClarahan, who assigned his interest in the properties to the Herbert Collieries.

The Western Maryland R.R. is hauling large quantities of coal from West Virginia mines to Baltimore, and Hagerstown, Md. The increase has been so great within the past few weeks that there is great difficulty in getting sufficient engines to move the trains, causing congestion in the various yards of the railroad. It is said, there are 15,000 carloads of coal stored on these lines awaiting transportation.

Wyoming

Sheridan—Increased freight rates proposed by the Chicago, Burlington & Quincy R.R. on coal from mines in Wyoming to junction points in Montana and beyond were suspended, Feb. 17, by the Interstate Commerce Commission, pending an investigation.

It is stated that mines in the southern part of the state are operating more steadily than those in the local field. This fact is accounted for on the grounds that the southern mines are largely owned by the railroad and smelting interests and their entire production is used by these interests, while the northern mines are commercial mines and depend upon the market to handle their product.

Canada

Victoria, B. C.—The British Columbia government proposes to send engineers to the country between Stewart and Ground Hog Mountain to obtain data for the proposed construction of a railroad from Stewart to tap the Ground Hog Mountain coal fields, this line eventually to form a link in another trans-continental system.

The next examination for mine managers, overmen, fire bosses and shot lighters will be held the latter part of April or early in May.

Calgary, B. C.—The city council has placed itself on record as in favor of having the municipality own and operate a coal mine, and has authorized placing $2500 in the estimates to cover the cost of investigating the different propositions offered to the city.

Great Britain

London—A national coal strike was virtually inaugurated, Feb. 27, when between 30,000 and 40,000 miners in Derbyshire and Nottinghamshire ceased work. This number was increased to 100,000, Feb. 28. No settlement was reached at the various conferences, Feb. 27, between the government and representatives of the miners and operators, although it was reported that the outlook had become more hopeful. Large purchases of Pocahontas coal for the British navy are announced. This will be shipped from Norfolk within 60 days. The first shipment of 25,000 tons will go forward as soon as the chartered steamers arrive.

Personals

John W. Braham has resigned his position with the West Virginia Colliery Co., at Wevaco, to become superintendent for the Clear Fork Coal Co., at Jarrolds Valley, W. Va.

J. E. Pettit, Utah state coal mine inspector, has returned to Salt Lake from a trip through Emery County, where he visited the mines at Castle Gate, Mohrland and Price.

E. J. Wallace has severed his connection with the Mississippi Valley Fuel Co., St. Louis, Mo., effective Feb. 19, and is now handling his trade from an office in the Victoria Building.

James Needham, president of the St. Paul Coal Co., is making an extended visit to the mining properties of the company in the West and expects to return to Ottawa, Ill., early in March.

T. K. Adams and Enoch W. Filer, of Mercer, Penn., and George Young, of Stoneboro, have been appointed members of the examining board for the third bituminous district of Pennsylvania.

B. B. Thayer, president of the Anaconda Copper Mining Co., in company with F. W. C. Whyte, general manager of coal properties, recently made an inspection of the company's coal mines at Diamondville, Wyoming.

R. A. Gray, general manager of the J. R. Crowe Coal Co., of Pittsburg, Kan., is taking full charge of the company's business in the absence of Mr. Crowe, who is making an extended trip to Panama and South America.

E. E. Bach has been appointed sociological superintendent, in charge of improvement work at the Ellsworth and Cokeburg plants of the Ellsworth Collieries Co. In creating this office the Ellsworth company has taken a pioneer step, so far as the coal industry is concerned.

Elmer E. Thomas, of Omaha, a representative of the United States Coal Co., together with C. V. Gould, of Chicago, a civil engineer for this company, have been in the vicinity of Kemmerer, Wyo., for some time, arranging for the opening of a new coal mine in this district to be located on the old Adaville property.

George O. Thomas, of Wilkes-Barre, Penn., for 20 years superintendent of the Clear Spring colliery, West Pittston, until its abandonment recently, has been appointed general inside superintendent of the Harleigh and Pond Creek collieries near Hazleton. Mr. Thomas has lately filled the position of inside superintendent of the Parrish and Buttonwood mines of the Parrish Coal Co. at Plymouth. The collieries named, both at Hazleton and Plymouth, are controlled by Madeira, Hill & Co., of Philadelphia.

Obituary

T. Guilford Smith, a member of the firm of Albright & Smith, agents at Buffalo for the Philadelphia & Reading Coal & Iron Co., died at his home on Feb. 21, aged 72 years. He was well known in the coal and iron trades and actively identified with educational work in New York state. Mr. Smith was a member of several American and international scientific organizations.

Construction News

Birmingham, Ala.—The Bryan Coal Corporation, of Birmingham, will make extensive improvements on its property, at Red Star, including the erection of a coal washer. It is estimated that about $225,000, in all, will be expended. Frank Nelson, Jr., is president.

The Cullman Coal & Coke Co. is reported to intend completing the railroad from Cullman to the Bremen coal fields.

Calvert, Tex.—The Central Texas Fuel Co. is preparing to develop about 250 acres of land for an output of 500 tons of coal per day. Machinery will be required at an early date, and an aërial tramway, about ½ mile long, will be constructed. Robert Magee is constructing engineer.

Barbourville, Ky.—The Clover Fork Coal Co., of Harlan, Ky., capitalized at $50,000, will develop 800 acres of coal land for an output of 500 to 1000 tons per day. Machinery and other equipment will be installed. B. W. Whitfield is the engineer in charge.

Scranton, Penn.—Kingsley and Wescott, of this city, have secured the contract for rebuilding the Bernice breaker of the Connell Anthracite Coal Co., which was recently destroyed by fire. Cost to be about $125,000.

Duluth, Minn.—The contract for the machinery equipment of the new Island Creek Coal Co.'s dock has been awarded to Heyl & Patterson, Pittsburg, Penn., at about $300,000. The Zenith Dredge Co. has secured the dredging contract in connection with this work at $100,000.

Bay City, Mich.—The Robert Gage Coal Co. will sink a new shaft near St. Charles this spring. Charles Coryell is manager.

Pittsburg, Penn.—The U. S. Bureau of Mines is planning to enlarge the testing station at Fortieth and Butler Sts. The new buildings will cost in the neighborhood of $200,000. H. W. Wilson is engineer in charge.

Indianapolis—The Rowland Block Coal Co., recently incorporated with a capital of $100,000, will sink shafts, build tipples and install machinery to do a coal- and clay-mining business at their property near Parkersburg, Owen County. George Rowland is a director.

Publications Received

ANNUAL REPORT OF STATE MINE INSPECTOR, SOUTH DAKOTA, FOR 1911. By Robert L. Daugherty. 16 pp., 6x9 in.; pamphlet.

BRITISH COLUMBIA COAL AND COKE. Pamphlet. 14 pp., 4½x7½ in.; illustrated.

This little book is issued for private circulation by W. E. Duncan, M. E., a consulting engineer of Merritt, B. C. It presents interesting news and facts concerning the British Columbia field and includes a directory of the companies operating in this region.

EXPLOSIVE MINE GASES AND DUSTS. By Rollin T. Chamberlain. Bulletin No. 26, U. S. Bureau of Mines. 67 pp., 6x9 in.

This report is a reprint of U. S. Geological Survey Bulletin No. 383, and has special reference to the explosions in the Monogah, Darr and Naomi coal mines in December, 1907. The results of the experiments set forth in this bulletin and the conclusions drawn have become generally familiar to the mining industry since their first publication in 1909.

Industrial Notes

The J. A. Brennan Drilling Co., of Scranton and Pittsburg, Penn., announce that during the year 1911 they took out over 30,000 ft. of cores in connection with diamond-drill operations on prospecting work. This company is fully equipped to undertake drilling work in any part of the United States, Canada, Mexico, or South America and contracts to produce a continuous core showing the strata beneath the land under examination.

The Best Manufacturing Co., Pittsburg, Penn., announces that it has engaged the services of Howard W. Evans as general manager of sales, who will hereafter supervise the sales, order and engineering departments. Mr. Evans is a specialist in this line of work and will be pleased to advise with prospective buyers of piping materials. With its new plant and complete engineering force, the Best company states that it is in a position to lay out entire piping systems, furnishing the material, cut and fitted ready for erection or to take contracts to furnish and install such systems complete and ready for operation.

E. B. Day, secretary and treasurer of the West Virginia Mining Institute, 108 Smithfield St., Pittsburg, Penn., is placing on the market a map-directory covering the State of West Virginia and two counties of Maryland. It is printed on linen, of a size suitable for hanging on the wall and gives among other matters, the location and authentic information concerning 500 mining companies and 815 mines in the territory covered. Each mine is numbered on the map and is thus referred to a chart directory giving the name of the operating company, the names of the various officials with the addresses of each, the name of the mine with its post office address, county, and railroad connections, the seam mined, thickness, kind of opening, kind of haulage, method of mining, number of men employed, number of coke ovens, capacity of mine, grades shipped, trade name and analysis of coal.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

With the prospective strike of the union miners now less than a month off, and only sufficient fuel in sight to meet current demands, the coal industry probably never faced a labor crisis under less favorable conditions. Strike possibilities in the past have invariably been anticipated by operators and consumers alike by the accumulation of large storage reserves, while in this instance supplies generally are reported low, and in many cases below all previous records. In view of the fact that for the first time both the anthracite and bituminous agreements expire simultaneously, this shortage in supplies is of particular significance.

The movement on railroads has improved materially during the past week, with the exception of some isolated districts, which are still feeling the effects of the congestion. Many large consumers will doubtless avail themselves of this opportunity to acquire what surplus stocks they can between now and Apr. 1. As is well known, the capacity of the mines—except in anthracite—far exceeds that of the normal consumption, and with favorable transportation conditions in effect, there is still an opportunity for the storage of heavy tonnages. That the operators of the Middle West are thoroughly alarmed over the outlook is evidenced by the fact that the entire output of some mines on the Illinois Central (on which the car service is particularly bad) is being stored on the ground.

On the other hand, many large steam users are not manifesting a very strong desire to stock because of the ruling high prices, due to the scarcity in all grades and sizes. They are withholding their requisitions pending a return to more normal conditions in the trade, and a consistent adherence to this policy will tend to make the situation still more acute, later. In any event, the trade will technically require a strike of short duration or suffer a severe depression during the period the surplus supplies, now being accumulated, are worked off.

Boston, Mass.

The expected has happened and prices are decidedly on the upward trend. At all points bituminous has jumped to high figures, and something of a scramble prevails at distributing centers. With contracts expiring Mar. 31, buyers are striving to cover supplies at least to May 1, and apparently figures will be reached that have not been quoted since 1903. Available coal is snapped up as soon as it is offered, and from a selling standpoint, each sale turns out to be a poor one. At the same time one large distributing company at Boston is naming \$3.80 on cars, Mystic Wharf, for yearly contract, as against \$3.30 for similar trade a year ago.

Pennsylvania bituminous has a ready call at tide, both at New York and Philadelphia, and at prices considerably advanced. The higher grades along with Georges Creek are out of the question for new purchases.

Marine freights are also firmer, \$1.25 having been paid Hampton Roads to Providence on a large tonnage, and \$1.35 to Boston. As high as \$1.25 is freely paid New York to Boston on anthracite, and \$1.15 to Providence for the same loading.

Anthracite is far behind on deliveries, and no hopes are held out; it has gone beyond a matter of sizes. From New York almost nothing is being received except individual coals in transportation engaged in the open market. What company barges arrive are loaded with screenings and stock egg. Broken and pea are not to be had. The situation is critical and there are interesting times ahead.

Prices range about as follows:

Clearfield[1]	\$1.55@1.75
Somerset[1]	1.70@1.85
Bituminous, en route to junction points[1]	1.90@2.20
Pocahontas, New River[2]	3.25@3.35
No. 4 Pocahontas, Clinch Valley, etc.[2]	2.75@3.00
Pocahontas, New River, Boston or Portland, on cars	5.00@5.25
Pocahontas, New River, Providence, on cars	4.75@5.00
Anthracite, egg and stove[1]	4.25@4.50
Anthracite, egg and stove, f.o.b. New York	5.25@5.50

[1]For shipment f.o.b. mines.
[2]F.o.b. Hampton Roads.

New York

Strike talk, combined with the short supply of soft coal here, has greatly stimulated the New York market and prices have advanced rapidly until even the lowest grades of steam coals are being held at from \$2.90 to \$3, f.o.b., and only a very small tonnage can be bought at those prices. The supply at the piers is extremely limited and shippers are barely able to take care of contract requirements with the coal they have available. The market here has not been so short in a long time.

All-rail demand is strong and prices for line shipment have also advanced. About the only coals that can be obtained for prompt shipment are of very ordinary quality and these readily command from \$1.35 to \$1.50, f.o.b. mines.

From consumers located on shoal-water points, shippers are beginning to receive orders to commence deliveries as soon as navigation opens. This would indicate that the supplies, accumulated last year, to carry over the winter period, have been reduced excessively by the severe winter, as ordinarily their stocks carry them well into April.

Philadelphia, Penn.

There is practically no change in the retail trade in this locality. The dealers all continue busy—not with the feverish activity of some few weeks ago, but there is a good demand, which depletes their stocks as fast as they can be accumulated. Pea coal seems to be the most difficult to procure at the present time, and as high as \$2.50 at the mines has been paid, with little of this size offering at that.

Pea size, since the advance in the price of chestnut, has been experimented with by quite a number of householders, and, in some cases, has been found to answer the purpose fairly well. A number of the furnaces in this city are equipped with grates to burn this particular size of coal, and the added number of users has made it a scarce article.

Stove and chestnut, in fact, all sizes, are in splendid demand, and the dealers all report substantial increases over the same period a year ago, when business in this line commenced to grow rather sluggish. The weather for the past week, while not cold, still compels the use of considerable coal.

The wholesale trade still enjoys a full measure of prosperity. Every pound of coal at the present time is going direct to the consumer, and, as an index of conditions, orders for certain sizes are either turned down or taken with the proviso that shipments will be made as promptly as possible, which is practically no promise at all.

Pittsburg

Bituminous—There has been some discussion of the proposition in certain districts that the miners work for 45 days after the expiration of the old wage scale, pending the fixing of a new scale, but

there is not the least likelihood of the necessary unanimity being reached, and it remains probable that there will be a general suspension in the union districts for perhaps 60 days. Nothing has been accomplished toward bridging the difference between the respective demands of the operators and miners.

The local coal market continues strong, with nearly all mines working to as large outputs as the car supply permits, which means about 85 per cent. of capacity in the district as a whole. Prices are firm at the advanced level noted a week ago and may soon score a further advance. We quote: Nut, \$1.10@1.20; mine-run, \$1.15@1.25; ¾-in., \$1.25@1.35; 1¼-in., \$1.40@1.50; slack, 90c.@\$1 per ton at mine, Pittsburg district.

Connellsville Coke—Prompt furnace coke continues scarce and is bringing practically as high prices as ever. There is practically no demand for furnace coke on contract, the furnaces now in operation being already well covered. Some of the brokers have not been able to catch up in deliveries on contract, and a considerable part of the demand for spot coke comes from them. We note sales of between 50 and 75 cars of prompt furnace coke in the past week, chiefly at \$1.80 and \$1.85, and quote the market unchanged as follows: Prompt furnace, \$1.80@1.90; contract furnace, \$1.80@1.90; prompt foundry, \$2.20@2.30; contract foundry, \$2.20@2.40 per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Feb. 17, at 393,364 tons, an increase of 39,000 tons, and shipments at 4582 cars to Pittsburg, 6416 cars to points West, and 864 cars to points East, a total of 11,862 cars, an increase of 1300.

Baltimore, Md.

The demand for practically all grades in this market has been exceptionally good, and prices, for the most part, remained firm. The trade is still facing unfavorable car movements on all the railroads; while some of the local operators were able to deliver with less difficulty through the week than heretofore, the majority of the offices reported that they encountered serious delays during the week, and that the car shortage was as bad as when the thermometer was registering around zero.

The prevailing opinion in Baltimore is that a strike in both the bituminous and anthracite fields will take place, and large orders were received during the past week for stocking-up purposes. These consumers, it is stated, will remain in the market until it has been definitely determined just what will be the outcome of the negotiations between the miners and operators.

Buffalo, N. Y.

The coal trade is in an uncertain condition, and promises to remain so for some time. Just now the weather is the chief element; when the thaw of mid-February came on, the consumers, both of anthracite and bituminous, took it for granted there would be no more severe weather and began canceling their orders. When the big blizzard of Feb. 21 appeared, everybody was dumbfounded, both at its severity and its effect on the railroads. It is now said that it will be April, at least, before the roads are in condition to deliver nonperishable freight to all points promptly.

There is some coal getting to destination from the sidings Eastward and prices are actually firmer in Buffalo than they are in the East. Shippers are astonished to find how little the general consumer has become awake to the situation, and the state of distress into which the roads and shippers have been for weeks finds little sympathy at the other end of the line.

It is difficult to quote bituminous, as there is no settled price; the shipper feels that he is entitled to an advance and he is earning it, but the consumer still finds coal at former prices. Quotations must, therefore, remain strong at former figures: \$2.60 for Pittsburg three-quarter; \$2.50 for mine-run and \$2.25 for slack, with Allegheny Valley coal about 25c. less. Coke is fairly strong at \$4.25 for best Connellsville foundry, and \$3.50 for stock.

The anthracite trade is a trifle more hopeful; the demand is not so insistent as it was and it will run down still more as soon as mild weather returns. Shippers have no surplus and do not expect any right away. The Western situation is reported a little easier, especially as the last cold spell did not strike that section as severely as it did the East.

Cleveland, Ohio

Conditions in the past week have been rather serious on account of car shortage, and while there has not been any actual suffering on account of the scarcity, nevertheless there has been quite an uneasiness because of the small amount moved from the mines. The railroads have been unable to deliver the heavy tonnages moving into the West and North during the past six weeks because of the snow blockade; as a result of the large number of loaded cars laid out on sidings the roads are short of equipment and cannot furnish empties to the mines. We are assured, however, by the railroads that now that the severe weather has abated the empties will be returned promptly and the mines will be supplied next week.

Prices have advanced on all grades of coal in the past week from 15 to 25c. per ton in this market. It is not expected, however, that these prices will remain after an adequate car supply has been furnished.

Columbus, Ohio

Just at the time when railroads were beginning to relieve the congestion of traffic incidental to the extreme cold weather of the months of January and February, another storm appeared and again demoralized traffic on all of the roads. As a consequence the condition is even worse than it has been at any previous time during the winter, and there is little hope for an immediate remedy unless more favorable weather appears.

Prices are still ruling firm, and there is a premium on all grades and varieties. Many manufacturing establishments had to close down temporarily to permit of the coal supply being used for heating purposes. Some suffering was reported in certain localities, but this was not widespread nor severe.

Operations in Ohio mining districts have been restricted to about 50 to 60 per cent. of the average. The chief hindrance has been the inability to secure sufficient cars. Motive power is lacking on the railroads and the general condition of traffic is demoralized to the extreme.

Retail trade has been active because of the low temperatures which have been prevailing. Consumers were compelled to place additional orders, and the ice on the streets made deliveries rather difficult. Prices in retail circles rule firm and higher.

Prices prevailing in Ohio are as follows:

Hocking Valley	
Domestic lump	\$1.60
¾-in.	1.40
Mine-run	1.15
Nut	1.15
Nut, pea and slack	0.80
Coarse slack	0.70
Pittsburgh No. 8	
¾-in.	1.30
Mine run	1.10
Coarse slack	0.80
Pomeroy Bend	
Domestic lump	1.75
¾-in.	1.50
Mine-run	1.20
Kanawha	
Domestic lump	1.40
¾-in.	1.25
Mine-run	1.05

Cincinnati, Ohio

Conditions are little changed from what they were a week or ten days ago. There has probably been a lessening of the pressure on traffic officials, owing to the gradual clearing up of congestion at the various terminal points on most railroads in this territory. For this reason also, the wholesale offices feel the tendency is in the right direction, so far as pressure on them is concerned for delivery of orders long overdue. They have in no way been responsible for the delay, although the buyer is inclined to consider them so.

The demand for the various grades of fuel is practically unchanged, either relatively or as a total. Fine coals are strongest, with some grades nearly impossible to get. As soon as the railroads are on something like a normal basis again, as regards deliveries, it is probable there will be a big drop in the orders in wholesale offices. Many orders now on hand are doubtless duplicated in more than one office by the purchaser. When he has enough in his bins, regardless of whom purchased, he will stop shipments by canceling other orders, which he can readily do on the ground that delivery was too long delayed, and the delays have been such within the last 60 days that no seller could deny them.

Thurmond, W. Va.

The cold snap of January, which was hailed as a sure promise of better prices and increased output, has caused the worst congestion of movement on the western railroads connecting with the Chesapeake & Ohio and the Norfolk & Western that they have ever seen, while at the same time the demands for coal have been largely increased, both on contracts and for spot shipments. Owing to the large number of cars tied up, more particularly in the Toledo district, where there are about 14,000 loads, the supply of empty cars is so small that the mines here are working only about two and one-half days per week. Some of the Middle West railroads are stocking up, in anticipation of a strike, the Pennsylvania Lines having placed orders for 60 cars daily, and this is tending to add further complications.

A price of $1.25 per net ton, f.o.b. mines, is being quoted on all spot coal, and sales at $2.85 per gross ton, f.o.b. Hampton Roads, have been made.

The Chesapeake & Ohio and Norfolk & Western are moving such coal as is loaded to tidewater in good time and returning empties quickly, but the Virginian Ry. has fallen down completely, owing to a strike at its shops and the shortage and bad condition of its motive power.

Charleston, W. Va.

Market conditions have undergone no change in West Virginia during the past week, but a drop in prices is anticipated by some coal men if the mild weather continues much longer. The indications in the earlier part of the week were that the car supply would be good for the present week, a condition that has not existed since the first of the year; but it is too early to say that there has been a material change or improvement as yet.

Louisville, Ky.

Normal conditions are again prevailing in the local coal trade. The breaking up of the ice in the rivers, and the action of the railroad companies in relieving the congestion have brought about this condition, together with the letup in the heavy demand for coal. While business still continues brisk, both in the retail and the wholesale lines, everything is moving along smoothly. The difficulty which the commercial institutions were experiencing in securing enough fuel to keep steam plants going has been remedied, and manufacturers and office tenants have ceased to complain.

Memphis, Tenn.

The weather conditions in this territory have materially changed since our last issue, the temperature going up to as high as 60° the last few days. This has caused a surplus of domestic coal to accumulate in the city.

The wholesale end for steam coal has continued stiff and we have experienced some difficulty in being able to get a supply sufficient to take care of our steam contracts. The mines have held firm on their advanced price, and shown their wisdom in this matter, as their work has been limited only by the car supply.

West Kentucky prices are as follows:

No. 1 lump	$1.50@1.75
No. 2 lump	1.15@1.35
Nut	1.10@1.25
Mine-run	0.85@1.00

The demand for screenings has been something unusual the entire season, it being impossible to secure enough fine coal at any time to take care of contracts.

The Cahaba and Jellico fields are all crowded with orders, and prices range: Jellico, $2@2.50; Cahaba, $2.75@3.25.

Nashville, Tenn.

Prices are not quite as stiff as they were, but the demand for coal is good, and car service is, if anything, worse than it has been. This, in a measure, has kept prices as high as they are.

Quite a few inquiries have been made for foreign shipments after Apr. 1, but hardly anything before that period. There seems to be quite a difference of opinion in regard to the strike on that date, although many people who claim to be fairly well in touch with the situation contend that there will be none. The demand for screenings, though probably not as strong as heretofore, is still fairly good.

The prevailing prices in the West Kentucky field are as follows:

Lump	$1.35
Nut	$0.95@1.05
Screenings	0.30@0.40
Mine-run	0.90@1.00

Chicago

There is an upward trend in Chicago coal prices, which dropped from 25 to 35c. per ton last Monday and Tuesday, but recovered from the loss with a bound on Wednesday.

One of the chief features of the market has been storage-coal buying. The Burlington road took 4000 cars of Eastern coal, paying $1.10@1.20 for ¾-in., with the average price ranging in the vicinity of $1.15. Smokeless coal is firm at $1.25 at the mine for mine-run, with lump and egg hard at $2@2.25. Anthracite shipments have been just as heavy as the productive capacity of the mines and the carrying capacity of the railroads would permit.

Prevailing prices at Chicago are as follows:

Sullivan County:	
Domestic lump	$2.62
Egg	2.62
Steam lump	$2.37@2.57
Screenings	1.97@2.07
Springfield:	
Domestic lump	$3.05
Steam lump	$2.32@2.42
Mine-run	2.12@2.22
Screenings	1.82@1.97
Clinton:	
Domestic lump	$2.57
Steam lump	$2.22@2.32
Mine-run	2.17@2.27
Screenings	1.87@2.00
Pocahontas and New River:	
Mine-run	$3.25@3.55
Lump and egg	4.20@4.30

Coke—Prices asked for coke are: Connellsville and Wise County, $4.65@4.75; byproduct, egg and stove, $4.95; byproduct nut, $4.75; gas house, $4.90@5.

Indianapolis

A week or more of moderate weather previous to the snow storm has not lessened the demand for coal at Indiana mines, practically all of which are operating full time. Most of the present output is for storage. The dealers have in their yards almost enough for their trade until Apr. 1, when a suspension is looked for.

The result of this wage scale controversy is a demand for coal at higher prices through February and March by the consumers who want it for storage. The sale of such coal nets the operator a far better profit than if an agreement had been reached on a wage Feb. 1.

Minneapolis—St. Paul

The coal business in the Twin Cities has taken a decided slump during the past 10 days as the mild spring weather has affected the wholesaler and retailer alike. Many orders which were placed with the wholesalers during the latter part of December and in January are reaching destination and this condition, together with the mild weather, has put a damper on the dock and all-rail business. Except for the fact that the wholesalers still have on their books a considerable number of unfilled orders they would be doing practically nothing.

The strike proposition does not seem to scare the smaller manufacturer o. steam user much, but undoubtedly they will be in the market during next mont and will want enough coal to carry them over for 30 or 60 days. Owing to the demand of the large manufacturing plants for coal in 100-ton lots at the mines, and on account of the poor demand here, prices have taken a decided drop.

St. Louis, Mo.

Market conditions are practically unchanged, and indications are that there will be no radical change until perhaps after Mar. 5. There has been a marked increase in the amount of railroad tonnage placed during the past week, while at several points on the Illinois Central the entire outputs of the mines are being stored on the ground adjacent to the mine, and this is giving work on an average of five days a week to the miners.

Storage coal for commercial purposes is not as much in demand as it was two weeks ago. As a matter of fact, some of the large buyers are hesitating before placing orders, expecting there will be a surplus tonnage on the market the latter part of March if the weather gets warm. There is little storage demand from the country, and indications are that the last week in March will witness a heavy demand by those who are taking a long chance and waiting for the market to break.

The prevailing prices, which are very uncertain, as they change from day to day, are about as follows:

Franklin County	
Lump and egg	$1.85@2.00
No. 1 nut	1.75@1.85
No. 2 nut	1.60@1.70
No. 3 nut	1.35@1.50
2-in. screenings	1.00@1.10
Carterville	
Lump and egg	$1.65@1.75
No. 1 nut	1.50@1.60
No. 2 nut	1.35@1.45
No. 3 nut	1.15@1.25
Screenings	1.00@1.10
Mine-run	1.25@1.35
No. 1 washed	1.80@1.90
No. 2 washed	1.50@1.60
No. 3 washed	1.25@1.35

Spokane, Wash.

The coal situation in Spokane remains quiet, few sales either more or less than usual being made. The spring appears to be here, and warm weather is prevailing. No change has been noted in the prices of standard coals since last November. Local yards have a good supply on hand, and are receiving small shipments from the mines every week.

Salt Lake City, Utah

During the past week there has been an increased demand for coal, owing to the recurrence of winter weather. Beginning with March it is reported that the price of Wyoming coal in the Salt Lake market will be reduced to the same level as the Utah product. For the past two years it has been slightly higher. It is not known whether the reduction will be made in the freight rate or in the price of coal at the mine.

The prices of Utah coal follow: Lump, $2.40; nut, $2.15; slack, $1.25.

Portland, Ore.

There is no change in the situation here, the demand for coal continuing light on account of the mild weather. This has been a dull season for the fuel dealer, the only cold spell occurring early in January and being of short duration. As a consequence, not only coal dealers, but wood dealers as well have had rather poor business here during the winter months.

Production and Transportation Statistics

The Virginian Ry.

Total shipments of coal over the Virginian Ry. for January were 316,766 short tons as compared with 258,869 for the month previous. Strikes now in effect on this road are seriously crippling the service.

The Car Situation

In the two weeks ended Feb. 14, the surplus of coal cars decreased from 14,042 to 11,464, and the box car surplus decreased from 12,781 to 11,426. Miscellaneous car surplus showed little change, and the flat car surplus was slightly smaller.

Foreign Markets

Sweden

Concerning the effect the possible strike of the British coal miners on the situation in Sweden, the *Daily Consular and Trade Reports* says:

It is conceivable that the labor troubles in England might affect the situation to an extent such that Sweden would have to look elsewhere for its supply, thus giving a possible opportunity for the introduction of American coal.

Coal constitutes nearly 10 per cent. of the total imports into Sweden. About one-fifth of this fuel is entered at Gothenburg, which port and Stockholm are the principal import places, Malmo and Gefle coming next. The total import for the last three years for which figures are available has been, in tons: In 1907, 4,146,785; in 1908, 4,427,507; in 1909, 4,084,055. It was practically all from Great Britain.

The production of coal in Sweden is less than 7 per cent. of the consumption of the country, the output in 1910 being 302,800 tons. [A list of Gothenburg coal importers may be obtained from the Bureau of Manufactures.]

Great Britain

Business in the British markets is being conducted within restricted limits due to the uncertainty in the labor situation. The prices at which purchases can be made are governed, not so much by the relative value of the different grades, as by the condition of the consumer.

Approximate quotations are as follows:

Best admiralty, large	$4.56
Second admiralty, large	4.20
Best dry, large	4.32
Second dry, large	4.08
Black veins, Cardiff shipment	4.26
Western valleys, Cardiff shipment	4.20
Eastern valleys, Cardiff shipment	3.96

Financial Notes

The net income from the operations of the Delaware, Lackawanna & Western coal department for the year 1911 was $3,490,085, or $108,822 more than for 1910. Expenditures during the year on coal properties aggregate $747,265. Cost per ton of mining was about 2c. more, due to the necessity of working thinner seams.

Total earning of the Byproducts Coke Co. for 1911 were $479,746. Deducting depreciation accounts and dividends the total undivided earnings Dec. 31, 1911, were $169,051. From these earnings a dividend of $3 a share, amounting to $90,000, was declared, payable Feb. 15, 1912, and a bonus given the employees of $6942.

The newly organized Brier Hill Steel Co. of Youngstown, Ohio, has some valuable properties. Included among these are blast furnaces, rolling mills, ore properties and a good vein of coking coal. The blast furnaces, coke and ore properties are valued at $6,652,000 and the mill properties at $1,860,000. The total resources of the company are given at $15,000,000, with a cash and inventories account of $1,051,000.

It was announced in Denver on Feb. 16 that negotiations pending for several months had been concluded for the readjustment of the finances of the Denver, Laramie & Northwestern R.R. and its allies, the Denver-Laramie Land & Iron Co. and the Colorado-Wyoming Coal Co. The plan calls for a reduction in the total debt (funded and floating) to not over $1,000,000 through a reduction in the floating indebtedness by $1,000,000.

Stock of the Lehigh Valley Coal Sales Co., which sold recently at 192, advanced to 207 on the Curb. This is the stock representing the coal-mining properties segregated by the Lehigh Valley R.R. Co. Within two weeks the price has been down to 180. The Lehigh is almost as strong in the coal business as the Lackawanna, and stockholders are making comparisons between Lackawanna Coal at 350 and Lehigh Coal at 207, as showing the bargain possibilities in the latter.

Earnings of the Colorado Fuel & Iron Co. are running very much at the rate of last year, which showed a surplus of $1,260,000 after all deductions. Colorado Fuel preferred is selling around 115, with more than customary activity of late. By the time the company's charter expires, which will be on Oct. 21 of the present year, the accumulated unpaid back dividends will total about $1,320,000, or 64 per cent. of the entire par value of $2,000,000 preferred stock outstanding. Just what sort of a deal the preferred shareholders will get when the time comes for renewing the charter it is difficult to say; in fact, the matter of whether the company's charter will be renewed or the company reincorporated has not been settled.

West Virginia Statistics for 1911

By John Laing*

Excerpts from advance sheets of the chief mine inspector's report for the fiscal year ending June 30, 1911. The encroachment of the byproduct oven into the coke industry is responsible for a falling off in this branch. Total coal production for the period was 54,033,186 gross tons, a gain of 2.09 per cent. Tables giving complete statistics will be published in a later issue.

*Chief of Department of Mines, Charleston, W. Va.

Briefly stated, the mines of West Virginia reported for the year ended June 30, 1911, a total output of 53,733,186 gross tons of coal, and to this amount we have added 300,000 gross tons to cover the various small operations throughout the state, which are not required to report to this department; this makes a grand total of 54,033,186 gross tons of coal produced at all the mines in the state. This is an increase of 1,109,478 gross tons over that for the year previous, or a gain of 2.09 per cent.

It is gratifying for this department to be able to report an increased production in coal, taking into consideration the condition of the markets and business in general throughout the country during the past year. I believe that, if general business conditions continue normal during the present year, our production will far exceed last year's output and each year will continue to exceed the previous one until within the next seven or eight years we will be the leading bituminous coal-producing state in the Union. We are now the second largest producer, Pennsylvania being first.

The total value of the coal produced (54,033,186 gross tons) at the mines, was $52,952,522.28. The value of the coal loaded on railroad cars and shipped from the mines was $46,870,788.30, practically all of which was consumed in other states, which means that the coal industry brought this amount of money into the state of West Virginia.

On account of market conditions, we had a reduction in the coke production, it being this year 2,694,047 net tons, as compared with 4,217,381 last year, or a decrease of 1,523,334 net tons. Manufacturing of coke at the mines in this state is gradually being discontinued, as the various byproduct plants throughout the country can manufacture coke, even after shipping the coal from the mines to their plants, much cheaper than it can be produced at the mines; therefore, as above stated, coke burning at the mines is gradually being dispensed with. This, however, in no way interferes with the production, as the West Virginia coals are much in demand at the byproduct plants, owing to their superior quality for coking purposes.

The coke at the ovens this year was valued at $5,037,867.89. Practically all of this was consumed in other states, which means that the coke industry brought this amount of money into West Virginia during the year.

Accidents

We regret that there was an increase of 12 fatal accidents this year as compared with last, the total this year being 332. The increase is due to two serious accidents, one being the explosion of the Ott No. 20 mine, operated by the Davis Coal & Coke Co., Apr. 24, 1911, in which 23 men lost their lives; and on Dec. 31, 1910, there were 10 men killed in a runaway on an incline at the Lick Branch Mine, operated by the Red Jacket Coal & Coke Co., making a total of 33 men being killed. This shows conclusively that accidents from general causes, such as falls of roof, mine cars, etc., were not so great this year as last, which indicates that extra precaution has been taken by the operators, managers, superintendents, and foremen, notwithstanding the fact that more coal was produced. All of these accidents occurred at 223 mines, employing 28,533 persons and producing 26,966,844 gross tons of coal, while at the remaining mines there were produced 27,066,342 gross tons of coal, without the loss of a single life.

There were 179,710 tons of coal produced per each fatality, and a total of 819 nonfatal accidents, which is a decrease of 123, as compared with last year.

Quite a number of improvements have been made at the various mines on old plants, as well as opening up and reequipping new mines. During the year there were 21 new mines opened which have just begun shipping and which will materially add to the production for the coming year.

Men Employed and Labor Troubles

There was an average of 70,644 persons employed in and around the mines during the year, including 2868 coke workers. This does not include the mine superintendents, managers, foremen, fire bosses, store and office help for whom it would be safe to add 2350 persons, which would make a total of 72,994 directly connected with the operations of the mines in this state.

Included in this total of 70,644 there were 30,044 white Americans and 11,950 negroes, the balance being composed of Italians, Hungarians and other foreigners, who do not speak the English language.

We are pleased to report that the production in this state has not been held down on account of strikes, as there have only been eight of these throughout the entire state during the year. These affected six different mines, but were only local in each case and were amicably settled within a few hours after they occurred.

Examinations

Since the inauguration of the system of examining applicants for certificates to act as mine foremen and fire bosses, up to the close of the report for the year ending June 30, 1911, we have examined 2203 persons, 1243 of whom were successful, as follows: 627 first-class certificates; 566 second-class certificates; 50 fireboss certificates.

We believe that these examinations have done much good for many reasons. It has put the men holding these positions to thinking and studying mining conditions, which better qualifies them to act in these very responsible positions. As time goes on, we will, no doubt, have the advantage of a gradual improvement in the efficiency of men in such positions. The younger men, who are now working in and around the mines and who are aspiring eventually for such places, will educate themselves more thoroughly, knowing that when the time arrives and a vacancy presents itself, they must be in a position then to pass the examination; they will not then be permitted to accept the foremanship of a mine and then be taught the duties which they will have to perform, but will be prepared from the beginning, and when they are given such positions their advancement to still higher ones will come more rapidly. The men engaged in mining realize that the time has come when persons in charge of the lives of the men in and around the mines have got to be men of efficiency as well as of good moral character.

According to Edward W. Parker, of the United States Geological Survey, West Virginia possesses a larger supply of coking and other high-grade coal than any other state in the Union, except Pennsylvania. In 1910, West Virginia produced 3,803,881 short tons of coke valued at $7,355,233. Alabama produced 3,249,027 short tons valued at $9,165,821. In quality, the West Virginia coke is better than that of Alabama, but the average price of Alabama coke in 1910 was $2.82, while that of West Virginia was $1.93.

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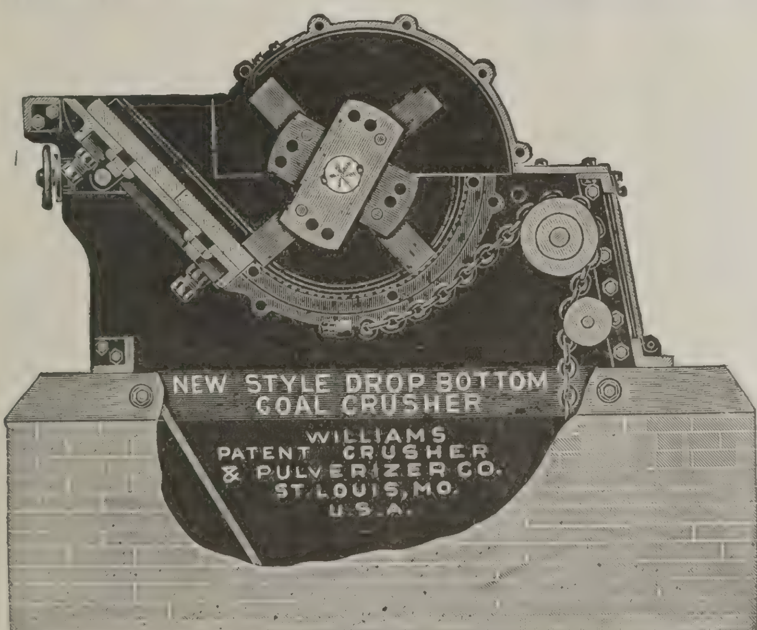

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COAL AGE

Devoted to Coal Mining and Coke Manufacture

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COAL AGE

Vol. 1 NEW YORK, MARCH 9, 1912 No. 22

THE English coal strike is the inevitable result of economic conditions in Great Britain. For a score of years the British people have been losing in their desperate duel with Germany for commercial supremacy. At the beginning, England was everything—Germany nothing. Today the Germans are leading and that country's success is due to the health, energy and education of its workingmen, brought about by a broad, carefully planned governmental policy.

The Germans have old-age pensions, accident indemnity, sick benefits and rigid regulation of dangerous employments. All these have advanced, not retarded business. The workers in Germany are housed in comfortable dwellings, eat good food, have pleasant surroundings and the opportunity to educate their children. As a consequence, German labor has maintained a normal consuming power, and exhibits high efficiency in production.

England has permitted her working population to deteriorate in slums; has pretended to believe that the strength of a nation is in her banks, palaces, armaments and battleships. "Every man for himself," has been the essential of English policy. Germany has understood that real strength lies in her men who work with their hands.

Before long, the United States, following close in the footsteps of England, will have to match forces with Germany and Japan, and unless there is a change in our present system, the struggle will be as unequal and as unsuccessful for us. We haven't, as yet, eight million people on the destitution line as has England, but the almshouse and public-hospital population of New York is increasing from 12 to 14 per cent. every year, while the total population of the city is only increasing at the rate of 3 per cent.

Every other man we meet has some solution for present social problems. When a strike occurs, we say it is due to the high cost of living—miners and laborers can't earn enough to purchase daily necessities. Suppose this is true. What are we going to do about it? Inflicting fines on the officers of a company because they won't compete with themselves is not a solution, for the public after all pay such charges. If we put these same men in jail, others will take their places at the helm of business, and the stern, relentless demands of our present industrial system will compel them to follow in the footsteps of their predecessors, whether they want to or not.

The whole matter has been one of evolution. Starting with a hundred small companies, we combined here and there until there were only fifty. These fifty were consolidated into ten; the ten became two, and at last the two merged into one great business machine, bigger oftentimes than the government itself. Each stage of this combining process was marked by the issuing of additional securities, based upon the saving of expenses and increase of income to be achieved by the consolidation. Then, in order to furnish dividends and pay interest on the enormous mass of securities, prices of products are put up, wages held down, and the majority suffer to benefit the "few."

Now, the mistake we make is in blaming the "few," rather than in condemning and correcting the system. It was true, perhaps, a century ago, that a man directed his business, but, today, business runs the man, and if he doesn't obey the precepts laid down for his guidance, business will remove him and a more obedient servant will be employed.

Just so long as we can take a value and legally capitalize it five- or ten-fold, just that long will business compel its servants to debauch legislatures, and cause many people to believe that it is as proper to bribe an assemblyman as to tip a waiter. The certain result of present methods is to increase poverty on one side and superfluity on the other. Strikes will occur with increased frequency and enlarged scope until the government first, and then business, are reformed along lines which will bring equality in a broader sense than now.

Until we prohibit the legalized capitalization of "latent value," we will not have taken the first essential step to correct present social evils. Too many are waiting for the next generation to deal with a problem of today. Evolution does not go backward. Competition such as we have had in the past will not return. Just as serfdom ran its course and gave way to feudalism, and the latter to capitalism, so must capitalism be supplanted by a system less designed to swell private fortunes and encourage personal greed. This is the age of man, not primates. We should be as willing to concede economic as geologic facts.

The Problem of Mine Timbering

By R. B. Woodworth*

Various materials of construction are here discussed with regard to their suitability for use in different kinds of mine supports and some conclusions are reached as to their relative values for this purpose. The third of a series of articles on mine timbering with special reference to the use of steel.

The right use of the materials of construction proceeds from an intelligent appreciation of the physical qualities of those materials, their respective advantages and disadvantages and their peculiar fitness for the service at hand. Each of the usual materials of construction has its right place and its right use about the mines. Economic waste, however, attends the use of a material in any service when some other material is better suited to that service.

In general these materials of construction fall into two classes. On one side stand the heavy permanent materials of low tensile strength but high resisttance to compression and crushing, for use in situations where mass is wanted; and on the other are the lighter materials of high tensile strength, fitted to carry large loads over wide spans with the minimum ratio of dead weight to external loading. Brick, stone and concrete belong in the first class; wood, iron and steel in the second. With the technical aspects of the mine timbering problem clear in our minds, let us pass to the consideration of the fitness of these materials for mine timber uses.

We need here to consider only the best kinds of wood; white oak, long leaf yellow pine, short leaf yellow pine, white pine and spruce. Wood is a material of wide distribution, easily framed and fitted for service, with moduli of elasticity about equal in tension and in compression, permitting satisfactory use as beams and girders to carry heavy loads over wide spans, or again as columns to carry heavy loads on long lengths with small area; and it permits of installation by manual labor alone. The defects of wood are its low shearing value, its liability, in its natural state, to decay and to the attacks of insect enemies, and its low resistance to fire.

Universal Use of Wood

Wood is the universal material for cheap construction and has proven its fitness for mine timbering purposes by long years of use, even in circular shafts for which it is, of all places perhaps, least suited. It loses its place in mine timbering only on the advent of something better, only where its capitalized cost, based on its durability, is less than the capitalized cost of substitutes based on their durability. If it were durable under the alternating conditions of temperature and moisture which obtain within the mines, and if it offered security against fire and the consequent destruction of life and property entailed thereby, no one could ask for better material.

Stone is a heavy material of great compressive and crushing strength, but low in tensile value; a good resistant to fire. Within the mines it would be structurally suitable for shaft lining were it not for the expense of masonry construction and the difficulties of placing it in the process of sinking. The use of waste rock, taken down in the process of mining, for building the side walls of headings and for large piers under tender roofs has every thing in its favor and its skillful use means much in the way of true economy. Such pack walls, as they are called in England, have much to commend them as the utilization of a by-product. They serve to carry the direct load at the sides of the headings. But this waste rock offers no opportunity for use as roof supports, unless laid in mortar and arched. The more extended use of waste rock in the mines of the United States might avoid the use of more valuable materials and this subject deserves the attention of mine operators.

Brick is an excellent fire resistant; of medium value in compressive strength and crushing value; without much tensile strength; excellent for side walls to carry roof supports and so employed to great a extent in permanent headings of English mines. It is ideal for circular shaft lining if the cost permits, not so good for elliptical shafts, and not at all adaptable for rectangular shafts. It resists bending stresses only when in arch form. It is used within a few mines in the United States for side walls in pump houses and fire zones and also for stoppings in air courses.

Concrete

Concrete, like stone, is high in compressive strength and shearing value, but low in tensile strength; it is also a good fire resistant and, therefore, eminently fit for lagging purposes. It makes an ideal lining for elliptical shafts. Concrete must be mixed with care and intelligence, and is often defective. If the ingredients are properly proportioned and the batch well mixed, it is a good material of construction for certain uses, but it is not adapted to resist bending stresses or alternating bending, tensile and compressive stresses such as occur in mine timbering. Concrete, moreover, needs reinforcement by steel in order that its bulk may not greatly increase the amount of excavation required.

Recently, experiments have been made, and several patents taken out in connection with the use of concrete for gangway supports, to replace steel or wood. I hold no brief against concrete, just as I hold none against any other modern material of construction; it has a

Steel-framed Gangway, Mine No. 7, Sturgis, Ky.

*Engineer with the Carnegie Steel Co., Pittsburg, Penn.

Note—Paper read before the Kentucky Mining Institute, Lexington, Ky., Dec. 11, 1911.

place that it alone can rightly fill, but its proper use is not as roof or gangway supports. Given a rectangular white oak or long leaf yellow pine beam of any span, width or depth, a plain concrete beam of equivalent strength must be 2.83 times as deep for the same width or 8 times as wide for the same depth; while a steel beam of equivalent strength may be 3.65 times shallower for the same width or 13 1/3 times narrower for the same depth. If reinforced concrete is used, the beam of equivalent strength and the same depth must have as much steel in tension reinforcement as there would be in the bottom flange of a steel beam of the same depth and strength.

SLOPE AT MINE NO. 8, WEST KENTUCKY COAL CO.

[These comparisons are evidently made on the basis of an allowable tensile stress of approximately 100 lb. per sq. in. for concrete; 800 lb. per sq. in. for wood and 10,500 lb. per sq. in. for steel, but it should be remarked that it is almost without exception a mistake to figure on concrete taking any tensile stress whatever and a concrete beam without reinforcement on the tension side is poor and unsafe design. It should also be remarked that the use of concrete arches is not here considered—a form of construction to which concrete is well adapted.—Ed.]

Cast iron was tried out years ago for roof and gangway supports and was abandoned, just as the cast iron beam, once common in building construction, has passed into history. This material is well suited to resist direct compression but not tensile stress or cross bending. The cast iron segment is, however, the standard unit for lining circular shafts abroad and subaqueous tunnels everywhere, with, however, the possibility that 25 years from now it will be driven out of even these fields by structural steel or a combination of structural steel and concrete.

STRUCTURAL STEEL

Structural steel is the modern universal material of construction. It is a malleable alloy of iron, carbon and manganese with moduli of elasticity high and about equal for tension and compression; shearing value three-fourths the tension value, and, therefore, relatively high, so high indeed that it need seldom be taken into account. It is a homogeneous material; easy to obtain, fabricate and erect; suited to resist tensile, compressive, cross bending and shearing stresses, either continuous or alternating, single or combined. It is in everyday use in the building of structures above ground and is a most suitable material with which to replace wood in the timbering of excavations underground for the same reasons that explain its use in place of wood above ground. Steel is most nearly like wood in its physical properties and, therefore, best suited to be its substitute. It is a material which long experience, both in the United States and abroad, has demonstrated beyond question to be economical for use in mine timbering as compared with any other material which has been used for that purpose; and it is economical in the sense that its qualities in regard to endurance, fire resistance, and offering the greatest strength for the least weight, are such as to enable it to show a comparatively low cost when computed on the ground of ultimate expenditure.

The substitution of steel for wood is simply the substitution of a material of great strength and endurance for a similar material of less strength and endurance. The substitution of steel for wood in mine timbering means no significant change in general design, and the simplification of details rather than modification of their essential character. Structural steel is a most flexible material. The forms of wood construction customary in mine timbering can be duplicated exactly in steel; a set of steel gangway timbers can alternate with wooden timbers; a set of steel mine shaft frames may be alternated with wooden frames; wood may be taken out and steel

DRIFT NO. 2, ROBY COAL CO., ADENA, OHIO

put in its place; steel may be taken out and wood put in its place; there are no other materials of construction permitting such easy interchange. Wherever bending and tensile stresses are to be resisted steel and wood find place, with this difference, that the use of steel avoids all those elements of economic waste to which wood is liable and with the further merit, as inferred from experience, that the use of steel within the mines means less excavation and better ventilation.

There is some difference in the behavior of wood and steel under service conditions. Steel deflects gradually under pressure and will bend greatly before fracture, and even when stressed past its elastic limit, may be taken out, straightened and replaced, whereas wood, in addition to the longitudinal separation of the fibers, breaks also transversely. This is why timber with long fibers is better than that with short, and why long-leaf yellow pine makes the most excellent wooden mine timber. The difference in behavior of steel and wood is of little practical importance in the timbering of permanent headings, but does come into account in the use of steel for props, and in other cases of possible re-use.

Steel and wood are alike, moreover, in that both are gnawed by the tooth of time. Wood rots; steel corrodes. The protection of steel from corrosion, however, is a simple matter and inexpensive; the preservative treatment of wood, on the other hand, if done well, costs as much, or more, than the raw material itself.

As a result of this examination into the several types of mine timbering, the stresses in their members and the physical qualities of the materials in common use, we can now tabulate these types of framing with the materials most suitable for use in them:

Circular shaft framing	Brick, concrete, cast iron or steel
Elliptical shaft framing	Concrete or steel
Rectangular shaft framing	Wood or steel
Square timber sets	Wood or steel
Triangular timber sets	Wood or steel
Gangway supports	Wood or steel
Roof supports	Wood or steel or pack walls, etc.
Lagging	Wood, steel, concrete or brick

STEEL ROOF SUPPORTS, MINE OF SPRING VALLEY COAL CO., SPRING VALLEY, ILL.

Earthquakes and Mine Explosions

Special Correspondence

A brief resumé of interesting discussions at the conference of the International Association of Seismology. Radio-active products the source of the earth's heat. Formation of mountains and valleys. The earthquake and the pendulum. Correspondence of seismic unrest and mine explosions.

Reading the editorial "Danger Periods In Mines" in COAL AGE, Dec. 16, page 317, recalls to mind the report of the three days' conference of the International Association of Seismology, held in Manchester, England, last July, when the governments of seventeen countries, including the United States and Canada, were officially represented. Many interesting theories were discussed, and since the question of the possible association between seismic unrest and mine explosions is now claiming the attention of experts, it may be interesting to present a summary of some of the matters then discussed.

Prof. Schuster, in his presidential address, recalled how in youth we were taught that the earth, once a molten and fiery globe, had gradually cooled down, leaving the inside still hot but gradually cooling and contracting. This contraction of the nucleus was for a long time considered the primary cause of geological dislocations. How do we stand at present? In the breaking up of radioactive products we find a source of heat, which, if the amount of radium and thorium in the interior of the earth is not decidedly less than that found near the surface, will not only balance the earth's loss of heat by radiation but actually increase its average temperature. Though reasons might easily be found why the surface layer of the earth might be richer in radio-active products than the core, we are nevertheless driven to the conclusion that the earth is now, and has been for a long time, in thermal equilibrium and that shrinkage by cooling does not account for any of the more recent displacements.

The causes of such inequalities as valleys and mountain chains, and the more general depressions and elevations that cause the distribution of land and water over the globe, have long interested geologists and mathematicians, but the wider discussion of the stability of the whole structure on which we live has only recently come into prominence. Only recently, Prof. Love has treated the problems of geophysics with masterly ability and lucidity, while the work of Prof. Heeker has brought to light the curious result that the earth appears to resist a change of shape less in a north and south (polar) than in an east and west (equitorial) direction. After referring to this fact the president said that Prof. Love, having failed to account satisfactorily for such effect in other ways, suggests that the lack of symmetry in rigidity was apparent only, and that the observed effects are due to the attraction of the tide wave in the

North Atlantic and its accompanying excess pressure on the sea bottom.

Among the papers read was one by Prof. Wiechert, describing the times taken by earthquake waves or seismic disturbances to radiate to different parts of the earth's surface. The later discussion of this subject led to the suggestion of a theory regarding the influence of the material forming the earth. It was stated that the earth can be divided into three zones or layers, through each of which the velocity of propagation of the disturbance follows a special law. The inner zone or nucleus was described as probably chiefly composed of metal, say nickel or iron. The first or outer layer was estimated roughly as being 750 miles, and the second layer about 1000 miles thick.

The Formation of Mountain Ranges

In a paper treating on the formation of mountain ranges, Prof. Reid, of the United States, referring to the view that these are due to volcanic action, stated that recent research has shown that such theory is insufficient. Another theory has been advanced claiming that they are the result of side thrust or tangential pressure, and still later observations ascribe their formation in part to gravity. The formation of mountain ranges it was urged must be explained by the expansion of material forming the earth. In support of this theory it was argued that it is impossible to increase or decrease what may be styled the equilibrium quantity of any segment of the earth, and if this be true the formation of ranges must be taken as evidence of the upward expansion of the material at that point, and a general decrease in density.

The upward force creates strains in the adjacent crust, and when these strains become sufficiently great they cause a break accompanied by a greater or less shock and a fault is developed at that particular point. The phenomenon is often followed by an earthquake. As the result of his observations, Prof. Reid found that earthquakes do not occur at the same fault line, except after long intervals of time; but if a number of severe earthquakes occur in quick succession the movements take place at different fault lines. Referring to the energy of earthquakes Prof. Reid said the intensity and area of the shock may not correspond, and it is of the utmost value to be able to estimate the quantity of energy manifested. Earthquakes differ enormously in the quantities of energy they develop. The Jamaica earthquake a few years ago (1906), although of great force near its origin, was limited to a small area and the amount of energy liberated was correspondingly small. The method used by Prof. Reid to estimate the energy developed by an earth shock depends chiefly on ascertaining the area of the surface of the earth affected, which involves practically the calculation of the area of any defined surface of an ellipsoid. The square of this area gives a number that is proportional to the amount of energy developed.

The Milne Horizontal Pendulums

The interest of readers of Coal Age will center, however, in the contribution of Prof. F. Napier Denison on "Horizontal Pendulum Movements In Relation To Certain Phenomena," giving the results of observations carried on upon the Pacific coast, for a series of years. It was stated that in the autumn of 1898 a Milne horizontal pendulum, swinging east and west, was installed at Victoria, B. C. Prof. Denison became deeply interested in observing certain wanderings of that pendulum, and has since 1907 closely observed the movements of another pendulum, 500 feet from the first and set to swing north and south. A careful comparison of the curves plotted daily for 1907, showed that each of these pendulums had a general tendency to move in the direction of the greatest air-pressure, and it was noticeable that this general direction was northwest and southeast. The presence of certain pronounced long-period undulations were also detected, possessing marked rhythmic characteristics too great to be caused by local meteorological conditions. Prof. Denison found that the east-west pendulum reached a maximum eastward movement during the summer months and a maximum westward movement in the winter. In addition to these semi-annual movements, annual movements were noticeable. The pendulum curves compared with seismic curves show in general over a period of 12 years that the periods of minimum-quake frequency usually corresponded with maximum easterly movements of the pendulum; while the maximum-quake frequency were mostly coincident with abnormally rapid movements of the pendulum and generally in connection with the westerly maximum swing.

Mine Accidents and Pendulums

Prof. Denison further said he had studied the pendulum curves and seismic records corresponding to the dates of numerous American and European mine explosions, his object being to ascertain what correspondence, if any, existed between mine explosions, the frequency of earthquakes and the swinging of the east-west pendulum. He found that the explosions appeared to occur more frequently during the months of extreme pendulum movements, and particularly at or near to the westerly swing. For the year 1904, the pendulum curve shows very small annual inequality, maintaining that year a close proximity to the normal line, and few earthquakes were recorded, while there was a remarkable absence of mine explosions. It was further stated that the same correspondence between extreme pendulum movements and frequency of mine explosions was to be noted in the curves relating not only to the winter months, when it might be expected, but also to the summer months. The correspondence of times of earth tremors with times of frequency of mine explosions seems to bear out the theory that the earth is undergoing great strains, at such times, and it is possible that the coal measures are affected to such an extent by those strains that gas may be liberated more freely, being assisted by the disturbance of the strata to make its way into the workings of the mine. Prof. Denison even suggested that it may be possible, after further study, by watching the movements of the pendulum to warn mine operators, so that special inspections of their mines may be made at certain so-called "periods of danger," when there seems to be a possibility of the occurrence of mine explosions.

In the view of Prof. Denison, Victoria, B. C., is most suitably situated for making such observations, and the generous support of the International Association of Seismology was promised by its president, Prof. Schuster.

The New Coke Plant at South Bethlehem

A new coking plant is being erected near South Bethlehem, Penn. A German company owns the plant and has done all the engineering work, though the plant, when completed, is to be operated by the Lehigh Coke Co. The plant is to consist of 8 batteries containing 75 ovens each, a gas-holder, byproduct plant, coal storage yards, and storage house for the liquid byproducts.

All apparatus and machinery is to be operated automatically so as to reduce labor to a minimum. The work of installing the first 300 ovens was begun last November; they will be finished and running within a year and the remaining 300 started. Each oven is to have a charge of 13 gross tons and the 300 together will require 4300 tons per day.

The plant is to consist of two parallel lines of ovens with heavy concrete foundations, separated by six railroad tracks, which are to be used for hauling the coal and coke. Each line of ovens is to be equipped with 4 batteries and each battery with a stack from 225 to 240 ft. high. Coal crushers will prepare the coal and electric conveyers will carry it overhead to the ovens where electrically-driven carriers will charge the ovens, raising and lowering the oven doors to charge the coal and draw the coke.

Faulty Power Plant Design

By E. L. Cole

Inefficient designs of power plants often waste money, cause breakdowns, accidents and fires. Many collieries are uncertain and uneconomical in operation because these facts are not understood or considered.

During a recent trip through the coal fields, I was amazed at some of the errors made in designing colliery power plants. And what was more surprising, was that the errors were not confined to the plants of the smaller coal companies. At the larger ones also was much erroneous designing.

In Fig. 3 is shown the position of a power station, containing two 100 kw., 250-volt direct current generators, operating at a speed of 220 r.p.m. A peculiar error at this plant was that of locating the generators at a point three-fifths of a mile distant from the boiler house, and at an elevation 85 ft. lower than the steam generators. A careful observer could see at a glance the danger to be apprehended from a body of water entering the steam chest and creating havoc. The attendant volunteered the information that the engines had suffered from three cylinder accidents, in the course of fifteen months, and that considerable trouble was always experienced when the steam pressure fell below 70 lb., as it frequently did, at times when all the pumps were running to rid the mines of the large volumes of water entering during the rainy season.

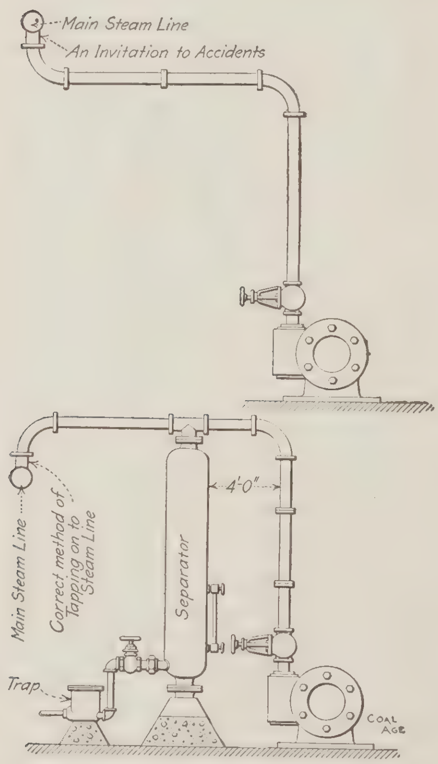

Fig. 1. Ill Planned Steam Piping

Needless Wiring and Piping

The reason assigned for locating the power house at such a peculiar location, was that a steam line was available, which had hitherto supplied two air compressers which were no longer in service. Whoever designed this power plant, seemed to have given little or no thought to his work. As shown in the plan of Fig. 1, 85% of the electric energy which was being generated at the power house, had to be transmitted to a point beyond the boilers. Adjacent to the latter there was an ideal location available for the power plant. Had the designing of the plant been in competent hands a considerable amount of money would have been saved to the owners. The boiler and electric plants would have been stationed side by side so that a large saving in the transmission of steam would have been effected and the cylinder accidents eliminated; the length of the transmission line would also have been much less, and a large saving would have been effected in the expenditure of money for copper wire.

Faulty Foundations

At another colliery the engineer had avoided the mistake of the first designers, and had located the power plant within 20 ft. of the boiler house. Nevertheless, he was guilty of a most grevious error, as the ground where the station was located was made up of a bed of ashes 15 ft. deep, and underlying it, was a large body of saw-dust, the site having been used before the days of coal mining for a saw-mill. Fig. 2, shows this faulty installation.

The construction of the steam line, and method of tapping it as shown in the upper half of Fig. 1 was a revelation of what not to do in designing and constructing steam plants. It would seem as if the designer had deliberately invited mechanical trouble, and as a result of the poor design this power plant has a record of fourteen minor accidents and three serious ones, which caused a large economic loss to the owners, but could have been easily avoided, had the plant been located 95 ft. from the boiler house, where a solid rock foundation was available, and had the steam line been designed as shown in the lower half of Fig. 1.

Another plant was well designed, but for the fact that the designer had failed to provide an exhaust head to prevent the moisture from scattering on the nearby roof. As the plant began operation in the summer time, the omission did not seem serious, until the month of December, when a carpenter, who was repairing the roof, slipped on the ice covered shingles, falling to the ground, sustaining serious injuries. Then the owner was compelled to give to the injured workman a sum of money which would have covered the cost of several good exhaust heads, such as the market affords.

Insufficient Circuit Breaking

A visit to the next plant disclosed the fact that the designer was a good mechanical engineer, but his knowledge of electrical engineering was somewhat limited, as he had four lines running out of the power house and all were dependent upon one double pole circuit-breaker, and when trouble occurred to one line only, as it frequently does in coal mines, work was suspended in all parts of the colliery, until the transmission of current was again resumed.

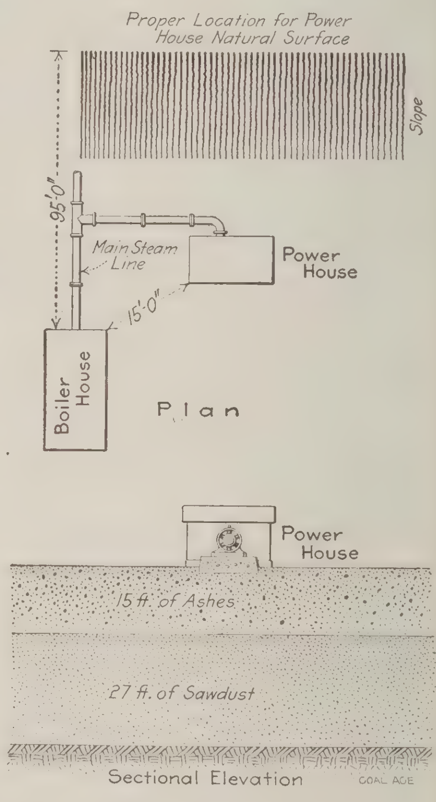

Fig. 2. A Poor Engine Foundation

Another error lay in not providing a circuit-breaker for a transmission line delivering power to a 65-hp. motor, which actuated an 18-ft. fan. Whenever one of the locomotives threw out

the solitary double-pole circuit-breaker in the power house, the current was cut off supplying the fan so that the armature stopped revolving. The spring on the starting box of the fan motor was weak and cessation of current did not serve to enable it to throw back the contact lever from the "on" position. Consequently, when the power was reëstablished, the full volume of current was thrown into the stationary armature. This happened several times and on two occasions it burned the coils, the cost of repair being $96.

Overtaxed Wiring

I paid a visit to a large breaker and it seemed to me, that whoever had installed the electric wiring was blind to all things but first cost. The breaker contained three hundred 16-cp. incandescent lamps, and eighteen 5½ ampere arc lamps. Yet the No. 4 service lines were brought into the building without any protective tubes, being controlled by one 50 ampere, double pole, single throw, fuseless knife-switch, which was mounted in a non-fireproof cabinet, minus a door. Furthermore, all branch lines were tapped to the service lines at the main switch, the only protection afforded were three double-pole fuse boxes, which were adapted to more current than the wires should have carried. All lines had more than the standard number of lamps then permitted by the National Electric Code.

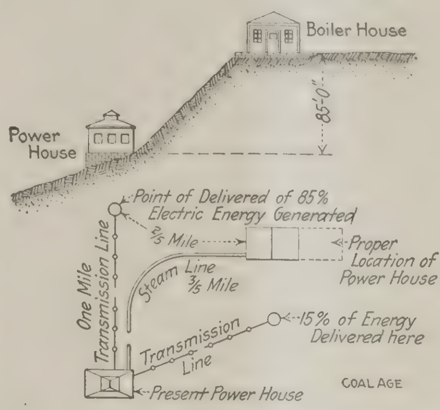

Fig. 3. Badly Located Power House

For instance three of the branches fed more than 30 incandescent lamps each, and as a result of the poor distribution, and the inadequate amount of copper wire used throughout the breaker the lighting was inefficient. In fact I saw several boys using ordinary miner's lamps to furnish additional illumination, but the most serious error was, that all lamp sockets were of the brass-shell type, and on account of the ever-present moisture, the fiber lining of the socket would readily lose its insulating qualities, and in the short period of eight months it was found necessary to replace 187 of the sockets. In consequence of the inefficient method of lighting this breaker, the lighting of coal-breakers by electricity received much unmerited criticism, due entirely to the fact that some untrained man had made a botch of a job which he should never have been permitted to undertake, for he thus introduced an extraordinary fire hazard, in an inflammable building.

I have mentioned but a few of the errors in the designing of electric equipment for the production of coal, and it would seem that the economic loss inflicted on owners would impress upon them the importance of placing the expenditure of their money in the hands of careful and competent engineers, but the trouble with many is, that while they keep an ever-watchful eye on the first cost, they seem to lose sight entirely of the expense of operating an ill contrived and inadequate plant.

The Run of Mine System in Illinois

By A. Dinsmoor

Causes that led to the strike of 1897 and the adoption of the "Run-of-mine," or "Gross-ton" system as a basis for the payment for mining. Results of the working of the system in Illinois during 14 years. Effect on miners and operators deplored. Need of mutual cooperation.

It has lately been my privilege to talk with a prominent coal operator in Illinois and with an ex-superintendent of mines, now a wholesale coal dealer in Chicago. They have given me permission to hand to the readers of Coal Age the information thus gained, upon the subject of the payment of miners by the gross ton—information that has been supplemented from other sources.

While this so called "run-of-mine" system prevails in the South and Southwest, in West Virginia, and to some extent in Indiana, special advantages for the study of the system are offered in Illinois.

History of Run-of-Mine System

Previous to 1897, there was in Illinois, a growing discontent on the part of the miners, whose earnings on the screened-coal basis failed to give satisfaction. The miners claimed, with some truth, that screens at many mines were manipulated to their disadvantage and that the spaces between the bars were widened to increase the amount of screenings. Operators gave, as an excuse for changing the screens at certain mines, that competition with other mines where the quality of coal was different from their own, justified and even necessitated such action. The men claimed further that many operators were encouraging an excessive use of powder, which again increased the quantity of screenings, as well as extorted from the miners a large portion of their wages to pay for the same.

These grievances and others led to a strong organization of the miners and the inauguration of the strike of 1897, which resulted finally in the adoption of the run-of-mine system as a basis for payment of coal mined. This agreement between the operators and miners was made law by act of the state legislature, June 3, 1897, and went into effect the first of the next month.

It proved to be, as the men hoped it would, a revolutionary movement. Some of the consequences they had foreseen, but others of equal or even greater moment were not anticipated. The output of coal increased at once from 19,786,626 tons in 1896 to 20,072,758 tons in 1897, and to 23,434,445 tons in 1899. The report of the Bureau of Labor Statistics for the year 1899, says that the adoption of the new run-of-mine system had not at that time resulted (as it has since) in a greater waste of coal.

To produce the coal mined in 1899, 419,263 kegs of powder were used, or about one keg to every 56 tons of coal. The number of fatal accidents that year was 84, against 77 in 1896; the number of men injured in 1899 was 597, against 672 in 1896. The whole number of men employed in 1899 was 36,991. Of these, 23,117 were English-speaking: American, English, Welsh, Scotch and Irish; the remainder were Germans, Italians and Poles in greatest numbers, French, Belgians, Austrians and Russians. The average price per ton received for hand-mined coal was 47c., and for machine-mined, 31c. These were the conditions after the gross-ton system had been in operation a year and a half.

Fourteen and a half years have now passed since the adoption of the system, and during this time cheap coal has had a large share in the advancement of the manufacturing interests of the state. Besides Chicago, with its more than $900,000,000 invested in manufactures, there are in Illinois no less than 30 cities where the manufactures range in value from between one and two to sixty million dollars, and these include almost everything that men can make from agricultural im-

plements to wire. The value of the manufactured products aggregate, as given in the last available report, $1,410,342,129.

Effect On Miners

In all mines in Illinois, where gas is found in dangerous quatities, and where shots of more than two pounds of powder are used, the law decrees that "shotfirers shall be employed by the company and at its expense," which would involve, $4 per day, an annual cost of about $500,000. The more intelligent miners recognize plainly that the expenditure for powder goes far to offset the higher price now paid for mining, 59c. a ton for hand mined, and 46c. for machine-mined coal, considering also the increased quantity of coal they are able to get out.

But the hours worked is as much an element of actual wage, with the miner, as the price received per ton. What with strikes and closed-down mines, the average number of days worked in 1909 was only 168, and in 1910, only 171. So much for figures; they tell much but do not make known all the conditions that the adoption of the gross-ton or run-of-mine system has developed.

The pledge made by the organization of miners in 1897, that their mining should be done in the former workmanlike manner that was possible when the coal was undercut and sheared by hand, and that the use of powder should not be inordinate, has been sadly broken. A premium has been put upon recklessness in mining. The man who used the most powder and took the greatest chances, made the most money, but produced the poorest coal; while the man who used skill in producing a larger and more marketable product and who strove to fulfill his pledge by using less powder, made less money.

This is fast bringing about a radical change in the character and class of miners employed. Experienced miners who were trained to use the pick, coming mostly from the collieries of Great Britain, and who were leaders in the movement of 1897, finding themselves now on the same financial footing or even worse than wholly untrained men from southern and southeastern Europe, a large majority of whom had never seen the inside of a mine before coming to this country, are rapidly disappearing from the state. They realize that at least one-third of the men who are nominally employed in and about the mines of the state are not miners, and should be classed as laborers. These men degrade the occupation; and good miners are making up their minds that they will be better off in every way if they find some other occupation, where better conditions prevail and work is steady.

Another serious development is the rapidly increasing loss of life and growing death rate, due largely to the excessive use of powder, especially where the practice of "shooting off the solid" prevails and where "blown out or windy shots" are liable to occur as a result of such proffligate use of powder. According to the 1910 Coal Report for Illinois, shooting off the solid is practiced in 57.7% of the mines. The number of men killed in 1910 was 406, including the victims at the Cherry mine.

Effect On Operators

Thus far, I have tried to show the effects of the gross-ton system upon the miners; but upon the operators they are certainly not less complex. In the first place, the quantity of slack coal produced is constantly increasing with the increased use of powder. There is not absolute agreement in the reports, in this regard, but some claim that in many of the mines in the central part of the coal field one-half of the coal mined is slack, which, of course, brings a low price and lowers the value of the total output. The profit operators make in selling powder to the miners does not compensate for the loss occasioned by the large percentage of screenings produced.

The principles of conservation are being violated in this waste. At a time when, at last, thinking people are alive to the duty of the preservation of natural resources, coal owners are forced to see much of their property sacrificed by the reckless methods of mining, which are legalized by special act and which, if continued, will lower the standard of mining and drive the better class of miners to seek employment elsewhere.

Again, heavy losses are sustained when, owing to explosion or other accident, or the overproduction of coal, or strikes, the mines are closed and the equipment injured or destroyed. New mines opened in 1902, when the long strike in the anthracite field afforded a new market to Illinois coal, have further complicated the situation for operators who were already in the field. I judge that many of the operators are ready to say that, if competition is the life of trade, competition may also prove to be its death.

But heavily as these burdens rest upon the operators, they feel most keenly and regret most deeply the loss of life and limb that overtakes the miners themselves and the sorrows and suffering that enter their homes, by reason of the oft-recurring accidents. However easy it may be to prove that injury or death was due to the carelessness or ignorance of the men themselves, operators are not blind to the fact that, under the circumstances, a measure of responsibility, large or small, and moral if not financial, falls upon them and compels them to do all in their power to insure the health and safety of the men.

Though legislation has slightly alleviated the situation in its attempt to control the use of powder by the shot-firing act, I judge the general situation in the state is steadily growing more acute, and Illinois operators and miners must get together on a more sound basis of equalization than the system now in use. If the newly organized Federation of Coal Operators will stand firmly and effectively together, a wiser and better system of paying miners may be thought out and adopted, and brotherly feeling between operator and miner strengthened thereby. The organization will thus certainly accomplish a much-needed work.

Type of Steel Tipple Construction Common at Illinois Mines

Possible Power Economies

By Henry D. Jackson *

Advocates the use of unsalable coal for colliery purposes. Central power stations tend to keep the coal demanded down to the capacity of the waste pile.

In your foreword of Jan. 6, I note your reference to the complaint of the coal operators that prices are low and general conditions unsatisfactory, particularly as a result of the increase in wages, the increase in cost of timber and other materials and the low price received for the product.

As you state, these increases require that the operator do something to offset them or that he effect every economy possible in the operation of his plant. Under the conditions resulting from the vast number of coal operations which are being started up, the only cure is economy in the production of coal.

Possible Economies

Economy can be obtained in a number of ways:

1. Economy can be secured by an increase in the amount of coal cut by such cutters as are already installed. This can be effected by operating these cutters at their maximum productive speed at all times, thus increasing the amount of coal which is undermined by each cutter, with consequent decrease of the cutting cost. This result only can be secured in the case of electrically operated machines by maintaining full voltage at the cutters, which in turn can generally be made possible by the proper distribution of the transmission lines and the use of the required amount of copper.

2. Decreased cost can be secured by increasing the capacity of the haulage, that is to say by making each locomotive handle its full capacity of cars. This in turn can usually be secured by giving them full voltage at all times. Hence the need for a proper design of the feeder system.

3. A third method of decreasing the cost is by increasing the efficiency of the power plant. At the present time there are a large number of mines operating stations of low efficiency and transmitting their power over feeder lines which are highly inefficient. This results in the use of a considerable amount of coal per year, which might otherwise be sold.

Economies by use of Waste Coal

One method of decreasing the cost of power at the plants might be by using the waste pile. To be sure, under most conditions this pile is composed of impurities in addition to the coal, and these are hard on the grates and cause considerable trouble; yet since this coal is entirely a waste product, the chances are that with a proper adaptation of grates and a proper handling of the fuel, there might result a considerable saving for then all the coal of good quality could be shipped to market and only the waste pile used. A conservative estimate will show that the type of plant usually installed for a small operation uses not less than 6 lb. of coal for each kilowatt hour.

If we take such a plant demanding 200 kw. continuously, the coal used would be 1200 lb. per hour, or 12,000 lb. per day of ten hours. This would represent a total coal consumption of 3,300,000 lb. per year of 275 days. If this coal were sold at a price of 90c. a long ton, it would show a saving of $1,325.70. Owing, however, to the fact that waste coal would probably cost a little more for handling and that the repair of the grates would be a further disadvantage, we might allow a reduction in price of 20c. per ton to cover this expense, so that the net saving would be 70c. per ton. This would reduce the economy to $1,031.10 a year. This, while small, is an important saving in a plant of this size and would pay interest charges at 6% on an investment of $17,185.00.

The use of a large plant supplying power to a number of operations would also materially reduce the costs. The investment for a mine power plant of good construction with three substations using rotary converters and supplying current to three operations, would be practically the same as the investment for three independent operations of fair quality and the same capacity. The coal required by a central plant will probably be half that required by three equivalent units, owing to the fact that the engine in the central plant is larger and also of somewhat better type, than the engine of a disconnected unit and further to the fact that its location will permit it to be more economically handled. In developing the same power that would be represented by three independent plants, the coal per kilowatt hour would be in the neighborhood of 4 lb. This figure allows for all the line and transformer losses so that a consumption of 4 lb. of coal may be expected to result in one kilowatt hour delivered at the substation. The estimate is based upon the supposition that coal of fair quality is used in the generating station and that the engines are operated with condensers. If each substation demands 200 k.w. the total coal required for ten hours a day, 275 days in the year, would represent approximately 2946 long tons, or a saving of $2,062.20, if waste coal is used in place of that which would be shipped.

Economy of a Central Plant

If now, in addition to this, we assume that we have saved by the use of the large plant the difference between the coal which would be burned in three small plants and that which will be burned in a large plant, there will be an additional saving of 2 lb. per kilowatt hour or 1473 tons. At 70c. per ton this will save $1031.10. Substation operations do not require the whole time of the attendant as this work can in most cases be done by a day man whose general duties require him to remain at or near the location of the substation. Consequently no charge need be made for attendants. This will cause a further saving of approximately $2288 per year, represented by the difference in wages which would have to be paid for a fireman and engineer in each plant, and the compensation which will now be paid to but one engineer and two firemen in the one big plant. These savings, if capitalized, will represent the interest on $89,688.33.

In addition to this, there is always the possibility of an even greater saving resulting from the use of electrically driven fans conveniently located and operated by alternating current. This saving will be large in many cases, as the change in installation will do away with the use of steam driven fan engines with their attendant high initial and operating cost. The coal required to furnish steam for these fans is excessive, as the engines are rarely economical, and steam has to be transmitted long distances. The actual saving is difficult to estimate, but it will probably be equivalent to the shutting down of one mining operation of 200 k.w. capacity for each 100-hp. used by the fans representing a saving of approximately $1,000 per year if coal from the waste pile could be used in the place of coal which would be shipped. The saving in initial cost, and, therefore, in interest and depreciation charges would be great, because the fan could be located most advantageously with regard to the mine workings, and little or no attention paid to the necessity for getting power to it, as high tension wires can be run practically anywhere.

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The Engineer on Development Work

By C. P. Collins *

Some pertinent and helpful hints for the young engineer together with a few notes on the magnetic meridian not generally known and an original chart for computing the per cent. grade at any angle of dip. Also a few timely observations on the preliminary investigations for a proposed mine.

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The art of surveying, which treats of making such measurements as will determine the relative positions of any points of the earth's surface, is of doubtful origin. It is the outgrowth of the science of geometry, which is derived from the Greek word *geometria*, meaning the "measurement of land."

Some attribute the invention of the art to the Egyptians, and that it was first practically applied by them in their efforts to recover and fix the land marks annually swept away by the inundations of the River Nile. The builders of the pyramids must have had some knowledge of the science of geometry. A papyrus in the British museum written 1700 years, B. C. gives rules for calculating the area of triangles and circles. The work of Hero of Alexandria 285, B C. mentions mine surveying and the crude instruments used at that time.

The Greeks surpassed all ancient nations in their attainments in the science of mathematics. Euclid founded a school of mathematics at Alexandria in Egypt during the reign of Ptolemy, B. C. 323 to 284. His elements are still in use in many schools and colleges; in fact, all textbooks on geometry are built upon the foundation so firmly and systematically laid in that early day by Euclid.

The Subdivisons

The art of surveying is wide in scope and extends from the measuring of a farm to that of the heavens. The principal branches are:

(1) *Land surveying,* which treats of the application of the principles of geometry and trigonometry to the measurement of land.

(2) *Geodetic surveying,* which includes all the operations of surveying, taking into consideration the curvature of the earth's surface; it is employed by the Government in compiling their maps and charts. While we use plane trigonometry in land surveying we must employ spherical trigonometry in geodetic surveying.

(3) *Hydrographical surveying*, which includes the locating of coast lines, harbor lines and channels, and embraces all operations necessary to a complete determination of the contour of the bottom of a harbor or other body of water.

(4) *Railroad surveying,* which is a comprehensive term, embracing surveys intended to ascertain the best line of communication between two given points; it also includes all surveys for the construction of bridges, viaducts, tunnels, etc.

(5) *Topographical surveying,* embracing all the operations incidental to finding the contour of a portion of land and locating all the objects which are worthy of note, and which are represented on the topographical maps by a system of conventional signs.

(6) *Mine surveying,* which includes the location of all important improvements, outcrops of minerals, and the outside boundaries of the mining operations, together with a careful location of all underground workings, and the preparation of maps showing the relative location of all points in the mine with the outside features.

Leveling, or vertical surveying, consists in determining the difference of elevation between given points, whereas, the location of the position of these points is horizontal surveying. In horizontal surveying the principal instruments required are the transit, plane table and tape and where great accuracy is not required, the compass. In vertical surveying we use the Wye level. The aneroid barometer is a useful instrument to determine the relative difference in elevations and when properly used gives fair results.

Necessity of Adequate Maps

If an experienced mining man be asked the essentials for the successful operation of a coal mine he would, no doubt, include ample ventilation, good drainage and favorable grades.

The all important features then for the mining engineer to determine are the facts which shall enable him to so lay out the mine that the ventilation may be ample to dilute the gases arising from the coal and replace the vitiated atmosphere by good, wholesome air. He must also drive his headings so the water may be successfully and economically removed, effecting drainage by gravity whenever possible, and if pumping be required, to so arrange his system of drainage that the water may be brought by gravity to a central point, from whence it may be removed by pumping.

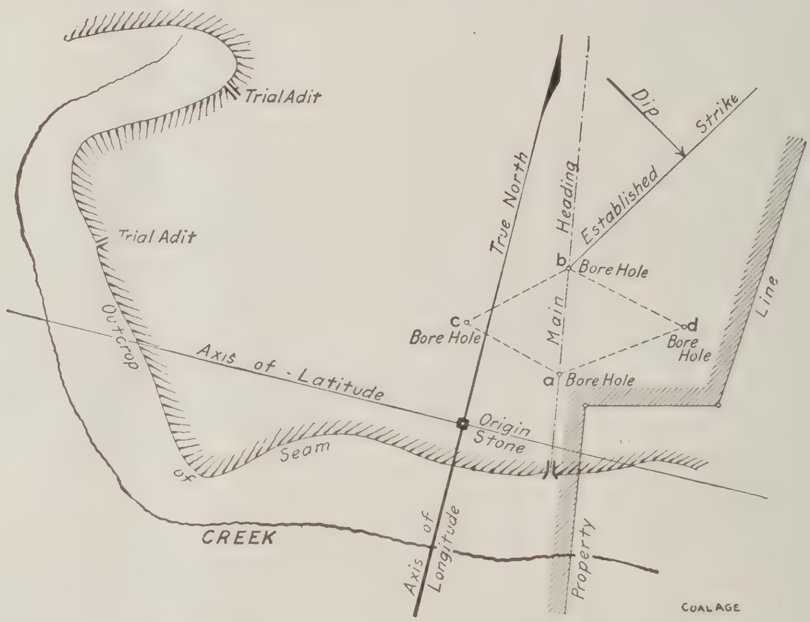

Fig. 1. Method of Prospecting a Virgin Field

Finally, and one of the most important features to bring the cost of output to a minimum, is a systematical plan of grades, that they do not exceed the limit for economical hauling of the coal from the workings to the tipple.

In order to effectually anticipate these requirements the engineer must, of course, make a careful survey of the field in question. Let us consider, for example, a virgin field of coal. The engineer must determine:

(1) The most feasible route for a railroad to enter the field.

(2) The extent and character of the coal to be won.

(3) The plane of the coal which will fix the line of strike and maximum dip of the seam.

(4) Whether the field be traversed by a synclinal or anticlinal axis.

Defining the terms just mentioned: The strike of a seam of coal is the line formed by the intersection of the seam with a horizontal plane, and is in Pennsylvania, Maryland and West Virginia, when normal conditions prevail, usually about North 30° East. The line of maximum dip is at right angles to the line of strike. The syncline corresponds to the valleys in the seam, and the anticlines to the ridges.

Establishing the Meridian

All surveys relating to the mining field proper, both inside and outside, should be carefully tied to a fixed base line. It has been my practice in all work of any importance, to carefully lay out a true

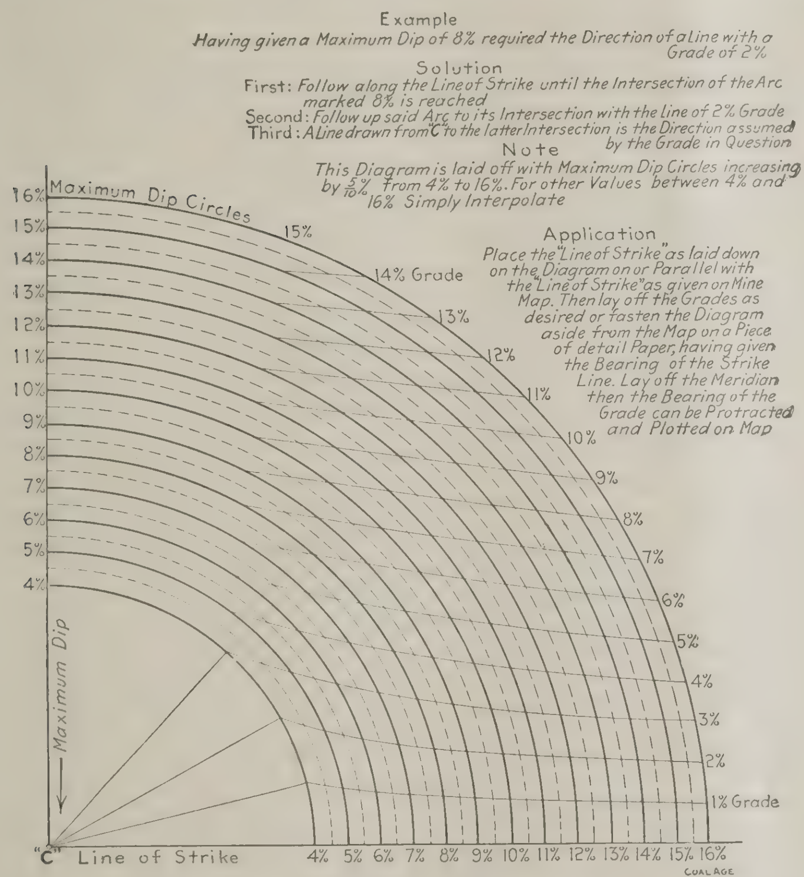

Fig. 2. Diagram for Computing the Grade at Any Angle to the Dip

meridian line from which to refer all future work.

The true meridian can easily be fixed by observations on the north star, known to astronomers as Polaris, which at certain intervals coincides exactly with the polar axis of the earth and is then said to be "on the meridian." *

It is slightly removed from the pole, and in our latitude corresponds to about 1½°. It appears to be gradually approaching the pole and from 1885 to 1906, a period of 21 years, its azimuth has decreased 0° 8′ 36″. Polaris can easily be found in the Northern heavens by first finding the well known circumpolar constellation, commonly known as the "Big Dipper," but to astronomers as Ursa Major or "Great Bear." It consists of 7 stars, as per Fig. 3, and the two outer stars of the bowl of the Dipper, known as the "Pointers," point very nearly to the North Star, thus assisting in finding it. The North Star is in the constellation Ursa Minor or "Little Bear," commonly called the "Little Dipper," and is the last star in the handle.

The Magnetic Meridian

The magnetic meridian, or the direction of the magnetic needle is constantly changing, and it may be of interest to say a few words concerning this strange phenomenon.

It appears to swing slowly like a gigantic pendulum. The most ancient observations are those taken in Paris: In the year 1541 the needle pointed 7° east of north; in 1580, the declination had increased to 11½° east, being its maximum; the needle then began to move westward, and in 1666, it had returned to the meridian; the declination then became west and continued to increase, till in 1814, it attained its maximum, being 22° 34′ west of north. It is now decreasing and in 1879 was 16° 56′ west.

Reviewing the experiments at Paris, we find the needle swung for a period of 39 years at the rate of about 7 minutes per year; it then began to swing backward towards the west, and in 86 years returned to the meridian, the movement being at the rate of a little over 8 minutes per year; it continued to swing to the west for 148 years at the rate of a little over 9 minutes per year when it again began to swing backward, the complete circle being covered in 234 years, at the rate of a little less than 8¾ minutes per year.

In this country the north end of the needle was moving eastward at the earliest recorded observation, and continued to do so until about the year 1815, when it began to swing westward and has ever since continued in that direction. Here, at Johnstown, the variations are at the present time about 4° 48′ west of north, and has been moving westward at the rate of about 3 minutes per year.

The needle also has a diurnal variation or daily change. In the northern hemisphere the south end moves westward from 8 a.m. to 1:30 p.m. over an arc of 5 to 15 minutes and then gradually returns to its former position. It crosses the mean magnetic meridian at 10:30 a.m. The diurnal variations change with the seasons, being greater in summer than in winter.

Through all places where the needle points to the true north, a line has been traced, called the "Line of No Variation." In the United States this line in 1900 passed a little east of Columbia, S. C., just west of Charlestown, W. Va., near Lansing, Mich., and enters the Dominion of Canada near the eastern shores of Lake Superior; this line is slowly moving westward. At all points East of this line the needle points west of north and at all points West of this line the needle points east of north. The cause of the movement of the magnetic needle is unknown, and because of the fluctuating value of the magnetic meridian it is of great importance to refer all our azimuths or angles to the true north.

The Zero of Co-ordinates

It is well to establish a good stone monument in close proximity to the mouth of the mine, calling this the zero of latitude and longitude for all future work. This stone is the origin or initial point of survey. At a convenient point and as far away as possible, another stone should be carefully set on the true meridian line; this stone is known as the "Sight Stone" for pointing the transit on the correct meridian.

Having thus established a good, reliable base, there is no excuse for inaccurate work and the position of all points

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*For a convenient graphic method of determining the true meridian by an observation on Polaris at any hour, the reader is referred to Coal Age, Vol. 1, p. 245.

must be determined by their mutual relationship with the original stone and meridian line. Thus the location of any point must be so many feet east or west of the established meridian, and so many feet north or south of the original stone. These notations are known as the coördinates of that point, and the point itself as the zero of coördinates.

It is of great importance that the engineer have on file in his office a book of coördinates for each mine under his care and have recorded therein a record of all property lines and other outside points of interest, also the mouth of the mine and all the important points in each and every heading in the mine itself. It is thus a simple calculation to determine the direction required for connecting certain points in the mine and in what direction a given heading must be driven to "just pass" a corner of an adjoining property, and not trespass thereon.

Prospecting and Drilling

Having thus established a reliable base line the outcrop can be located, and at favorable places small drifts driven into the coal far enough to disclose the seam in its natural bed. Levels are then taken at each of these points and from these data we calculate the plane of the coal. Having obtained in this way an approximate idea as to the general character of the coal seam, we lay out on a plotted map of the property, a proposed location for the entrance of the mine and also the direction of the main heading. This is known as the preliminary location.

Our next step then will be to prove whether or not our results obtained from the outcrop conditions, hold good in the body of the field, and also if the coal still retains a workable thickness. To obtain this very necessary information, the engineer should obtain the services of an honest and careful driller to put down such holes as he may direct.

The only proper drill for the work is the diamond drill of, at least, 2¼ in. core, and great care should be exercised that the driller sinks all holes in a truly vertical line, which can be done if he carefully levels up the machine before starting. The necessity of this is self-evident.*

The holes are usually put down on the line of the proposed main heading and one on each side of the main heading, as shown in Fig. 1.

Computing the Dip and Strike

We will then have two sets of triangles, *abc* and *abd* from which to calculate the plane of the coal. The first hole on the line of the proposed main heading should be at least 1500 ft. from the pit mouth and the sides of the triangles *abc* and *abd* should be about 1500 ft. in length.

After these holes are finished, they should be carefully cased to the rock and plugged with a white pine plug, the center of each being fixed by a tack. Each hole will then be carefully located in respect to the origin stone already mentioned, and they will serve as excellent checks for further underground surveys. Levels are also carefully taken on the tops of these plugs, and having given the depth of the holes, we can easily obtain the level of the seam below.

Four holes is the least number that can be put down to effectually test the body of the field; another set of triangles would, if the field be large, greatly decrease the liability of error in making future projections for the underground workings. If the results of the drilling are favorable, as to the physical and chemical qualities of the coal, and if they show the seam to be of a workable thickness, the engineer can then make his

Fig. 3. Northern Polar Constellation

final location and do it with the feeling that he has not opened the mine in the wrong place. The line of strike and maximum dip having now been determined, it is an easy matter to project the headings on feasible grades. The grade diagram shown in Fig. 2, I have used to good advantage in this work.

No matter how favorable a seam of coal may appear at the outcrop, it is a part of wisdom to resort to drilling and thus test the body of the field from which the good coal must be won. I have known many instances where the coal appeared to be in excellent condition at the outcrop, and utterly failed as a mining proposition; but this was only found out after thousands of dollars had been spent in installing a modern plant. How many times one hears it said: "Why, that mine is opened in the wrong place."

Results of Insufficient Engineering

The mine has been started; they find now by actual working what should have been pointed out to them by a competent engineeer. They try to drive a heading in this direction and find it is going to the dip; they turn, and it is too flat; they turn again and it is too heavy a grade, and soon have a mine which is simply a hole in the ground, utterly devoid of any system whatever.

Now they find they are not able to keep up the output, and tne superintendent gets a letter from the New York office which makes his ears sing. The mine was located near an anticlinal axis, the main heading is beginning to rise at an abnormal grade, the coal begins to show signs of breaks and faults, and soon begins to descend into another basin, all of which is found out when contracts are to be filled and coal at a top notch price.

Yes, this is a familiar picture to all who are concerned with mining. There is no necessity for guessing; this method of trying to drive this way and that to obtain favorable grades is wholly uncalled for; mining is becoming more and more each day a scientific study, and will continue so until in the near future as much care will be exercised in the location of a mine as is now paid to the location of a railroad, and as much stress will be put on their proper layout as that of a town, which shall one day develop into a large city.

A mine is, in fact, an *underground town*, where ventilation, drainage and feasible grades are the universal requirements for future success, all of which depends so much upon the consideration and accurate preliminary work of the Mining Engineer.

Mine Car Lubrication

Perfect lubrication contributes enormously to the reduction of expense for wear and tear on any machine, but it would seem that its benefits in connection with mine-car equipment have never been fully realized or even approximately attained. The lubrication of mine-car wheels is a subject that, apparently, has not been given the serious thought and consideration that it deserves on the part of car-wheel manufacturers or mine operators.

Probably the most widely used form of wheel for mine service is that known as the cavity type. This is an ingenious device, but one which has never satisfactorily proved its value on account of the great number of poor lubricants that are easily available and generally used. Oil, of one kind or another, is usually supplied to these wheels, but, as a matter of fact, oil is not a properly constituted lubricant for this class of work. While the cavity mine-car wheel may have originally been designed for the use of oil, the idea has never worked as satisfactorily in practice as in theory. There is, as a rule, too much clearance and lost motion between the axle, wheel and other parts, to secure an economical use of oil.

It is probably no exaggeration to say that at least 50 times more oil is wasted than is actually consumed in mine-car service, so that under these conditions a

*For additional notes on prospecting with drills, the reader is referred to "The Lignite Fields of Colorado" in Coal Age, Vol. 1, p. 535. The irregular character of the Cretaceous coals of the West has probably made the Western engineer more efficient in this respect than his Eastern brethren.—Editor.

high-grade oil develops no greater economy than a cheap oil, and its fluidity causes it to waste away quite as freely, irrespective of its lubricating value. It would therefore seem that the user derives as much benefit from the cheapest grade of black oil as from the better and more expensive varieties.

Requirements for a Lubricant

A heavy grease is, perhaps, even more inappropriate than a thin oil for use in the cavity-type mine-car wheels, on account of its solidity. The axle receives its supply of lubrication through a slot or opening, which leads from the reservoir cavity in the hub of the wheel. The lubricant should be of a proper consistency to leak through these openings when the car is at rest, but if it is too fluid and does not possess the proper body or viscosity, it will work out rapidly when the wheel is in motion, leaving the axle and wheel dry, and subject to friction that increases in proportion to the load on the car.

With these conditions in mind, the Keystone Lubricating Co., of Philadelphia, has developed a lubricant which is especially adapted for use in mine-car wheels of the cavity type, although it can also be used satisfactorily in other forms of wheels, such as those fitted with roller bearings, etc. This material is known as No. 119 mine-car grease, and is said to possess the exact semi-fluid consistency, or viscosity, necessary to feed properly through the small opening from the reservoir cavity of the wheel to the axle, when the cars are at rest.

The grease is not soluble in water, and it is claimed that a metal surface coated with this material is rendered immune from the chemical attack of even the strongest mine water. The lubricant is in itself neither alkaline nor acid, and consequently has no harmful action on the metal which it coats.

Plugs for Oil Cavities

Many makes of mine wheels are not equipped with plugs in the feed holes leading to their oil cavities, but to obtain economical service with the Keystone compound it is imperative that the wheels should be tapped and plugged before the lubricant is applied, as it cannot be expected to give satisfactory service if afforded so easy an opportunity of wasting. It has frequently been considered unnecessary or undesirable to tap and plug these holes when oil was employed, because the bother of unscrewing and replacing the plugs recurred too frequently to warrant the effort for economy. But when it is necessary to apply the lubricant only at periods of from three to six months apart, the labor and time lost in connection with handling the plugs becomes inconsiderable.

Tests of Lubricant

This lubricant has been subjected to tests in the laboratories of the William Cramp & Sons Ship & Engine Building Co., of Philadelphia, under the direction of M. H. Schwenk, engineer of tests, and also in the laboratories of Cornell University, under the direction of Prof. R. C. Carpenter, and in every instance is reported to have developed a lower frictional resistance than any of the other lubricants tested in comparison.

One of the chief merits claimed for this material is the fact that its consistency does not change under extreme conditions of heat and cold. During January of this year, the unusually cold weather which prevailed throughout the country afforded a severe test for this quality of the grease. At Hazleton, Penn., and at Danville, Ill., the temperature frequently reached as low as 15 to 20 deg. below zero. This lubricant was in use at both the towns mentioned, and is said to have developed the same lubricating efficiency at these temperatures as it did when more moderate weather prevailed.

The Blakely Manufacturing Co., of Duquoin, Ill., reports having made a test on No. 119 grease, the details of which are as follows: On Jan. 2, 1912, they placed 2½ lb. of the lubricant in one of their 16-in. car wheels, weighing 100 lb., mounted it on an axle, and connected it, by means of a belt, to a line shaft. From Jan. 3 to 31, the wheel ran 212½ hours at 120 r.p.m., which is equivalent to traveling a total distance of 1213.47 miles on a track. The wheel had a 2⅛-in. diam. bore.

On Jan. 31, the wheel was removed from the shaft, cleaned of surplus grease, and was found to weigh ½ lb. less than when started on the test. This ½ lb. of grease had in part been lost along the axle, and also represented that which dripped from the oil holes while the wheel was standing or running. No attention was paid to the position in which the oil holes happened to be when the wheel came to rest, and it was allowed to remain just as it stopped. With the exception of several days, during which it was run for 5 hours only, the wheel ran 9½ hours each day. It was run continuously for 5¼ hours every morning, and for 4¼ hours every afternoon.

The British Coal Fields

Special Correspondence

At the present time when labor problems in the British coal trade are so much in evidence, the accompanying chart of the coal fields of England, with the accompanying statistics, are of interest.

Map of English Coal Fields, Showing Railroad Connections to London

District	Annual Output	No. of Miners	Miles to London
Scotland	41,500,000	55,000	380
Northumberland	12,600,000	46,000	275
Durham	39,400,000	128,000	245
Cumberland.	2,175,000	7,000	310
North Wales	3,500,000	11,200	185
Lancashire..	23,750,000	57,000	198
Yorkshire...	38,500,000	93,500	175
Derbyshire..	7,250,000	47,000	130
Nottingham.	13,850,000	37,000	...
Staffordshire	14,000,000	29,000	146
Worcester ..	6,000,000	11,000	115
South Wales ...	48,750,000	120,000	180
Gloucester & Somerset .	1,500,000	7,600	120

The estimated coal resources of the British Isles have been proved at 100,000,000,000 tons. The average annual world's production is 1,070,000,000 tons, of which the United Kingdom's proportion is 263,000,000 tons, and of this total 84,500,000 tons were exported.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Ignition of Gas by Roof Falls

Joseph G. S. Hudson, mining engineer of the Mines Branch of the Canadian Department of Mines, gives an interesting account of two Bellevue explosions which occurred on Oct. 31 and Dec. 9, 1910, this account forming a part of his report to the Minister of Mines.

"The Bellevue mine is one of three mines operated by the West Canadian Collieries Co., Ltd., and is situated near Hillcrest Station, Alberta, on the main line of the Crows Nest Pass division of the Canadian Pacific Ry., and is in close proximity to the divisional line between the provinces of Alberta and British Columbia.

Explosion in Idle Mine

"On Oct. 31, 1910, the Bellevue mine was shut down for the observance of Thanksgiving Day, and in consequence there were no men working in the mine. Some men were engaged in erecting a power-transmission line over the surface of the ground, immediately above the underground workings, and they were much surprised to see a cloud of dust and débris issuing with considerable force from the mouth of the chutes into the open air. On an investigation being made by the mine officials it was found that the explosion doors of the ventilating fan had been blown open, and at the surface openings débris was thrown all around.

"Knowing that no men or lights (even safety lamps) were at that time in the mine, it seemed hard to explain why a mine explosion had taken place, and considerable anxiety was felt as to the probabilities of a second like disaster following the first. After the damage of the first explosion had been remedied and the ventilation restored by a renewal of the air stoppings, etc., the mine resumed work."

Mine Explodes Again

On Dec. 9, 1910, a like occurrence took place, but in this case, unfortunately, men were working in the mine. Evidently it was an explosion, or culminated in an explosion, and was not merely a roof fall because men were burned quite severely.

The second jury called in the case declared that thirteen men came to their deaths by carbon-monoxide poison, and one by the combined effect of that gas and the fracturing of his skull, the said gas and fall of roof being caused by the caving of the rock over coal chutes 76 to 78 within the mine.

However, the mine was a gaseous one, and a cave of the roof may not have been the cause, or contributing cause, as it probably was in the mysterious disaster of Thanksgiving Day of the same year. Yet Mr. Hudson remarks in his report that the explosion appeared to have started at a point where no men were working. "All the men who were in the working faces gave evidence that the explosion came from the older section of the workings, the force of the explosion being concentrated in the district from chutes 50 to 80."

Roof Falls Given as Cause

Mr. Hudson further remarks: "One important point which did not come out in the evidence is that a stratum of rock situated in the roof immediately over the coal is composed of a coarse-grained sandstone highly impregnated with iron, so that when two small pieces are struck together vivid sparks are emitted. It is affirmed that matches, pipes and tobacco were found on one of the bodies recovered from between chutes 53 and 54, but this allegation was by common consent declared to have no bearing on the explosion.

The theory that I would suggest as being the probable cause of the disaster is as follows: It is known that a large body of rock fell from the roof in the vicinity of chutes 70 to 80. The rubbing and grinding of the rocks as they fell, emitted sparks at a high temperature. The heat generated by the friction and the concussion of the rock raised the temperature of the air and gas to a high point, so that it would require only a spark of comparatively low thermal intensity to reach the ignition point of a small volume of hot explosive gas. That the defective state of ventilation in the old workings was favorable to explosive conditions was manifest; for the air passed only by leakage through the board stoppings on the main gangway, and not by a direct current. Hence the air was in a sluggish condition, and consequently when the explosion occurred, a large volume of carbon-monoxide gas would be formed without much demonstration of explosive force. Mr. Brownrigg, one of the fire-bosses, informs me that where a piece of roof falls on the wrought-iron sheets in the chutes, a continuous streak of vivid sparks can be seen, and also that when a chute is abandoned, the sheet iron is left in place."

Similar Mysterious Explosions

It is probable that the causes given by Mr. Hudson are indeed correct. The fact that none of the men were killed by the violence of the explosion almost proves conclusively that they did not cause it by an ill-placed or windy shot, or by tampering with a safety lamp. The Adrian explosion of Nov. 9, 1911, started apparently where no men were working. Another explosion occurred at the same workings many years before, also when the mine was idle. No men were found in the mine when it was searched, nor was it discovered that any men were missing. At Maindy colliery in the Rhondda Valley of Wales, a violent explosion occurred when the mine was idle, the fact not being known until the next day. A disused heading in the Pentre working of the same valley was the scene of an explosion when no one was in that section of the mine. Thus it is no new thing for explosions to take place without human agency.

Chemical Changes in Coal Formation

The following article is abstracted from remarks made by Vivian B. Lewis in a recent series of addresses before the Royal Society of Arts, England. The lectures bear a common title "The Carbonization of Coal."

The chemical theories which have been brought forward to explain the present chemical condition of coal nearly all start with the assumption that the original material from which the coal has been formed is $n(C_6H_{10}O_5)$. This empirical formula represents the class of bodies known as "Celluloses." The ratios of the atoms in these bodies lend themselves to an easy explanation of the formation of various kinds of coal. Different proportions of the known gaseous products of the checked decay which take place during the formation of peat, lignite and coal, i.e., methane (CH_4), carbon dioxide (CO_2) and also water (H_2O), are subtracted plausibly enough from the originating substance.

Oxygenation vs. Dehydration

Some theorists have held that the infiltration of water holding oxygen in solution caused reactions by which these compounds were evolved. Thus the carbon was concentrated in the carbonaceous material. Others have looked upon the reactions taking place in the original cel-

'lulose as one of dehydration. Both are probably right in some degree. The conditions under which coal has been formed are so various that cases could be found to support either theory.

Moreover such theories are rendered invalid by the fundamental errors of supposing that nature is dealing with purified cellulose, and that the various coals are definite compounds that can be represented empirically by a formula.

Our only knowledge of the coal plants is derived from their fossilised remains. Owing to the complete nature of the destruction that has taken place in structure the evidence to be obtained is small indeed. While of a totally different and far more simple form than is ours today, it must be true that the plant life of the carboniferous period which gave rise to our coal deposits varied as much in character as does the sphagnum of a peat bog from the timber of a forest.

Chemical Differences Due to Origin and Geologic History

Although the vegetable fibers of all forms produced by plants contain cellulose, they also contain ligno-cellulose and other allied compounds. Moreover they vary in the extractive matter of their sap to a very great extent. Even if we suppose that they all underwent the same treatment as regards time, temperature and pressure during their conversion into coal, we should expect wide differences in composition in the coal formed. Furthermore as the conditions vary even more than the material dealt with, it is small wonder that great differences are found between the coals from every bed in a colliery, and even between different parts of the same bed.

It is impossible to give accurate explanations of changes taking place under conditions of which we know only the general trend, and occurring in material, the composition of which is of the most variable character. We are met by the further difficulty that when we have the completed coal itself, its refractory behavior toward solvents and any ordinary reagents prevents our learning much more about its constitution than can be given by an ultimate analysis giving its percentage composition, or a proximate analysis showing the effect which heat has on it in causing it to yield fixed carbon, volatile matter, ash and moisture.

It is clear that in our present state of knowledge all that is possible is a generalization based upon the known facts. The truth or error of the theory will be shown by its degree of accordance with the results obtained by destructive distillation.

Twenty years ago I came to the conclusion that the most satisfactory view to take of the composition of coal was that it consisted of an agglomerate of the solid degradation products of vegetable decay, together with such of the original bodies as had resisted to a greater extent the actions to which it had been subjected. All my recent experience of the carbonization of wood, peat and coal confirms me in the opinion that this is in the main correct.

Resinous Bodies

All the plants of which we have fossilized record in our coal measures consisted of sedges and reeds, tree ferns, club mosses or lycopodia, and trees akin to the pine. In those prehistoric days, however, the conditions of growth—warmth, moisture and carbon dioxide—were such that these plants grew with a succulent freedom and rapidity unknown in latter days. These conditions rendered their tissue an easy prey to decay and fermentation, actions which left only the more resistant unchanged. The work of Morris, Carruthers, Fleming and Huxley has shown us that the bituminous matter in coal is largely derived from the spores of fossil mosses akin to the lycopodia.

If we take the club mosses of today we find that their spores give us that body known as lycopodium, a substance so resinous in its nature that it resists the action of water and is used to coat pills, while the same resinous characteristics render it so inflammable that a little blown through a flame provides the theatrical world with its artificial lightning. Spores of this character from the giant growths of the carboniferous period, together with the more resinous portion of plants akin to the pine, are the substances which have resisted the actions taking place during the ages which have elapsed during the formation of coal.

Mineral Compounds Inert to Carbonaceous

Of all the multitude of changes taking place in the formation of coal we only know about those involving the constituent elements—carbon, hydrogen and oxygen, but it is improbable that the mineral bodies in the sap and fiber of the original vegetation play any important part in the actions which brought about the change. For the reduction of sulphates to sulphides, and the combination of the sulphur with iron from the surrounding soil to form pyrites and organic compounds containing sulphur, and the deposition in the mass of other water-carried salts, all tend to the production of the ash of the coal, and do not interfere with the carbonaceous material in its main changes.

In the same way nitrogen compounds, which are found in every fuel of vegetable origin, are present in all stages of the formation from peat to coal. Yet it is impossible to suppose that they play any part in the change. Water, although it is probably an active factor and also a product in the decompositions, cannot be taken into account in tracing the actual course of the changes from analyses of the body produced.

Soluble and Insoluble Bodies

Starting with the fiber of the original plants we find two well defined bodies—cellulose, as represented by cotton fiber, and lignose, as represented by jute fiber. In the former the percentage of carbon is 44, in the latter 47, each giving distinctive reactions with dilute acids at 70° C., with aniline sulphate, with the Schultze solution, and with mixtures of sulphuric and nitric acids. In the cellular tissue we find starch, and besides these bodies there are present the extractive and mineral matters of the sap. The extractive bodies are those which can be dissolved out of the coal without change in composition.

Among the extractive matters we find gums, such as those which exude from the acacia and cherry. But these are also present in the juice of many plants. Mucilage, vegetable jelly, which gives many juices their power of gelatinising, resins, essential oils and other well defined bodies can all be extracted from coal by solution. In some forms of vegetation the essential oils undergo oxidation and form resins, and these being more resistant to change accumulate in masses of decaying vegetable matter, so that large quantities of them are found in lignite beds in a fossilized but little changed state.

The changes in the carbohydrates and extractive matters depend largely upon the conditions of decay. Given moisture and air, they become converted into carbon dioxide and water; check the decay by cutting off free access of air, the action is slowed down and the gases evolved are carbon dioxide and methane.

High Voltage

It will not be long before it will become necessary for our collieries to produce electricity at the mines for transmission to the various points where power is used, thereby saving the expense incurred in lengthy railroad haulage. The *Génie Civile* states that a primary tension of 100,000 volts, while exceptional, is already utilized in regular practice in several installations of the United States and of Canada,. notably that of the Ontario Power Co. Such voltage has just made its appearance in Germany at the installation of the Metallurgic Society of Lauchhammer. This company possesses some power stations in Saxony and Prussia. A central station has been erected generating 20,000 kilowatts. This station is located at Lauchhammer near the coal mines there. It includes 12 water tube boilers, 4 turbo-alternators of 5000 kw. apiece, from which the current at 5000 volts is transformed to between 100,000 and 110,000 volts for the main transmission lines.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

To metal miners the word "conglomerate" means a heterogeneous mass composed of fragments of preëxistent rocks. In coal-mining parlance, this same word means R. A. Quin, general manager of the Susquehanna Coal Co., Mineral Railroad and Mining Co., Summit Branch Mining Co., Lytle Coal Co., Lykens Water Co., etc. In brief, Mr. Quin is one of the cornerstones of the Pennsylvania Railroad Company's extensive coal holdings in the anthracite field. Hewed out in the quarry of experience by such pioneers as Morris Williams, he has proved a reliable support to the structure built by those who fashioned and placed him.

Oh, yes! you want to know what all this has got to do with the term "conglomerate"? Well, when a fellow's name and nature are Irish, and he has a German father, and Welsh mother, in addition to having been born in Pottsville, Penn., that's crowding a sufficient number of diverse things into one coherent mass to justify Noah Webster's idea that the net result is a "conglomerate."

And speaking of Pottsville, reminds me of one thing. It's just as necessary to graduate from the Pottsville High School to become a manager of a big anthracite coal company as it is essential to be born in Ireland before you can get a job on the New York police force. Besides Quin, there are Huber, Zerbey, Baird Snyder, and a lot of other six-cylinder, high-powered humans whose names illumine the honor roll at the P. H. S. In fact, I am not sure but that Richards, chief executive driver for the Reading Company, slipped over from Minersville, only four miles away, read his second primer and partook of that feast of knowledge supplied by the Pottsville teachers.

Most men have hobbies and Mr. Quin is no exception to the rule. When he isn't working on some scheme to increase output and decrease costs, you can safely figure that he's telling a new story or listening to the recital of a rejuvenated joke. When asked a question to which he doesn't care to give a direct reply, it's two to one he'll say, "Well now, I'll tell you. You know the story of ———," and when the tale is ended, you're fairly sure to have the answer to your query.

Starting as an office boy for the Pottsville Iron and Steel Company, Mr. Quin on his 18th birthday attached himself to the Lehigh Valley engineering corps at Lost Creek, Penn. This job held him four and a half years, when he changed

to a position in Reading, on the city engineering corps, under the direction of Harvey Tyson. His stay in Reading was limited to five months, after which he returned to Lost Creek and was assistant bookkeeper in the company store for six months.

His next position was on the Penn. Geol. Survey under William Griffith and Frank Hill. This job held him in Scranton for more than a year, when he was transferred to Pottsville on the same class of work. Concluding his employment on the State Survey, Mr. Quin identified himself with A. B. Cochrane and Son, civil and mining engineers in Pottsville, and remained with this firm for nine years.

On Jan. 1, 1898, the Shipman Koal Co., Shamokin, Penn., needed a superintendent, and Mr. Quin was selected to fill the place. While serving the Shipman people, he sunk the shaft at Shamokin that is still in daily operation. At the end of fifteen months, "R. A." was made superintendent of the William Penn colliery of the Susquehanna company at Shaft, Penn., and his rise to the general managership of this same company was rapidly effected.

Mr. Quin isn't just the sort of man who can look at a four-column row of figures, wet his pencil and write the sum total. Such genius generally can be hired for the salary of a second-class clerk. Mine managers of the Quin type have talents that consist more in a capacity to labor intensely, than in any marvelous ability as mental acrobats.

Mr. Quin's success in the management of companies producing 4,000,000 tons and employing 12,000 men may be attributed principally to his personality—his marked skill in developing teamwork. Loyalty is his maxim, and duty with him is a principle, not a sentiment. He teaches that "communion is strength, solitude weakness," and believes the evolution of coöperation is in direct proportion to the evolution of civilization.

There is no doubt but that Mr. Quin's unassumed modesty has heightened other qualities in the man. His is a true virtue entirely compatible with a proper estimate of self-worth, and not demanding the denial of merit. He meets his subordinates on an equal, but dignified plane, encouraging them in the belief that we differ only in virtues, not birth. He asserts, however, that the man who thinks himself inferior to his fellows, deserves to be, and generally is.

R. A. Quinn has the enviable faculty of seeing the happy side of things, no matter what the outlook. His philosophy embodies the belief that, "in pain, we should recognize the effort to restore health, and that trials are merely matters of correction and discipline." According to his idea, every optimist is an asset to the race; every pessimist a dead loss.

Early recognizing that all effort based upon motives which are not just will ultimately fail, Mr. Quin has so shaped the policy of his company as to secure the faith and confidence of his employees. As an example of his practical philanthropy, he long ago suggested to the men that instead of all the miners at a colliery staying idle to attend the funeral of a fellow workman, they should appoint a committee to be present at the funeral, while the others work as usual and donate a portion of the day's earnings to the widow. When this is done, the company also makes a substantial contribution, takes charge of the total amount that is created, does not ask for rent if the widow lives in a company house, and apportions out the fund to her as she needs the money. This practice is heartily approved by the company's employees.

It is also noteworthy that the Susquehanna Coal Company under Mr. Quin's management has developed a system of "first-aid to the injured" that is a model plan worthy of imitation. All of his collieries have stations equipped with complete sets of rescue apparatus.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

The British Strike

The strike in Great Britain naturally arouses more than ordinary interest in the United States, because of the hope it holds out to us of securing a market for coal, because of the indication it gives of the possible trend of events in the American coal labor market, and because it affords such a clear indication of the terribly disastrous results which must follow a complete withdrawal of coal from any market.

We do not believe that the strike will last long, because we are convinced that Great Britain is not ready to face disaster, bankruptcy and starvation. Something will be done to remove the deadlock. It may not be a just solution. It may well be a solution as economically unsound as are other English decisions of recent date. But the British public cannot permit the idleness and grinding poverty which will descend on the millions who will be thrown out of work as a result of the strike, cannot endure long the frequent conflicts which must ensue between the police and soldiers and the starving people.

Strikes in England are often of long duration; one readily recalls the strike among the quarrymen in the Penrhyn slate quarry and those of the stevedores and lighters at many of the ports. More extensive strikes are usually shorter, and those which touch the vital interests of the British people last scarcely over night. One recalls how speedily the recent strike of railroad hands collapsed. Yet this strike did by no means paralyze England as completely as does the coal-mining suspension of today. The sea was still open for transit and much of England's business is sea-borne. It was the fear of invasion which stilled that strike and it may have a similar effect on the coal controversy.

The strength of the present revolutionary "Government" of Great Britain, we use the word in the British sense, is not considerable. In fact, the Unionist party, which opposes Home Rule for Ireland, is the strongest party in that branch of parliament which has control. The "Government" has the support of the Laborites, Parnellites and Anti-Parnellites, and these three smaller parties give the government its whole majority, enough to enable it to pass any bill which satisfies at once the Laborites and Anti-Parnellites, and they are usually at peace with themselves and the "Government."

Parliament is now sitting. It has no constitutional restrictions but its own autocratic will. The upper chamber might be expected to curb the lower. While this chamber would like to do so, it does not feel it safe after the recent conflict. So full power is invested in the present ministry and its following in the "House" to do just as it will.

The temper of Mr. Asquith and his associates forbids us to think that they would hesitate at any price to promote peace. His associates believe firmly in alleviating the conditions of the working classes by perpetual contributions from the National purse. Seeking only the more obvious remedies, they have no sure hold on basal economic truths, and have little fear of the risk of making the working classes paupers on the state bounty. Mr. Asquith's assertion that it will be the duty of the Ministry to introduce and force the passage of a "minimum wage" bill, has not developed the situation at all. His line of reasoning could have been readily forecasted.

We may look for drastic measures therefore, which will have the concurrence of the richer people. The rich will begrudgingly prefer any measure to anarchy, and anarchy seems very near at hand as a result of the economic heresies now freely circulating in England.

"Restriction of output is going to put everyone to work," "the English capitalist must be content with 3 per cent. on his money," "a man must be paid a living wage whether he earns it or not," these are a few of the suggestions which are agitating the people and controlling the government of a country which in the past produced economists like Adam Smith, Malthus, Ricardo and Marshall.

Mere sentiment and opportunist palliatives have replaced reasoning.

The operators of South Wales oppose a settlement. They argue that they have an arrangement with their men which has yet some time to run. The men, however, desire to strike. Only 15.1 per cent. believe that in the long contest last year enough and more than enough suffering was endured.

About 60 per cent. of the English operators, it is said, are willing to treat for a minimum wage. This wage is not so likely to be unfair in the British Isles as it would be in the United States, because owing to the prevalence of longwall workings, closer surveillance is possible than could be attempted with room-and-pillar methods.

It must be conceded also that the miner of Great Britain, though not putting out a tonnage in any way comparable with that of the miner in the United States, is subject to a severe restriction in his activity due to the high temperature of the mines being combined with maximum humidity. It is well known that such conditions are enfeebling to the body and enervating to the mind.

But everyone knows that on his own soil, partly by reason of the prevalent dampness, and partly as a result of ill considered trades unionism, the British workman will not do all that his strength and health will permit. It does not matter why he fails to do a fair stint of work; the fact is just as clear that he needs the energizing impulse of a piece-work price, in any event, and not less so when in an "abnormal place" where clays, binders, faults, pitches and dips prevail. It is to be hoped that the minimum wage will not be forced on the operators of Great Britain by act of Parliament. It is an economic blunder of an extremely grave kind, and will be thrust on an industry where conditions are sufficiently simple and normal that a piece-work price can best be applied, and where competition of a severe kind confronts the operator in every over-sea market.

This competition to which reference is made can never come from the United States as far as European trade is concerned. So long as these states continue to be large producers of grain and iron, it is assured that whether the ships on which our products cross the seas are ours or the property of others, there will be no space left in the holds for coal so long as more valuable freightages can be secured. We may gain a hold during a foreign strike, but the difficulty over, our coal must find its market on this continent. It will be a sorry day when our coal goes regularly across the Atlantic. In that day the United States will be so peopled that it will no longer export grain, and almost all hope of future expansion will be gone. Coal is not and, for many years, will not be the natural outgoing freight of self-sufficient and exporting nations. While coal sells at its present low price in most of the world's markets, its shipment will continue to be either for short distances or as ballast.

The Mines and the Schools

We have often wondered that mining is not being taught in our public schools. Many mining towns are solely inhabited by people whose entire support is derived directly or indirectly from the mining of coal. There is no training which will so well fit the children of such parents as one which will pertain to the mining work going on around them. No teaching will, in like degree, attract the interest of the scholar; no lessons can so effectually aid the truant officers as those which will cast a foregleam of the conditions under which the future work of the boys will be conducted.

Owing to the absence in colliery villages of any scholars but those whose male relations are engaged in mining, it will not be necessary to instruct those whose interests are in some other trade, agriculture for instance, in the practice of a trade for which they will have no use.

We are met by the time-honored objection which we have so often heard, that there are too many studies in the schools of today; the children have no time to become proficient in them all. Perhaps this is true. It is most certainly an indubitable fact that they do not become as proficient as we have a right to expect. But, for the sake of so valuable a course of instruction, why not pass up analysis, which never made a correct writer, or civics, a record of the fleeting political expediencies of men, or much of the history which is only learned to be forgotten. Compared with vocational teaching, all other teaching seems foolish. An adjective voices the conclusions of the centuries. Such a vocational training has been dubbed suggestively by our forebears as *academic;* mere mental gymnastics; it has nothing to do with the stern realities of life.

Some have said that there is nothing humanizing or broadening in a vocational training. We are not referring to those who have made a frantic appeal for Greek and Latin roots as the only pabulum for children, but to those who feel the urgent need for imparting ethical training and who believe that it is imparted most effectually by history, geography, physiology and literature. We hold with them that the training which is purely mental is not sufficient for the developing child and the coming citizen. But is not a vocational "reader" a fit place for moral lessons? It could be filled with tales of heroism, replete with stories of manly forethought. The complete modern vocational training teaches not only how work is done, but how to protect and help the worker. First aid and rescue work are more morally uplifting than a knowledge of the bones in the human anatomy or of the number of counties in the State of Pennsylvania. The child in his imaginative years will conjure up all sorts of visions of the salvage work he will feel destined to do when he takes his place side by side with the veterans of the mines.

An objector takes the view that we are training the boys to be mere miners; we ought to make them lawyers, doctors, teachers or at least make farmers out of them. Those who thus argue should be requested to supply the market with coal without the employment of miners. If the boys of our colliery towns are to be urged not to enter the mines because they are dangerous, unhealthful, stunting places, these boys must be replaced by others or mining will cease. If it were not for the cost of coal when dug by such sentimentalists, we might wish that such had the digging of it.

But mining is healthful work, makes strong and independent men. It may be doubted if any man except the farmer is more free to come when he pleases, to work when he likes, or to leave when he wills. In the bituminous regions he is almost entirely unrestrained and it is noteworthy that the farmers in some sections are quite generally adopting this so called undesirable toil and are never to be weaned from it when once the choice is made.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

The Fireboss Question

I have read with much interest the article in COAL AGE, Nov. 18, page 190, entitled, "A Fireboss Suggestion;" and also the "Letter From A Working Fireboss," Dec. 2, page 254, and another "The Fireboss Problem," Dec. 16, page 321, from a fireboss of West Virginia. I am a fireboss in the Pittsburg district and have had a wide and varied experience while working in the employ of different operators in this part of the state. I must say that the letters of these firebosses are striking close to the mark. There is undoubtedly but one solution to the fireboss problem as it stands to-day, and that is to be found in government employment of all firebosses.

Today the fireboss is considered only a necessity thrust upon the operator by the mine law—something that he must have if he wishes to operate the mine, but for which he would otherwise have little or no use. Article 5, Section 3, of the bituminous mine law of Pennsylvania, 1911, will prove a big help to many firebosses whose duties are so prescribed as to make it impossible for him to perform the work of mine foreman or assistant mine foreman while making his second trip through the mine. The law, however, does not prohibit the mine foreman or assistant mine foreman from performing the work of the fireboss, which they have been known to do in some instances, on idle days when the mine is not working full time and only part of the men are in their places. On such occasions the fireboss, who is generally paid by the day, is laid off and his earnings much reduced, while his living expenses continue, and his work is given to the monthly men to perform.

Such are the conditions existing throughout a great part of the Pittsburg district to-day. Of course, this may not all be the fault of the operator. In many cases, I believe that the operator is not to be blamed for the existing conditions, but that the superintendent and the mine foremen at many mines do this, in order to make a record for themselves by cutting expenses, regardless of the injustice done to the fireboss. There are still however, some good mines in the Pittsburg district where the fireboss is well treated and his work given the importance it deserves, but they are few.

But since a few good companies cannot relieve the situation for firebosses working for other companies, whose officials are less considerate, I believe thoroughly that there is, as has been suggested, but one solution to the problem. In order that the fireboss may have an equal chance with the other mine officials to earn his living, and that he may not be compelled to work between two fires to which his position virtually exposes him, he should be a government official, and under the control of the mine inspector of the district in which he is employed. He would then be able to perform his duty fully and in compliance with the law, without fear of losing his position.

I would suggest further that there should also be a law passed or the Department of Mines should make a ruling prohibiting mine foremen or assistant mine foremen, who are regularly employed as such, from acting in the capacity and in place of the fireboss, except in case of emergency. I have never written to any journal before, and perhaps I have done poorly this first attempt, but I hope you will print these few lines and that other firebosses will take up the subject and give their suggestions, so that we can get one another's opinions and secure for the work of the fireboss the respect and recognition it should command.

A FIREBOSS.

Western Pennsylvania.

Shot Firing in Mines

Letter No. 1—Replying to "J. N.," in your issue of Feb. 17, p. 619, who asks for a discussion of the question of firing two or more shots at one time in one place, I would say that the only advantage gained in firing more than one shot at a time, in a single working place, is when one is about quitting for the day and does not expect to return to his place. He will then not be obliged to work in the smoke or to wait for it to clear.

On the other hand, the risks of firing two or more shots at one time, in a single close place, are many. The practice is always dangerous.

First, assuming a shot is placed on each rib and fired by either squib or fuse, one of these shots may possibly hang fire and cause the miner to think that both shots went off together, in which case the shot that has not gone off, is liable to explode when the miner returns to his place.

Second, one of the shots may release a pocket of gas, and the other set off the gas that has accumulated.

Third, if the place is dusty the first shot will probably raise more or less of a cloud of dust that will be fired by the second shot. This will produce what is called a "windy shot," or possibly a local dust explosion.

Fourth, a miner often drills what he calls a "chance" or "dependent" shot, which is intended to go off first and break down the coal, so as to give the second shot a better opportunity to work. If both of these shots are fired together, the chance or dependent shot may hang fire or fail to go off at all. The second shot will then prove to be a windy or blown-out shot and may create much havoc.

The practice of firing two or more shots at one time is also unsafe on account of roof conditions, since the miner will always have a better chance to reset the props knocked out by the shot, when a single shot is fired at a time.

DAVID FULTON.

Marion, Ill.

Letter No. 2—The firing of shots in mines depends greatly upon the conditions existing at the working face. The firing of a shot almost invariably produces a certain amount of flame, which is projected into the air at the time of firing. The safest method is to fire but one shot at a time; and to allow a sufficient interval between shots for the ventilating current to mix with and render harmless the products of combustion resulting from previous shots and to carry off any coal dust that may have been thrown into the air by the force of the previous blast. The interval of time that should elapse between two consecutive shots will differ with the local conditions and the amount of ventilation; but, in ordinary mining practice, this interval should never be less than five minutes for shots fired in the same working place.

More than one shot should never be ignited at the same time in any one working place, unless the firing is done by electricity or by fuses of such length that neither of the shots will explode in less than five minutes from the time they are lighted.

When successive shots are to be fired in any working place in which the roof is broken, or faulty, the smoke must be allowed to clear, and the roof must be examined and made secure before firing the second shot.

NOAH BURTON.

Anglin, Ky.

Letter No. 3—The question of shotfiring is of paramount importance both to miners and operators, and the discussion of this subject as suggested on page 619, COAL AGE, Feb. 17, will prove beneficial to all parties interested. This question, like the one just discussed in your paper; namely, "Sealing Off A Mine Fire," is one that requires a careful consideration of the conditions, both natural and physical, which are different in different localities. Opinions will of necessity vary and no doubt men of wide experience will disagree as to the advantages and disadvantages derived from firing two or more shots in any working place at the same time.

In considering this question it is necessary to know the kind and amount of explosive used and the means employed to fire them. Firing shots "on the solid," charged with black powder or a mixture of dynamite and black powder, as practiced in some mines, should be strictly prohibited. Such a method of shotfiring has been the cause of many disasters, although many mining men are not willing to admit it. To my mind the best method of firing shots in a mine is to fire all shots in one working place, at the same time, by means of electricity and not by the use of fuse. The number of shots allowed each working place should be fixed by the management. All shots should be tamped and fired by competent shotfirers after all the men are out of the mine.

The most important regulation in connection with shotfiring, and the most neglected one, I am sorry to say, is the restriction that no shots be fired in any place where a large volume of cool fresh air is passing; as, for example, on the main slope heading, and the new headings just turning off the slope heading; or, to use a familiar term, in places on the "first of the air." The firing of shots in these places has in many instances been the origin of serious mine explosions. In order to eliminate the danger from this cause the heating of the intake air will often prove effective; but, in addition to this, I would advise the keeping open of at least two crosscuts near the face of the places where the shots are to be fired and, also, the slowing down of the fan during shooting hours, although many will question the wisdom of such a procedure.

The advantages of the above method are, in my opinion: (1) increased safety; (2) fewer missed shots; (3) better results; (4) reasonable cost. By the old method of shooting with fuse or squib there is great liability to accidents due to "windy shots"; shots hanging fire; use of short fuses; premature explosion of charge; falls of roof, and the inhaling of poisonous gases produced by the shots.

By the use of permitted explosives tamped by competent men and fired by an electric battery when all persons except the shotfirers are out of the mine and the ventilation properly controlled so as to avoid shooting into a large supply of cool fresh air, the above dangers may be entirely eliminated. For the past two years we have been following the above outlined policy, at our mine, with marked success, and the results are most gratifying both to the miner and operator.

EDWIN HUSBAND,
Mine Foreman, Virginia Mine.
Bessemer, Ala.

Sealing Off a Mine Fire

Relative to the best method to employ in sealing off a mine fire that has gotten beyond control, will say, that my experience in both gaseous and nongaseous mines has been to either slow down the fan, or place a regulator in the entry (depending upon conditions in other parts of the mine) so that just sufficient air will be supplied to enable the men engaged in fighting the fire to work comfortably.

Then remove the nearest crosscut stopping outside of the fire, and place the first brattice on the intake side as near as possible to the trouble. The stopping on the return side can then be placed at the most available point in the return, but as near the fire as possible, in order to inclose the fire zone in a small area; place a metal pipe with a valve, in one or both of the stoppings, to test the temperature when desired.

We have found it necessary at times to lead a temporary brattice from the open crosscut along either entry to get the stoppings near the fire.

J. E. PETTIT,
State Coal Mine Inspector.
Salt Lake City, Utah.

Should Ventilation Be Reduced Before Firing Shots

The article entitled "Causes of Iowa Mine Explosions," by John Verner, p. 545, COAL AGE, Feb. 3, draws attention again to the question of reducing the air current in a mine, just previous to the time of firing, and revives the discussion as to whether or not it would be practical to stop or slow down the fan ventilating a mine, say for 30 min. before firing time. This is an interesting question, and should be thoroughly discussed.

Mr. Verner advances the argument that a draft of air in a mine increases the danger of an explosion, while a slow or feeble ventilating current reduces the liability of explosion to a minimum. Can we not have a thorough discussion of this question by practical mining men who have had experience along this line? We would be glad, also, to see this question thoroughly explained in the columns of COAL AGE.

U. S. WILSON.
Dayton, Tenn. NELSON RIGSBY.

Taffanel Barriers

Mr. Lindrooth, in his timely note on stone dust shelves in the issue of Feb. 24, fails to state correctly the origin of the device. It comes, perhaps, *via* England, but the invention, I believe, is that of Jules Taffanel, the distinguished director of the Liévin (France) Experimental Station organized by the Comité Central des Houillères. This station is most complete and the results of its experiments set the pace for the rest of the scientific mining world. About a year ago, the Cross of the Legion of Honor was conferred upon M. Taffanel with a note in the Journal Officiel that his experiments at Liévin had been "pursued by methods and with a scientific insight which were universally admired." He is *the* great authority on the coal-dust question. In a report on the experiments carried out at Altofts (England) by the Mining Association of Great Britain in 1910, M. Taffanel says, "Like ourselves, they (the British) recommend general schistification as a practical means of lessening the probability that a coal-dust explosion will occur. As for the arresting barrier (arrêt barrage) used at Liévin as an additional precaution for stopping an explosion, that is on the way to becoming general, they do not speak of this explicitly, not having tried it; but by analogy and example they suggest the use of similar arrangements for increasing the efficacy of schistification."

After a recent visit to M. Taffanel's splendid testing gallery and to many continental mines, the writer can say that experiments have already shown the efficacy of these "Taffanel barriers." They are being quite generally introduced in the mines of France and on the Continent in general to form limiting zones. I observed many already installed in the mines, and many more were planned. In most cases, fine ashes were placed on the overhead shelves. The simplicity and cheapness of the device are as much to the credit of the distinguished inventor as is its efficacy.

A. B. JESSUP, Mining Engineer.
Lehigh Valley Coal Co.,
Wilkes-Barre, Penn.

Air Ducts for Mine Fires

In reference to the article in your issue of Feb. 10 on "Collapsible Air Ducts for Mine Fires," I would say that these ducts or brattices are not, as stated in the article, an Austrian product, but are covered by a German patent, and have been made for a number of years by a German mine-supply house.

Should any of your readers be interested in obtaining further information on the subject, we can get for them further descriptive matter.

KERN COMMERCIAL CO.
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Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Can A Miner Fire His Own Shot?

Please state whether a bituminous mine foreman in Pennsylvania in charge of a gaseous mine can permit, according to law, any miner to charge, tamp and fire his own shot, assuming that the man is competent of performing this work with ordinary care.

MINER.

Johnstown, Pa.

The new revised (1911) bituminous mine law, Article 4, Section 14, provides that: "In such portions of a mine where explosive gas is being generated in quantities sufficient to be detected by an approved safety lamp and in which locked safety lamps are used, the mine foreman shall employ a sufficient number of competent persons who are able to speak the English language to act as shotfirers whose duties shall be to charge, tamp and fire all holes properly placed by the miners, and to refuse to charge any holes not properly placed." This section further specifies that "No holes shall be fired by any person other than a shotfirer," and requires that "Each shotfirer shall keep a record of and report to the mine foreman, every hole that he has refused to charge, every blownout shot and every hole that has misfired."

Taking this section 14, thus far, it would seem to be the intention of the lawmakers to restrict the firing of shots, under the conditions named, to competent persons appointed by the mine foreman to act as shotfirers, the apparent meaning being to delegate this work to persons other than the miners themselves. This meaning is further strengthened by the fact that the shotfirer so appointed has the authority, by law, to refuse to fire any shot, that is (in his opinion) "not properly placed." It is significant that, if a miner were appointed to fire his own shot, he would not, in any case, refuse to fire such shot, with the result that a dangerous shot might be fired.

There seems, however, to have been added to this section what may be called a "rider", which authorizes the mine foreman to permit miners to fire their own shots; at least this is the meaning by implication. The clause reads "It shall be the duty of shotfirers and miners who are permitted by this act to fire their own shots, to visit and examine the places where shots have been fired, before leaving the mine, to see that there is no fire or any other danger existing."

Taking the section as a whole, we would say that a mine foreman in charge of a gaseous mine, in the bituminous district of Pennsylvania, is authorized by law to allow a miner to fire his own shot under the conditions specified. We would suggest, however, that the wording of the law leaves room for argument.

Methods to Be Adopted to Avoid Squeeze

In a mine where I have been employed the general method of working is as follows: The butt entries are driven to the rise on a grade of about 1:20. Rooms are driven to the right and left of each pair of butt entries and worked "on face." The rooms are driven on 39-ft. centers, being about 21 to 24 ft. wide, and leaving 15- to 18-ft. ribs between them. The general plan of proceeding is to work No. 1 butt, advancing, and No. 2 butt, retreating. The coal is from 6 to 7 ft. thick and is overlaid with a hard sandstone roof; the floor is a hard fireclay, overlying a limestone. The coal is a hard bituminous coal.

This method gives a good deal of trouble from squeeze. Will you kindly suggest how the method can be modified so as to reduce the liability of squeeze, and obtain the largest percentage possible of coal?

Smithton, Penn. MINE FOREMAN.

Our correspondent has omitted one important factor; namely, the depth of cover or amount of roof pressure. The general plan of mining described is that in common use in the Pittsburg district. The plan has numerous and decided advantages, and when properly conducted and carried out has been very successful. It enables the operator to maintain his tonnage in the mine, and meet the necessary expenses of driving the butt entries. If it were not for this latter reason, the retreating system could be employed in all the butt entries.

There may be several reasons for the squeeze mentioned by our correspondent, and without a more exact knowledge of the facts in this case, we can only suggest what these may be.

(1) In all coal extraction it is important to leave a certain percentage of pillar coal in the first working. How much this percentage should be will depend on numerous conditions, such as depth of cover, character of the roof, floor and coal, and the inclination and thickness of the seam. A general rule in mining is to take out from one-third to one-half of the coal in the first working, leaving the remainder as pillar coal to support the roof and protect the entries till the time comes to draw back the pillars. This rule, however, is greatly modified by local conditions.

In general it may be assumed that when a squeeze has occurred the reason is that too little pillar coal has been left or too large an area has been kept open; that is to say, too large an area of roof has been left standing on timber. One of the surest remedies to avoid squeeze is to draw all standing timber, and induce a fall of roof, so as to settle the weight on the gob. Uniformity of work, in drawing pillars, is also essential. If these precautions do not suffice, a further remedy must be found, in increasing the width of pillars relative to the size of opening. This will decrease the roof pressure per square foot.

Considerations Before Drawing Pillars

What matters should be carefully considered before the work of drawing pillars is begun?

Before starting to draw pillars in a mine, it is important to consider what weight of cover is resting on the pillars. Regard must be had to the thickness of the seam; its depth below the surface; face; the nature of the strata; the hardness of the coal. A careful inspection should be made to ascertain to what extent the roof has fallen in the rooms, and in any abandoned adjoining section of the mine. If there is a large standing area in which the roof is supported on timber in the rooms, the work of drawing the pillars will be most difficult and dangerous; because the weight thus thrown on the pillars will crush the coal. It is also necessary to closely inspect the roof for any evidence of a fault or slip, as these will cause much trouble after the pillar work has been started. It is necessary to consider further the later effect the drawing of pillars will have to cause damage on the surface; and whether the disturbance of the overlying strata will allow water to flow into the mine; or whether the drawing of the pillars is going to shut off any coal yet to be mined.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions Asked at Fireboss Examination, Held at Cumberland, Wyo., Jan. 29-31, 1912

Ques.—What are the principal gases met with in coal mines?

Ans.—The gases commonly classed as the principal mine gases are methane or marsh gas (CH_4), carbon monoxide (CO), carbon dioxide (CO_2), hydrogen sulphide (H_2S), and olefiant gas (C_2H_4).

Ques.—Which of these gases are heavier and which are lighter than air? Under what conditions and where would you expect to find each of these gases?

Ans.—Of the gases named, carbon dioxide (CO_2), sp. gr. 1.529, and hydrogen sulphide (H_2S), sp.gr. 1.1912, are heavier than air. The gases lighter than air are marsh gas or methane (CH_4), sp. gr. 0.559, carbon monoxide (CO), sp. gr. 0.967, and olefiant gas (C_2H_4), sp. gr. 0.978.

The gases heavier than air would, by virtue of their specific gravity, tend to accumulate in the lower portions or the dip workings of a mine, while those lighter than air, for the same reason, would tend to accumulate at the roof, or in the higher portions or rise workings of a mine. There are, however, many conditions in the mine that prevent the accumulation of the gases in these several places. As a rule it is safe to assume, in practice, that each of these gases will be found, in greater or less quantity, at points near where they are generated.

However, large volumes of carbon dioxide or blackdamp (CO_2) will always be found in the lower places or dip workings in a mine generating much blackdamp. Likewise large volumes of marsh gas, mixed with air (firedamp) will generally be found in roof cavities or at the face of pitch workings, in mines generating much marsh gas. Olefiant gas is usually found associated with marsh gas. Carbon monoxide is seldom found in dangerous quantities, except in the afterdamp of an explosion, or in proximity to a gob fire, or after the firing of one or more shots in a close heading or working place. This gas is often found accumulated behind what is called a "standing shot"; or, in other words, where the coal has been dislodged and moved forward in a body but not broken down. Hydrogen sulphide is also seldom found in large quantities in mines, but may be sought in damp, low places, especially where iron pyrites occurs in the coal or the adjacent strata.

Ques.—Which do you consider the most dangerous gas found in coal mines and why?

Ans.—Carbon monoxide (CO) is generally considered to be the most dangerous of the common mine gases. This is because its presence in the mine workings is often unsuspected till too late, due to the fact that the lamps of the miners continue to burn brightly in the presence of this gas. The gas is extremely poisonous; one-half of one per cent. breathed for a short time will generally prove fatal, while a larger percentage of the gas may cause instant death. Men have been found killed by this gas, in positions that indicate they had no previous warning whatever.

Ques.—Describe the action of the different gases on the flame of a safety lamp.

Ans.—The action of the different mine gases depends in any case on the quantity of gas present in the air. Three of these gases; namely, marsh gas, carbon monoxide and olefiant gas, are combustible, and when mixed with air in proper proportions, explosive. These gases exert a peculiar influence on the flame of a safety lamp by increasing the combustion of the lamp flame. Marsh gas (CH_4) gives a well defined flame cap that is visible to the naked eye when at least 2.5 or 3 per cent. of gas is present in the air. This cap forms and is observed as a pale-blue tip above the flame of the safety lamp. Marsh gas is a light hydrocarbon gas.

Olefiant gas (C_2H_4) is a heavy hydrocarbon gas. Its combustion is more violent than that of marsh gas and, for this reason, its influence on the flame is often such as to cause the flame to jump. This gas, therefore, interferes considerably with the formation of a cap. When much is present it is difficult to observe the gas cap formed, owing to the lamp flame being less steady. The presence of much of this gas in firedamp makes the mixture more dangerous, because less easily detected. Should explosions occur in the lamp, these are more violent when olefiant gas is present than is the case with pure marsh gas.

Carbon monoxide when present has the effect of lengthening the flame of the safety lamp and increasing somewhat its brightness. The cap formed by this gas is not clearly visible and the gas must be detected more by the brightness and lengthening of the flame. However, it is unsafe to rely wholly on these indications for its detection. Other means should be used as the blood test or the canary or mouse test.

Carbon dioxide, when present in sufficient quantities, dims the flame of the lamp; when present in larger quantities the flame is entirely extinguished. This effect is due to the dilution of the feed air of the lamp by an incombustible gas and the consequent reduction of the temperature below the temperature required for the combustion of the carbon in the flame. Both marsh gas and hydrogen sulphide when unmixed with air extinguish the flame of a lamp.

Ques.—What proportion of firedamp in an air current forms an explosive mixture of the least dangerous character?

Ans.—The proportion or percentage of marsh gas in a firedamp mixture that may be considered less dangerous is where the volume of air is more than thirteen times the volume of gas, or the percentage of gas is less than 7.14. This mixture is below the lower explosive limit of firedamp, and may be considered less dangerous because the addition of more air renders the mixture less and less explosive. Any firedamp mixture above the higher explosive limit is rendered more and more explosive by the addition of air, which is sure to occur when the gas is disturbed.

Ques.—Are there any possible conditions known to you and which may occur in a mine in Wyoming that would make the combination given by you in answer to the preceding question, as the least dangerous, one of a very highly dangerous character, no further addition of firedamp being made to the current?

Ans.—Yes, the presence of fine coal dust floating in the air will render an otherwise nonexplosive mixture, explosive. Also the presence of olefiant gas in firedamp renders the mixture more explosive than it would be otherwise.

Ques.—Does the quantity of gas given off by mines vary with the change of the atmosphere, and why?

Ans.—In all gaseous mines there is evidence that any considerable fall of atmospheric pressure is always accompanied by an expansion of the gas and air contained in the abandoned places of the mine, and this would naturally increase the quantity of gas in the air current. It is probable that the observed increase in the percentage of gas in the mine air is due entirely to this cause.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Preventive Methods, Lackawanna Company

By C. E. Tobey*

Coal mining is a hazardous occupation at its best, but when you consider that from 65 to 80% of the fatalities are due entirely to carelessness or ignorance on the part of the men themselves, you will readily understand with what the companies have to contend. How to educate our men so as to eliminate this carelessness is a problem which I assure you has had more thought and discussion at our superintendents' and foremen's meetings than has been given our cost sheet. Every suggestion and idea which appeared likely to uplift our men or prevent them from injuring themselves or their fellow workmen has been tried out, and I am pleased to say that some of these ideas are producing good results.

The Extension Schools

Out of our force of 18,500 employees, 6000 of them are Polish, 1000 Slavs, 1000 Russians, 2000 Lithuanians, 500 Italians, 500 Austrians and about 500 Hungarians. A large number of these cannot even understand the English language, and it is necessary to educate them somewhat before they can understand or comprehend the company rules. It is hard to get them interested, as many of them are suspicious of your efforts in their behalf. They cannot understand why the "big boss" should take any interest in their safety or welfare, and it requires a continual study to learn how to reach them. This is being done most successfully through our extension schools, under the direction of our Mining Institutes, which were organized and fostered by our Young Men's Christian Association.

The Scranton District Mining Institute has between 1700 and 1800 members, practically all of whom are actual mine workers. At the regular monthly meetings of this institute, papers are read and discussed on various mining subjects, and demonstrations given in first aid, etc. All these subjects are very interesting and instructive to our advanced classes, but cannot be understood or comprehended by the non-English-speaking miners, and it is for their benefit that the extension schools were inaugurated. These are called extension schools because they are held at various places around the mines; any convenient hall or building in which benches and desks can be placed, or perhaps some handy district school building is used. Some bright, young, energetic mine foreman who is a member of the Mining Institute has charge of the class, and devotes two evenings each week trying to teach plain English to these non-English-speaking foreigners. Blackboards and charts are used, and the Dr. Roberts system followed. It is marvelous how some of these young foreigners grasp the meaning of English words, and when they get far enough advanced so that they can understand English, they then come to the institute, or, perhaps, join the mining class which is held in the Y. M. C. A. twice a week and presided over by a competent mining engineer.

The Magic Lantern

For the special benefit of our non-English-speaking employees, Colonel Phillips, our general manager, conceived the idea, some time ago, of illustrating the dangers of careless mining. He selected the accidents that most frequently occur, such as fall of roof, misfired blasts, etc., and had them actually illustrated before a camera in the face of the workings. Several hundred of these photos were taken, covering some thirty of the most common kinds of accidents. It took a photographer many months, and much of the time of the foremen and others, to get suitable photographs which would bring out the points desired. Some two hundred of these photographs were made into lantern slides and shown with a magic lantern before our foreign schools.

Foreman Gages Miner's Bit and Finds It Too Small

The Miner is Sent to Shop to Have Bit Resharpened

*Superintendent coal department, D., L. & W. R.R.

Note—Address delivered at Penn. State Y. M. C. A. convention, Bradford, Penn., on Feb. 23, 1912. First of two articles.

By this method instruction was provided whether the members of the class understood English or not, and no talking was necessary, as the pictures spoke for themselves. The teacher only needed to point to the illustration thrown on the sheet and either shake or nod his head, and the dullest foreigner could readily see the right or wrong way, and the result of choosing it.

Lantern Slides in Book Form

These magic-lantern exhibitions were a success from the start, and drew crowds of foreign men, women and children. They enjoyed them as much as they would the shows at a nickelodeon, and, at the same time, absorbed something for their future welfare and safety. They frequently asked to have the exhibitions repeated, and, in many instances, after the show was over it was necessary to put out the lights in the hall to induce them to disperse and go home.

Our company was so pleased with these photographs and this system of educating its foreign employees, that they arranged to have them published in book form with simple and appropriate lessons prepared on the Dr. Roberts system by J. H. Dague and S. J. Phillips, of the educational staff of the Scranton Y. M. C. A. These primers will be used exclusively in our foreign extension schools and distributed among these classes.

Careless Timberer Goes Home

Many rules have been adopted for preventing accidents and protecting the lives of our employees. For instance, whenever the roof of a chamber has been reported by the fireboss as being in bad condition and unsafe, instead of cautioning the miner when he enters the mine and instructing him to place the necessary props, that miner is not allowed to go in, but is sent home for the day while the place is being made safe by company men, the result being that this miner becomes more careful and does not allow his place to get in bad condition, as such carelessness has its effect in his pay envelope. By the old method the miner took his own time in placing the props, and frequently either he or his laborer, or both, got caught under a fall of roof as a result of his carelessness and delay. Our records show that at least 45 per cent. of the fatal accidents were caused by falls of roof in the face of the workings, and by this new rule we hope to greatly reduce this average, and, in fact, in the one district where it has been tried, we found, last February, that just before this rule was adopted, out of 952 working places an average of three per day were reported to have "bad roof," whereas in December the average was less than one room per day, and in that same district, while there were eleven men killed in the year 1910 by falls of roof, we had but three fatalities from that cause in 1911.

Misfire Means a Return Home

Necessity and self-preservation forced us to adopt another rule which was thought at first to work a hardship on the miner and a reduction in the output, but which really worked out to the advantage of all. A great many accidents, a majority of which proved fatal, were caused by misfires. In other words a miner would light his squib and retreat to a place of safety, and if the shot did not go off promptly, he concluded the light had gone out and returned to the face just in time to receive the delayed shot. Rules were laid down forbidding the man to return to the face for a certain number of minutes, but it was soon found that no definite time could be set for a delayed shot, and again, time passes slowly when a man is waiting. Although he might feel that he had waited 15 min., the fact is he may have been waiting only 4 or 5 min., so it was decided necessary to adopt the rule that no miner be allowed to return to a missed hole. He must take his dinner pail and go home for the balance of the day. There is no question but what this rule is evaded more or less by some reckless dare-devils, but they not only run the risk of being blown to Kingdom Come, but also of immediate discharge from the service if found out.

Gaging the Bit

A great many accidents happen from "premature blasts," the charge going off while placing the cartridge in the hole or in tamping it. The friction produces a spark which ignites the powder. It was a study to find out what caused this—it was plainly carelessness, but in what manner? In watching these conditions closely, one of our superintendents noticed that the paper cartridge sometimes appeared too large for the hole, and in forcing it in, it frequently happened that the cartridge became torn and the powder leaked out. Upon closer examination our superintendent discovered that the drill used by the miner had become worn down until it was not capable of boring a hole large enough for the cartridge to enter. Today, these drills and bits are regularly gaged, and, if found too small, are immediately sent out to be drawn out and sharpened, and the miner cannot resume work until he has a drill of the proper size, and we have found that the misfired shots have reduced about 75 per cent. since adopting this rule. We also have a special committee, whose duty it is to visit all our breakers, boiler houses, etc., and hunt out danger spots and recommend methods of eliminating them, and we have an Inspector of Safety Appliances, who follows up and sees that the suggestions of this committee are fully carried out.

The Drill Hole is Conformed to Standard and the Charge Can Then Be Inserted by Scraper

Is It Any Use?

In reply to your anticipated question as to whether all these precautions taken have actually saved any lives, or reduced the fatalities in our mines, I am proud to say that although in 1911 our production increased 370,000 tons over 1910, the number of persons killed in and about our mines was 15 less—and that there were 170,000 tons of coal produced for every man killed, as against 124,000 tons in the previous year. This means that 15 human lives have been saved through some source and the preservation of 15 breadwinners for at least 10 widows and 50 children, and if only one of these 15 could be credited to our efforts, we would feel amply repaid.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission recently heard arguments in the case of John W. Boileau and other Pittsburg district coal operators against the Pittsburg & Lake Erie and other railroads. The case has required many months for collecting testimony and the arguments were presented by attorneys of national prominence. Wade H. Ellis, Louis D. Brandeis and Cyrus E. Woods, among others, appeared for the operators. The complainants summarized facts in the case as follows: "The rate from the Pittsburg district to Ashtabula was not an outgrowth of competition among the railroads, but was fixed and is maintained by agreement of the carriers from the Pittsburg and competing coal fields. The rates from all districts, fixed by agreement, practically ignore differences between Pittsburg and the other districts in the matter of distance from the markets, and give Pittsburg a rate per ton per mile over 100 per cent. higher than those from the competing fields.

"The defendant railroads are, to a large extent, interested in coal properties in the fields in whose favor the discrimination is practiced. The present freight rate to Ashtabula leaves the Pittsburg operators with practically no margin of profit on their lake coal business.

Comparison with Other Rates

"Compared with coal rates from all other districts competing in the same markets, the 88c. rate from Pittsburg is the highest per ton mile, and greatly exceeds the rates from Illinois and Indiana. It exceeds the average of coal rates throughout the United States, though there is included in this average the high rates for coal moving in small volume and for short distances, and for coal moving in the mountainous regions of the West. Compared with the rates made by defendants on other commodities hauled over their lines, it exceeds the average charge on all freight (including high-class merchandise) where the average haul is about the same as the haul from Pittsburg to Ashtabula.

"The 88c. rate yields a train-mile revenue greatly in excess of the average on defendants' lines, and three to five times the average train-mile revenue on all railroads in the United States. The rate from the Pittsburg district has constantly been going up while the cost of carrying the coal has constantly been going down. The actual cost to the carriers of hauling the coal for which the 88c. rate is received is less than 24c. per ton."

The argument for the coal operators was concluded as follows:

"The carriers have put in no defense in this case because there was none available. That the cost of the service, the calculation of which they have not even attempted to refute, shows the rate charged is excessive, and out of all proportion to the expense of the service rendered, is unchallenged; that the effect of the rate on the business of the shippers has been ruinous, remains undisputed by any testimony; that a comparison of the rate in question with any rate with which it may be fairly and justly compared shows it to be out of line with all coal rates, is not disputed by any evidence; and the discrimination in favor of competing fields in which the carriers themselves have a financial interest, is not denied."

Argument for the Railroad

The defendants were represented by O. E. Butterfield, George S. Patterson, Clyde Brown, and other railroad attorneys. Their argument began with reference to a decision of the Commission in 1889, and the point was made that there is no evidence that the service is less valuable today than it was when the commission approved a charge of 90c. (1889), nor is there any evidence that it costs less today than it did then. Furthermore it was said that "the rate in question considered alone is apparently reasonable."

The point was also made that "the fact that the business in question may be profitable to the lines most favorably located, most highly improved, and most efficiently equipped, should not condemn the rate," nor "should the profits on other business be cited as an excuse for reducing the profits on coal traffic."

One of the most important points for the defendants was made by W. M. Duncan, when he said: "It seems apparent that the West Virginia and Kentucky mines cannot or will not be shut out of the lake coal business. A reduction in the present Pittsburg rate would undoubtedly, as we view the situation, be followed by a similar or equivalent reduction in the other lake cargo coal rates from the competing fields and then the Pittsburg operator would be in the same position as he is now. The railroads would suffer to the extent of the reduction."

Alabama

Birmingham—A $15,000,000 coal company for the development of the Warrior coal fields, with English capital, is in prospect, and has progressed so far that the financial backers are in this country for an investigation preliminary to the formation of the company. This information comes from L. A. May, recently returned from London, member of the New York & London Financing Co. and well known in Birmingham.

Colorado

Denver—The Rocky Mountain Fuel Co., in support of a petition for an injunction restraining the miners of the northern Colorado coal camps from interfering with their employees and committing alleged acts of violence, has filed in the federal court a large number of affidavits in which specific cases of violence, intimidation, threats of murder and arson are given in detail. One of these affidavits is by E. E. Shumway, president of the company, and he injects a new issue into the situation by charging that not only are the peace officers of Boulder County derelict in their duty, but that the employees of the Denver & Interurban and the Colorado & Southern R.R. are in full sympathy with the strikers and insult and abuse the employees of the coal company.

Illinois

Marissa—The coal miners of Marissa are promised steady work until Apr. 1 through the purchase of the maximum capacity of the mines up to that date, by the Illinois Central R.R. Heretofore the work has been slack, owing to failure of the railroads to furnish enough cars, and, as a result, the miners were leaving Marissa.

Chicago—It was announced, Mar. 1, by John P. White, president of the United Mine Workers, that representatives of miners and operators in the bituminous coal industry would meet in Chicago Tuesday, Mar. 5, to make arrangements for a second joint wage conference before the expiration of present contracts on Mar. 31.

Petition for an injunction against the Illinois Central R.R., filed by coal operators to prevent the enforcement of the railroad's new car-distribution plan was dismissed, Feb. 28, by U. S. Judge K. M. Landis. The bill prayed to enjoin the Il-

linois Central from putting into effect an order of the Illinois railroad and warehouse commission, directing that car distribution be regulated by the mine capacity of operators. An appeal from the commission's order is now pending before the Circuit Court of Sangamon County, and Judge Landis ruled that therefore the United States Court has no jurisdiction, the filing of the appeal serving as an injunction to delay the enforcement of the new schedule.

Belleville—The Belleville Savings Bank has brought suit to foreclose a mortgage of $1,100,000 on the mines of the Southern Coal & Mining Co. The mining company claims that they will oppose this suit and that it is a misunderstanding. The mines on which the mortgage is held are the following: Walnut Hill, Avery, Harmony, Oak Hill, Shiloh, Glendale No. 2, Germantown, Muren No. 1 and Muren No. 2, all located on the Southern Ry.

Danville—Officers of the Brazil Block Coal Co., who are operating the mines formerly known as the Dering Nos. 2, 3 and 4, have made out a statement showing the total payroll for the second two weeks of January; the number of men employed; the average pay per man, and the average pay of the men at the different mines. It is as follows:

Gross pay roll	$48,132.10
Total number of men	1118
Average per man	$43.05
Average per man per day—	
No. 2 Mine	$3.24
No. 3 Mine	$3.41
No. 4 Mine	$3.43

Indiana

Sullivan—Judge Bedwell, of the circuit court, has overruled a motion to quash the affidavits against the Monon Coal Co., charging that the company failed to maintain washhouses. He also held the law constitutional. The coal company will appeal to the supreme court.

Boonville—The Wilson-White Coal Co. has changed its name to the Cypress Creek Coal Co., and has elected C. P. White president.

Terre Haute—The moderation in the weather has not lessened the demand for coal at Indiana mines, and all except those on the Chicago & Eastern Illinois are operating at full capacity. Most of the present output is for storage. The dealers have in their yards enough for their trade until Apr. 1 when a suspension of work will take place through failure of the operators and miners to agree on a wage scale.

Kansas

Pittsburg—An accumulation of gas exploded in mine No. 6 of the Mayer Coal Co. in the morning of Feb. 16. Props were torn out, empty powder cans and dinner buckets sent in every direction and doors blown from their fastenings but none of the 150 men at work at the time was injured. The immediate cause of the explosion is unknown. State Mine Inspector Besson ordered the mine shut down until steps had been taken to free the mine of gas.

Turck—Mine No. 4 of the Fleming Coal Co. has been shut down by order of Mine Inspector Besson, since Feb. 2, because it was found that the company was not complying with the state mining laws. Rapid advance was being made toward old workings that are filled with water and necessary precautions were not being taken.

Kentucky

Providence—One of the largest coal-land transactions in this section for some time is now under way. Options on 5000 acres of mining rights will be taken up and about $500,000 paid to the owners. The land lies in Webster and Hopkins Counties, and was bought in by a French syndicate about two years ago.

Harlan—M. M. Hamilton and G. W. Middleton, of Shawanee, and F. F. Cawood, of Harlan County, have purchased a tract of coal and timber land lying along the Clover fork of the Cumberland river, 21 miles east of Harlan, on the extension of the Wasiota & Black Mountain R.R. The tract contains more than 300 acres and lies adjacent to the railroad right-of-way which has been surveyed up the Clover fork. It is understood that development of the property will begin at once.

Louisville—The Stony Fork Coal Co. and other coal companies of the Middlesboro field have attorneys at Washington pressing a case before the Commerce Court which promises to be of great interest to coal shippers all over the country. The defendant companies are the Louisville & Nashville and the Southern Railway Co. The point at issue is, whether an action involving tariffs, etc., may be filed in the Commerce Court in the first instance, instead of applying to the Interstate Commerce Commission and then taking the matter up on appeal, if necessary. The allegation is made that, due to disputes as to tariffs, the two defendant railroad companies refused to furnish cars to the complainants at the busiest season of the year, hundreds of empty cars standing on the side tracks in the meanwhile. As a result the coal operators lost heavily. It is suggested that a similar case was filed with the Interstate Commerce Commission from Illinois. It was not decided until one year later. Such a condition would be intolerable, it is pointed out, with perishable freight waiting to be handled or large orders of any commodity waiting on cars for moving. The decision therefore will be awaited with much interest.

Missouri

Kansas City—After a short session the conference between representatives of the locals of the United Mine Workers of America in Missouri, Kansas, Oklahoma and Arkansas and of the Interstate Southwestern Coal Operators Association adjourned, Mar. 1, subject to call. The contract of the miners expires Mar. 31, and the wage scale that will be in force during the next two years will be adopted at the meeting which, it is believed, will be held here this month.

Ohio

Columbus—The defense in the government's suit under the Sherman anti-trust act against six railroads and three coal corporations charging conspiracy in restraint of trade and monopoly of the bituminous coal industry of three states, rested its case before the U. S. Court of Appeals, Feb. 29. According to facts brought out in court, the Chesapeake & Ohio controls the Hocking Valley and the Kanawha & Michigan roads, while the Lake Shore & Michigan Southern controls the Zanesville & Western and the Toledo & Ohio Central railroads. It was stated that the Hocking Valley was bought by the Chesapeake & Ohio R.R. in order to extend its trunk line system and that the public has been much benefited by this purchase.

Attorney-General Hogan, of Ohio, has made a ruling of considerable importance in the matter of the new state mining code. The code provides that in the case of shaft mines there must be two separate and distinct shafts. The Golden Rod mine of the Guernsey Coal & Mining Co., of Newark, Ohio, did not follow out this ruling. In sinking, a hard rock formation was reached; the lower part of the main shaft was enlarged and a cement partition was used to form the two shafts. It was held that this arrangement does not comply with the law.

Oklahoma

McAlester—A deal has been consummated here whereby W. E. Beaty and associates comprising the Pocahontas Mining Co. have acquired the lease and mining property of the Indian Coal & Mining Co. at Pocahontas. The Indian Coal & Mining Co. was owned by J. A. Nichols and H. A. Miller, of Asheville, N. C.

Pennsylvania

Bituminous

Clearfield—The Conman Shaft Coal Mining Co. was recently awarded $145,830 damages by a jury in its suit against the Pennsylvania R.R. Co. for discrimination in coal car distribution. This makes the third verdict given at Clearfield

against the Pennsylvania R.R. and is the largest of the three.

Ebensburg—The extensive coal holdings of John C. Martin, near Portage, Penn., were recently sold to an Eastern syndicate. The properties comprise about 5000 acres and are being worked by 10 mines with an annual output of 800,000 tons. The new owners will not operate the mines but merely constitute a holding company and will continue the leases held at present by the various operating companies.

Osceola Mills—W. J. Davis, who for 17 years past has operated the Loch Lomond mine near Hawk Run, has recently secured control of the Eureka, No. 21 mine, at Osceola, formerly operated by the Berwind-White Co. This mine taps the "D" or Moshannon bed, which here averages 4 ft. in thickness. Mr. Davis is equipped to begin operations at once.

Johnstown—Continuing the campaign against alleged violations of the mining laws, Inspector Thomas D. Williams has caused the arrest of six men employed in the Puritain mines in Cambria County.

Du Bois—Bids have been received by the Buffalo, Rochester & Pittsburg R.R. for a 4-mile extension of the road, into Jacksonville, and it is stated that construction work will be started as soon as the contracts are let. This extension will tap one of the largest tracts of coal land in Indiana County.

Brownsville — Twenty-five Russian Poles employed at the mine of the Monongahela River Consolidated Coal & Coke Co., two miles north of here, caused a riot at that place Feb. 26, in which nearly a dozen miners were slightly hurt. Recently the miners were ordered to equip themselves with safety lamps. Nearly all the 250 men purchased lamps but the 25 Polish miners refused, and when they appeared on the morning in question, the foreman refused to permit them to enter the mine. The Poles attacked some of the other miners.

Connellsville—A new coking corporation, the Aetna Connellsville Coke Co., recently took over a half interest in the Dunlap Connellsville Coke Co. A complete new organization was effected by changing the name of the concern from the Dunlap Connellsville to the Aetna-Connellsville company and taking in new stockholders. The new company will take over the works of the Dunlap concern. They have 119 ovens in Redstone township on the Dunlap creek. At present the company is operating 79 ovens, about three-fourths of its capacity. Inability to secure labor has been the cause of not running full.

The Crystal and Madison plants of the Sackett Coke Company of Smithfield have been purchased by the United Connellsville Coke Co. of Pittsburg.

Anthracite

Scranton—The case of John W. Peale, of New York, against the Marian Coal Co. has been appealed to the U. S. Court of Appeals by attorneys for the coal company. The case grows out of a contract entered into between the coal company and Peale, whereby the New York man was to handle the entire output of the company's washery.

A piece of ice falling to the foot of the Central shaft, West Scranton, Feb. 26, smashed through the hood of the cage, killed one man and injured two. The men were removing a fellow workman who was ill; he lay on a stretcher in the cage at the time of the accident and miraculously escaped injury.

Wilkes-Barre—At a conference of anthracite coal operators in New York, Mar. 5, the demands of the miners were formally refused. A committee of ten was appointed to convey this reply to the miners' representatives at the joint conference to be held Mar. 12.

Tamaqua—A route which may prove to be an extension to the Delaware & Hudson R.R. lines below Wilkes-Barre, is being staked out by engineers who have been at work for several weeks between Tamaqua and Danielsville. The engineers refuse to discuss the matter, but it is surmised that they are at work for the Delaware & Hudson, mapping out a road that will give that company an independent outlet to the big coal fields it recently acquired in the Schuylkill region.

Washington

Seattle—At a recent meeting of the stockholders of the Crown Coal & Coke Co., at Walla Walla, R. G. Belden resigned as president and was authorized to go to Europe to negotiate a $1,000,000 bond issue for the company. The Crown Coal & Coke Co. operates on about 5800 acres in the Crows Nest Pass district, of British Columbia.

North Yakima—A 14-ft. seam of high-grade bituminous coal has been discovered on a property along Taenum Creek, near Cle Elum, Wash. A company has been organized with $500,000 capital to work the strike.

West Virginia

Williamson—It is said that the Norfolk & Western in a short time will begin the construction of a 20-mile branch from Williamson to extend into the new coal field being opened just south of here. There are 15 large operators producing coal in this field and it promises to become one of the most productive in West Virginia. The town of Williamson is enjoying an unprecedented boom and real estate has jumped to enormous values.

Fairmont—The British government has placed an order with the Consolidation Coal Co. for 12,000 tons of George's Creek Coal. This will be loaded at Curtis Bay, Md., for shipment to Gibraltar.

Wyoming

Kemmerer—At a meeting held here recently by representatives of the various miners' locals of this district it was decided to proceed at once with the erection of a hospital in Kemmerer. Representatives were present from the locals at Sublet, Diamondville, Frontier, Susie, Glencoe, Oakley, and Elkol. It was their decision to erect a strictly miners' hospital to be presided over by the various affiliated locals. The need of a hospital in this district has long been known, but previous efforts in this direction have failed. It is expected that a temporary hospital will be in operation by Apr. 1, this year.

Canada

Winnipeg, Man.—Assurance that the Canadian Northern Ry. would immediately investigate the proposition of building a line into the Taber coal field, was given recently by Sir Donald Mann, vice-president of the railway. He said that a party of engineers would be sent out this spring to locate a line into Taber.

Great Britain

London—The national coal strike, after being in force for a week, still seems quite remote from an early settlement. The miners, although practically assured of a minimum wage, continue to demand the rates called for by their own schedule. Over 250,000 workmen in other industries have been thrown out of employment. Railroad service has been cut down to a minimum and shipping is greatly hampered.

Chronology of Coal Mining for February

Feb. 1—The joint scale conference of bituminous operators and miners at Indianapolis adjourned without having reached a basis of agreement.

Feb. 2—Fire destroyed the breaker and colliery buildings of the Connell Anthracite Coal Co., Bernice, Penn. Loss, $150,000.

Feb. 6—Fire destroyed the boiler and engine houses of the North Breeze Coal & Mining Co., Breeze, Ill. Loss, $50,000.

Feb. 12—A serious mine fire broke out in the coal mines at Antonienhütte, Prussia. Twenty-seven men were reported to have perished.

Feb. 18—The plant of the Knickerbocker Briquet Co., at Murphysboro, Ill., was destroyed by fire. Loss, $100,000.

Feb. 22—A fire in the No. 5 mines of the Western Coal & Mining Co., Lehigh, Okla., resulted in the death of eight men.

Feb. 29—Over 1,000,000 coal miners in Great Britain went out on strike for a minimum wage.

Personals

Harry J. Young, for some time past salesman for the W. J. Hamilton Coal Co., has resigned to accept a position with the Consolidation Coal Co., with headquarters in Detroit.

Dr. J. A. Holmes, director of the U. S. Bureau of Mines, recently delivered an address before the Southern Appalachian Coal Operators' Association, on "Some Lessons from Recent Mine Disasters."

A. B. Crichton, mining engineer, of Johnstown, Penn., will remain in charge of the coal properties, near Portage, Penn., formerly held by John C. Martin, and recently taken over by an Eastern syndicate.

Cyrus Echard has been elected president of the recently organized Aetna-Connellsville Coke Co., of Connellsville, Penn. Other officers are: D. M. Parkhill, vice-president; Francis M. Ritchey, Jr., secretary and Joseph B. Echard, general manager.

Francis S. Peabody, president of the Peabody Coal Co., of Chicago, Ill., delivered an address before the students and faculty of the College of Engineering of the University of Illinois, Feb. 27, on "The Operation of Coal Mines from a Commercial Standpoint."

L. B. Lincoln, of Chicago, vice-president of the American Peat Society and the Peat Association of Canada, recently visited Mankato, Minn., and vicinity, with a view toward the possible development of a peat industry in that locality. Mr. Lincoln secured options on peat lands at Janesville, Waseca and Owatonna.

N. D. Monsurratt, vice-president and manager of mines of the Sunday Creek Coal Co., C. E. Fukes, chief engineer, and F. E. Knox, assistant to the president, all of Columbus, Ohio, were recently in Charleston, W. Va., and visited the Sunday Creek company's plants at Longacre, Harewood, Carbondale, Mammoth, Cedar Grove and Shrewsberry.

Major James H. Allport, for many years prominently identified with the development of coal lands in the Barnesboro region of central Pennsylvania, has become connected with the Clinchfield Coal Corporation, of Dante, W. Va., in an important capacity. Major Allport will not give up his Barnesboro residence at present, but will devote most of his time to the West Virginia concern.

F. William Hausmann, for the past six years chief mechanical engineer for the Sloss-Sheffield Steel and Iron Co., of Birmingham, Ala., has recently resigned from this position. Mr. Hausmann, as mechanical engineer for all the coal and ore properties of the Sloss-Sheffield company, has inaugurated a number of important improvements, and has many friends in the Birmingham district.

Obituary

John Carver, aged 65, one of the pioneer coal operators of the Kanawha Valley and brother of Enoch Carver, died recently at his home in Charleston, W. Va. Mr. Carver's health had been failing for some time. He was associated with the firm of Carver Brothers until about a year ago, when this concern became financially involved. Mr. Carver came to America from England in 1864. He is survived by a wife and eight children.

Construction News

Birmingham, Ala. The Stith Coal Co., of Birmingham, contemplates the construction of a coal-washing plant.

The Gas Light Coal & Coke Co. contemplate building a coal washer.

Seattle, Wash. The Poulson Coal Co. will erect coal bunkers on the water front, Bellingham Bay, Wash. Harry Yarrow and former State Senator Poulson control the properties.

Middlesboro, Ky. The Nicholson Coal Co. has increased its capital stock from $60,000 to $120,000 and will spend $15,000 on the installation of a coal-washing plant and other equipment.

Duluth, Minn. The contract for construction work on the first section of the Island Creek Coal Co.'s new dock has been awarded to Whitney Bros., of Superior, Wis. The estimated cost is $600,000.

Saginaw, Mich. The Roberts & Schaeffer Co., Chicago, Ill., is preparing plans for new coal docks to be built at Saginaw for the Pere Marquette R.R. Estimated cost, $25,000. A. R. Merrick is superintendent.

The Pacific Coast Coal Co. will erect a $250,000 plant for the manufacture of coal briquets near Renton, Wash. Plant is to have a capacity of 400 tons per day. Plans are being prepared by James Anderson, engineer for the company.

Block, Tenn. The Tennessee Jellico Coal Co., which has recently acquired the property of the Block Coal & Coke Co. will, during the summer, complete the tipple and washer at Block, increasing the daily output to 1000 tons. Robert Wedekind, Louisville, Ky., is president.

Waverly, Ky.—The Alabama Coal & Coke Co., which recently purchased the Drury Coal Co.'s properties near here, will install new boilers, pumps and coal-cutting machinery and will build additional houses, remodel and repair the tipple, etc. R. M. Auxford, Birmingham, Ala., is general manager.

Charleston, W. Va. The Sunday Creek Coal Co. is preparing to build a power plant at its Longacre property, to take the place of one that was recently destroyed by fire. The new plant will be much more extensive and complete than the one destroyed. C. E. Fukes, Columbus, Ohio, is chief engineer.

Hinton, W. Va. The West Virginia Power Co., recently organized with $5,000,000 capital stock, is reported to contemplate the construction of a hydro-electric power plant at the Sandstone Falls of New River, west of Hinton. Paul T. Brady, of New York, and Fred Auld, of Charleston, W. Va., are among the incorporators.

Publications Received

THIRTEENTH ANNUAL REPORT OF THE MINING INDUSTRY OF IDAHO for 1911. By Robert N. Bell, state inspector of mines. 134 pages, 6x9 inches, illustrated.

THIRTY-SECOND ANNUAL REPORT OF THE DIRECTOR OF THE U. S. GEOLOGICAL SURVEY for the year ending June 30, 1911. By George Otis Smith, director. 145 pages, 6x9 inches, 2 plates. Government Printing Office, Washington, D. C.

QUARTERLY OF THE COLORADO SCHOOL OF MINES for January, 1912. 30 pages, 6x9 inches.

This number contains the proceedings of the Colorado Mining and Metallurgical Association at the mass meeting held in the House of Representatives, Denver, Dec. 28, 1911.

JOURNAL OF THE WESTERN SOCIETY OF ENGINEERS, February, 1912. 200 pages, 6x9 inches, illustrated. 50c., office of the society, Chicago.

The papers presented in this issue are: "Notes on Structural Steel Designs," by Albert Reichmann; "The Use of the Great Lakes," by Robert R. McCormick; and an article on the "Going Value" of business enterprises, by Frank F. Fowle.

Trade Publications

Ingersoll-Rand Co., 11 Broadway, New York. Leaflet, Form 4111. Type BC hammer drills. Illustrated, 16 pages, 6x9 in.

Goulds Manufacturing Co., Seneca Falls, N. Y. Booklet. Triplex power pumps. Illustrated, 16 pages, 6¾x8¼ in.

Stromberg-Carlson Telephone Manufacturing Co., Rochester, N. Y. Booklet No. 290. Private telephone systems. Illustrated, 20 pages, 3½x6 in.

Allen & Garcia Co., McCormick Building, Chicago, Ill. Attractive booklet describing and illustrating consulting and construction work executed by this firm of engineers: Coal mining plants, bridges, coal-washing plants, factory buildings, etc. 20 pages, 6¼x9½ in.

Industrial Notes

The Pennsylvania Storage Battery Co., of Philadelphia, Penn., manufacturer of an electric lamp for miners, has removed to a larger plant, at Nos. 221-227 North Twenty-third St.

The Ruggles-Coles Engineering Co., 50 Church St., New York City, recently received from the Toltec Portland Cement Co., Mexico, an order for one of their Class A-10 machines. This is the third dryer of this class ordered by this concern, the two they now have being used for drying coal.

The Goulds Manufacturing Co., Seneca Falls, N. Y., announces that at the annual meeting of the board of directors, Feb. 26, all the officers who served during the past year were reëlected. The annual report on the business of the company showed a slight increase over the preceding year in both the gross amount of sales and net profits.

The Metropolitan Coal Co., of Boston, Mass., is to abandan its present yard in Chelsea, Mass., and will occupy new and larger quarters on Broadway of the same city. This new coal-handling plant which, with its equipment, will cost in the neighborhood of $100,000, is being designed by Monks & Johnson, architects and engineers, 7 Water St., Boston, Mass.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The coal market has experienced an activity during the past week verging on a panic. Another touch of cold weather, in addition to the possibility of labor troubles, has developed an almost unprecedented demand at some of the largest distributing centers in the East. The requisitions for spot fuel have been so urgent that there is a strong probability of a sensational advance in prices, should the situation continue unrelieved.

The shortage is most acute at seaboard points and is being further aggravated by transatlantic steamers coaling for the round trip because of the strike in Great Britain. The larger buyers in the market are seeking to cover their requirements through May. In anthracite the consumption for February was the largest in years, and all possible receipts for the current month are already covered; supplies are fair at some points, but no additional stocks are accumulating.

In the Pittsburg district the car situation is much improved and the mines are working up to 80 or 90 per cent. of their full rated capacity; the demand is urgent and any coal available for Eastern shipment commands almost unprecedented figures. At other points, particularly in northern New York, Canada and in through Ohio, the railroad congestion is still acutely evident, with no prospects for immediate relief; the Ohio mines are only working from 35 to 50 per cent. of normal. Some recession in prices has occurred in the South, but the trade continues brisk. There are many inquiries for April tonnages, but the operators are refusing to quote beyond Apr. 15.

The market in the Middle West is extremely erratic, prices fluctuating rapidly and over a wide range. The dealers believe they have sufficient coal *en route* on cars, while the shippers claim much of this is being confiscated by the railroads, some of whom are dumping coal on the right-of-way for storage purposes.

Another fall in temperature has caused some activity in the Far West.

Boston, Mass.

The principal change in the situation here is the demand from transatlantic companies for bunker coal to make the round trip. This marks a further depletion of stocks already short, and shippers of bituminous may well wonder where supplies are to come from in sufficient volume. Prices for spot coal are therefore somewhat firmer, although no pronounced lift over last week can yet be reported. The larger buyers are seeking to cover their requirements for May, and in order to be safe for April are buying spot coal at high prices. Occasional rumors are heard of contracts being placed for the entire year, but as yet there is no general move in that direction. Meanwhile the current market is active and likely to become more so.

The trustees of the Boston City Hospital closed for 3000 tons of New River lately, one cargo each of 1000 tons for March, April and June, at $4.90 alongside the wharf. At $1.25 freights this would net $2.75, f.o.b. Newport News. Water rates today are strong at $1.25, and for 1500-ton barges $1.35 is asked below bridges. To Providence and other Sound ports, $1.25 has been paid.

The higher grades of Pennsylvania coal remain out of the market, and others that are available are steadily advancing in price. Of these there are relatively only small amounts at either New York or Philadelphia.

Supplies of anthracite are not gaining any, and all the dealers are anxious over shipments due or promised. It will take a large March tonnage to give Eastern dealers, not any surplus, but enough to keep them going.

Wholesale prices are as follows:

Clearfield, for shipment, f.o.b. mines	$1.65@2.00
Somerset, for shipment, f.o.b. mines	1.80@2.00
Pocahontas, New River, f.o.b. Hampton Roads	3.25@3.40
Pocahontas, New River, Boston, on cars	5.00
Pocahontas, New River, Providence, on cars	4.90@5.10

New York

The bituminous situation here at New York has hardened during the present week to an unusual extent. The supply of coal at the piers is shorter than in years, and buying by shippers who are short on their contracts has caused an advance in prices until even coals of unknown quality are being held at $3.65, f.o.b. piers, which is equivalent to $2 at the mines. These are the grades of coals that ordinarily do not find a ready market on a basis of 80c. at the mines. Demand is unusually heavy, both spot and contract, and shippers are having all they can do to satisfy contract obligations.

As is usually the case where there is such a heavy demand, coal business is being hampered by a short car supply and slow movement on the railroads, which tends to aggravate the situation and make the present shortage keener.

The strike in England has had a marked influence on the coal business here. The additional demands from abroad have caused consumers added uneasiness about the labor situation, and the efforts of coal buyers to accumulate stocks amount to almost a panic.

Philadelphia, Penn.

Added impetus was given to the retail trade by a snow storm last week. The impression that winter was still with us, in addition to the uncertainty of the labor situation, has again started an increased flow of orders toward the dealers. The situation, locally, had eased up somewhat on egg and chestnut sizes, they being in better supply, but the reminder that more cold weather might be expected, has had the effect of making them again active.

From a careful survey of the situation in this locality, it appears that few, if any, of the dealers have been able to accumulate any stocks whatever. Of course, some of the yards have considerable coal in them, notably the large ones, but any cessation in fresh supplies would soon reduce these to a minimum. As far as the prepared sizes and pea are concerned, none of the dealers report any going into stock for the future, all of these going out as fast as new coal comes in. The month of February has perhaps been one of the most favorable in the history of the trade in this vicinity. Almost to a unit, the yards have been going at full blast for the entire month, which is quite unusual, and so far in March there is not the slightest indication of a cessation.

Pittsburg

Bituminous—The output of coal is now limited only by the transportation facilities, all mines in the district operating as full as the car supply will admit. There is a little stocking of coal at mines, but as a rule, not much. Mines are operating on an average of between 80 and 90 per cent. of the full rated capacity. The car supply is fair, being almost satisfactory at many mines, and in no districts is it materially below what would be sufficient in times of normal demand. Consumers have thus far stocked relatively little coal, having been deterred at first by general business uncertainties and later by the advance in prices. The railroads have been stocking

coal very freely. Slack is decidedly scarcer than screened coal.

Greensburg district coal has sold as high as $1.60 and Clearfield at $1.70. Some brokers have standing orders to purchase everything available at $1.50 because of the urgent demand in the East. We quote: Nut, $1.20@1.30; mine-run, $1.25@1.35; ¾-in., $1.35@1.45; 1¼-in., $1.50@1.60; slack, $1@1.10 per ton at mine, Pittsburg district.

Connellsville Coke—Spot furnace coke has moved up about 5c. per ton in the past week, due to continued demand for a moderate tonnage, while there is practically no surplus available. The demand has been from brokers and operators, short on their contracts, more than from consumers. No interest has been manifested in contract coke. We advance prices on prompt furnace 5c. per ton and on prompt foundry 5c. to 10c. per ton: Prompt furnace, $1.85@1.95; contract furnace, $1.80@1.90; prompt foundry, $2.25@2.40; contract foundry, $2.20@2.40 per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Feb. 24 at 391,253 tons, a decrease of 2000 tons, and shipments at 4505 cars to Pittsburg, 5248 cars to points West and 985 cars to points East, a total of 11,735 cars, a decrease of 100.

Baltimore, Md.

A somewhat sensational rise in prices of practically all grades of bituminous coal took place in the Baltimore market during the past week. The low grade bituminous product which the trade has heretofore been only too willing to sell at prices ranging from 90c. to $1.10 per ton, has been selling during the week for $1.50, with consumers eager to purchase. The next best grade brought about $1.60 per ton, while the Big Vein Georges Creek coal sold at not less than $1.30, and was scarce at that figure. The market was the most favorable from the standpoint of prices and demand that the trade in Baltimore has known for some time.

Buffalo, N. Y.

Coal shipments continue to be held up on most of the railroads about as badly as a week or two ago, and there is not likely to be much relief until warmer weather appears. The Canadian roads are in particularly bad shape, and consumers in the Dominion are finding deliveries much delayed. There is not much talk of actual distress among consumers, but their supplies in some instances are near the vanishing point.

The most trouble for several weeks has been in northern New York, as supplies in that section are growing quite small. Deliveries from the mines in the bituminous district have been held up for weeks on sidings a long way from their destination. Cars have been piling up at Dewitt, on the New York Central, and equipment appears to be insufficient to handle them.

Prices have been holding with great firmness on spot coal, and there is not much to be had, the difficulty being to keep the customers supplied on old orders. Salesmen are not making much effort to land new business, and in some instances have been called in from the road. Pittsburg quotations are $2.60 for three-quarter, $2.50 for mine-run and $2.25 for slack, with Allegheny Valley about 30c. less. Coke remains firm at $4.25 for the best Connellsville foundry and $3.50 for stock.

Cleveland, Ohio

Conditions in the past week and up to the present writing, are worse than they were the week previous, owing to the continued shortage of cars. A great many of the mines in the Ohio fields have been closed down on account of this, and those that are working are only running about 35% of their capacity, 20% of which is absorbed by the railroads.

In the Cleveland market today, however, there are not over a dozen cars of coal of all kinds on track, where under normal conditions there should be from 300 to 400. Prices in consequence on all grades have increased from 20 to 30c. per ton, in fact it is not a case of price at all with parties requiring the coal. Reports are that a number of factories in Cleveland and the vicinity have been reducing their output and discharging men, and that a number have closed down altogether. The general impression among coal dealers is that conditions will become very serious in the near future.

Columbus, Ohio

Demoralization on all railroads leading from the Ohio coal fields and especially congestion at junction points have not been relieved and as a result the coal traffic during the past week was cut down to a small percentage of the usual figures. Suffering still continues in Michigan where many schools were compelled to dismiss, and practically all of the manufacturing establishments in many parts of Michigan have been compelled to close down.

Prices are still firm in every variety and district. Operators and jobbers do not anticipate any decline and it is generally believed that quotations will rule high from this time on. While the circular has not been advanced, premium coal is now the rule and any spot fuel will bring considerably more than the circular figures.

As a result of the transportation troubles it is almost impossible for railroads to get the empties back to the mines and the production in all the Ohio fields has been quite low. It is estimated that between 35 and 50 per cent. of normal will cover the output. Some of the sections are selling quite a tonnage of railroad fuel.

Retail trade has been good despite the warmer weather. Many of the domestic consumers were compelled to make their second orders as their supply was exhausted. The usual winter prices are prevailing in the domestic trade.

Prices in Ohio fields are as follows:

Hocking Valley	
Domestic lump	$1.60
¾-in.	1.40
Mine-run	1.15
Nut	1.20
Pea and slack	0.85
Coarse slack	0.75
Pittsburg No. 8	
¾-in.	1.15
Mine-run	1.05
Coarse slack	0.90
Pomeroy Bend	
Domestic lump	1.75
¾-in.	1.50
Nut	1.50
Mine-run	1.25
Small sizes	1.00

Hampton Roads, Va.

With the price of spot coal at Hampton Roads advanced to $3.50 yesterday, an increase of 80c. in two days, it is the opinion of a number of local coal men that the price will go to a high figure should the strike in England continue for any length of time. Four steamers have been chartered by the British Admiralty to load coal here, the charter calling for Gibraltar, but it is likely that they will be sent to another port from there, the freight rate being $4.80. One or more of the steamers are expected here this week, the ships under charter being the British steamers "Bleamoor," 2403 tons; "Corby," 2280 tons; "Kassala," 2498 tons, and "Teespool," 2938 tons.

An agent of one of the local companies said he had been approached by representatives of the Italian government for prices. He has furnished samples of coal and claims the prospects look good for a large shipment to that country. Representatives from Brazil have also been making inquiries regarding the price of coal from this port and it is likely that considerable business will be done with South America if the strike continues.

Coming as it does, when the coal operators shipping from here are swamped with orders and handicapped by lack of cars, the strike has caught the local shippers in a bad way. The price of coal on contract has not advanced any, nor will it, according to the local agents, but that spot coal would perhaps advance to $7 or $8 a ton in 60 days, should the strike in England continue, seems reasonable to believe.

It seems to be the prevailing opinion among the coal men, however, that the English government will bring the operators and miners to terms and the matter be settled before it reaches large proportions.

Louisville, Ky.

In a few instances retail coal dealers are advertising reductions in the price of coal despite the fact that March promises to more than retain its record for winter temperatures. Kentucky lump is being advertised at $2.75 a load; Kentucky nut at $2.65; Jellico lump, $3.40; Pocahontas, $3.25; Jellico nut and slack, $2; Straight Creek lump, $3.25.

These prices do not stipulate a 2000-lb. ton, however, and as a rule the dealers are holding, as yet, to their old prices. A number of them advertise the fact that they did not increase prices during the severe winter, now passing, and in this respect Louisville certainly made an enviable record.

Nashville, Tenn.

This section of the South is still experiencing good coal-selling weather, and the demand continues unusually brisk for this time of the year. Quite a good deal of coal has been sold during the past week in the West Kentucky field, for deliveries commencing Apr. 1, at good prices. It looks as though the nonunion field will certainly reap a rich harvest in event of a strike.

Up to the present time little railroad coal is being stored in this territory, but there are many inquiries for heavy tonnages in April, while few of the operators are inclined to quote for delivery after Apr. 15. Quite a good deal of coal has been booked for the first two weeks in April. Although there is still a good demand for screenings, on account of better car service during the past week, and plenty of domestic coal being mined, the situation has eased off considerably.

Indianapolis

The operation of several mines along the rivers and low lands was considerably interfered with by high water during the past week. Some mines were closed for a few days during the earlier part of the week, owing to the heavy snow, the miners not being able to get to the mines.

The demand for coal is good and the mines have orders booked to keep them busy on full time for several months.

Chicago

There has been a slight slump in domestic, while the price of steam coal remains unchanged. A lot of coal held out by the railroads has arrived on the market with a resultant weakening of some prices.

On the other hand, a continuation of buying for storage purposes has strengthened the market in other directions. Franklin County coal, which was selling several days ago at $2.25, wholesale, is now being disposed of at $2 and $1.75. The screenings market has advanced about 5c. a ton while some weakness has developed in anthracite. The price for Pocahontas mine-run is firm at $1.25 or better with occasional sales at $1.35. Coke is strong, Connellsville and Wise County being scarce; the market for the latter shows a 10c. advance. Hocking Valley coal has been slow in arriving at the market.

Prevailing prices at Chicago are as follows:

Sullivan County:	
Domestic lump	$2.62
Egg	2.62
Steam lump	$2.37@2.57
Screenings	1.97@2.07
Springfield:	
Domestic lump	$3.05
Steam lump	$2.32@2.42
Mine-run	2.07@2.17
Screenings	1.87@1.97
Clinton:	
Domestic lump	$2.57
Steam lump	$2.32@2.42
Mine-run	2.17@2.27
Screenings	1.87@2.00
Pocahontas and New River:	
Mine-run	$3.25@3.55
Lump and egg	4.20@4.30

Coke—Prices asked for coke are: Connellsville and Wise County, $4.85; byproduct, egg and stove, $4.95; byproduct, nut, $4.75; gas house, $4.90@5.

Minneapolis—St. Paul

Wholesale men say there has been a slowing up in the demand from the Northwest as the dealer refuses to stock up in anticipation of the much talked of strike. Retail merchants claim they have coal *en route* and figure that by the time deliveries are made on orders placed now there will be no market for the product and they will have to carry it over. Wholesalers argue that they should not bank too much on these shipments as the railroads are confiscating large quantities of coal for their own use and will continue to do so more freely from now on.

The steam users and retailers are laying in very little coal for storage purposes. The fact that during previous strike periods the docks at the head of the lakes have always been able to furnish supplies leads them to think that no matter what happens they will be able to get sufficient coal. This year they may find things different if the labor troubles continue very long, as stocks on the docks will most likely be cleaned up by Apr. 1. Prices at the docks on bituminous coals are reported to be at circular. Screenings are scarce and only small quantities can be had here and there. Southern Illinois coal is selling all the way from $1.75 up to $2.50.

St. Louis, Mo.

The St. Louis market is in a very unsettled condition. One day the demand will be exceedingly good and the next the supply will exceed the demand to such an extent that there will be a dropping off from 15 to 25c. per ton. The later part of each of the past two weeks a heavy snow set in, tying up the railroads for a day or two and pushing the Standard prices out of sight. It also stimulated the market to some extent on the other coals, but as soon as the weather moderated, prices went off again.

The railroads are still buying heavily, with the exception of the Frisco, which did not start until Monday of this week. The Illinois Central, it is understood, has purchased the output of approximately one-fourth of the mines on the St. Louis division, and this coal is being stored on the right-of-way. It is understood that the Burlington has bought in the neighborhood of 500 cars of Standard coal and also 300 of Eastern coals. There is some storing in the manufacturing lines in St. Louis and outside, but not to the extent that has been anticipated. Indications are that the market, both Standard and high grade, will grow stronger unless weather conditions are abnormally warm.

The high-grade coals from the inner district are bringing $1.25 and are in good demand; anthracite is moving fairly well at the current circular. Eastern smokeless is coming in slowly, but is in good demand, and gas-house and byproduct coke is moving freely at the prevailing circular of $4.75, St. Louis.

An approximate quotation of prices is as follows:

Franklin County	
Lump and egg	$1.75@1.85
No. 1 nut	1.70@1.85
No. 2 nut	1.60@1.75
No. 3 nut	1.35@1.40
2-in. screenings	1.10@1.20
Carterville	
Lump and egg	$1.70@1.85
No. 1 nut	1.60@1.70
No. 2 nut	1.50@1.60
No. 3 nut	1.30@1.40
Screenings	1.10@1.20
Mine-run	1.30@1.40
No. 1 washed	1.60@1.75
No. 2 washed	1.40@1.50
No. 3 washed	1.30@1.40
No. 4 washed	1.20@1.25
No. 5 washed	0.75@0.90
Standard	
6-in. lump	$1.75@1.80
2-in. lump	1.50@1.65
Screenings	1.05@1.15
Mt. Olive	
6-in. lump	$1.75
3-in. lump	1.75
2x6-in. egg	1.50
No. 1 nut	1.30

Salt Lake City, Utah

The past week has seen a brisk demand for coal, owing to a renewal of cold weather. Beginning Mar. 1, Wyoming coal is being sold in the Salt Lake market at the same price as the Utah; heretofore, Wyoming coal has demanded a slightly increased price.

Among the coal dealers there is great interest in the development of a big deal in Emery County coal properties by William G. Sharp, president of the United States Smelting, Refining and Mining Co., and Thomas Davis, of the Davis coal interests of West Virginia.

Mine prices are: Lump, $2.45; nut, $2.25; slack, $1.50.

Portland, Ore.

One cargo of Australian coal arrived here a few days ago from Newcastle, and the vessel is now at Astoria discharging part of it. The remainder will be brought to Portland. There is already an over-supply of Australian coal here, and this will probably have to be carried over for next season. Another cargo, due to arrive here in March, will be diverted to Puget Sound.

The demand for coal in this section will not be heavy until the wood supply runs low, or the opening of the Panama Canal, when there will be a demand for bunker coal; it is almost certain that a number of steamship lines will be established to ply between Pacific Coast ports and Europe.

San Francisco, Calif.

Last year foreign coal imports here aggregated 343,525 tons, of which 193,890 were from British Columbia and 149,635 from Australia.

The main source of the coke supply is Belgium and England and the imports for 1911 were 20,000 tons from the former and 15,000 from the latter, these figures include foundry, smelting and gas-house cokes. Owing to a sharp advance in freight rates, spot prices and for forward delivery are high, about $13 to $13.50 for foundry and $11 for gas house.

This winter has been marked with typical Californian weather and the movement of coal has been sluggish. Stocks on hand, while not large, are accumulating, but with the undoubted influx of people who will come here to participate in the building of the World's Fair in 1915, the coal merchants have every confidence in the future.

Current prices in the trade are as follows per long ton:

Wellington, British Columbia	$8.00
Pelau Main, Australia	8.00
American Cannel	8.15
Rock Springs	9.00
Cumberland	12.50
Peacock (Rock Springs)	7.90

Production and Transportation Statistics

Erratum

In the table of shipments over the Norfolk & Western Ry. for the months of January, 1911-12, appearing in Coal Age, Vol. 1, p. 662, the headings "1911" and "1912" should be reversed.

Baltimore & Ohio R.R.

Shipments of coal and coke over the lines of the B. & O. R.R. for the months of January, 1911-12, were as follows:

	1911	1912
Coal	2,352,240	2,443,528
Coke	271,217	329,556
Total	2,623,457	2,773,084

Imports

Imports of bituminous coal into the United States for January were 124,788 tons, valued at $349,709 as compared with 144,457 tons valued at $401,147 for the same month last year.

Exports

Comparative statement of fuel exports for January, 1911-12, is as follows:

	1911	1912
Bituminous	740,974	667,263
Anthracite	251,737	221,854
Coke	87,578	53,114
Bunker coal	481,874	552,965
Total	1,562,163	1,495,196

Island Creek Coal Co.

Severe winter weather has cut down production for the last two months. January output was about 125,000 tons and February was 145,000 tons. This is 80,000 to 90,000 tons less than the normal output for those months, had weather troubles been less acute.

Foreign Markets

France

The French imports and exports of coal for the year 1911 were as follows:

Imports

From	1911	1910
Coal		
Great Britain	9,099,265	8,470,527
Belgium	3,910,824	4,052,045
Germany	2,994,297	2,156,726
Other countries	226,317	227,965
Totals	16,230,703	14,907,263
Coke		
Belgium	482,655	495,610
Germany	1,787,853	1,737,645
Other countries	48,993	30,839
Totals	2,319,501	2,264,094
Briquettes		
Great Britain	121,989	121,006
Belgium	790,957	671,828
Germany	189,390	109,315
Other countries	86,990	72,366
Totals	1,189,326	974,515

Exports

	1911	1910
Coal	1,335,195	1,278,698
Coke	184,416	168,977
Briquettes	114,495	131,457
Totals	1,634,106	1,578,132

Egypt

Imports of coal into Egypt for the year 1911 were 1,581,620 tons, showing an increase over the year previous of 208,485 tons.

Great Britain

Coal is practically unobtainable on the market today, and in consequence business is at a standstill. Quotations for both large and small steams are purely nominal, as follows:

Best Welsh steam coal	$4.68@4.80
Seconds	4.32@4.44
Thirds	4.08@4.14
Best dry coals	4.50@4.62
Best Monmouthshire	4.20@4.26
Seconds	3.96@4.02
Best Cardiff small coals	3.42@3.54
Seconds	3.12@3.24

The prices for Cardiff coals are all f.o.b. Cardiff, Penarth, or Barry, while those of Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage, and for cash in 30 days—less 2½% discount.

Spain

Comparative statement of Spanish fuel imports, practically all from England, for the years 1910-11 is:

	1910	1911
Coal	2,021,116	2,055,468
Coke	294,158	316,448

Russia

Coal production of the Donetz Basin for the year 1911 was 16,380,000 metric tons, an increase of 7% over that for the year previous. Of the total 4,553,640 tons were destined for the use of railways, 3,701,880 tons were consumed by metallurgical works, 982,800 by sugar works, 7,108,920 by other consumers. and 32,760 tons were exported.

Financial Notes

A $15,000,000 company, backed by English capital, is being formed for development of Warrior coal fields near Birmingham, Alabama.

The earnings of the Philadelphia & Reading Coal & Iron Co. in January were so large that it is believed the officers expect a coal strike. The gross earnings of the coal company for the month showed an increase of $719,220, or about 17 per cent.; net earnings increased $243,888.

The International Coal & Coke Co. was closed from April to November last year on account of labor troubles, but since November it has been adding to the output until at present it is about 1000 tons a day. Expectations of a resumption to the 6% dividends is supposed to be back of the demand for the company's stock, in which the trade is active.

There are reports abroad that the Colorado Fuel & Iron Co. directors are planning to make a payment on the preferred stock of some of the accumulated dividends. On the $2,000,000 8 per cent. preferred stock that is outstanding the company owes something like $1,480,000, or 74 per cent. What seems to support the reports is the fact that the company's charter expires in October. It is said that before it can be renewed the indebtedness on the preferred stock must be paid off. Likewise, the preferred stock is selling around 115. Though dividends have not been paid since 1903, the company earned 62.98 per cent. on the preferred last year and in 1910 it earned 75.34 per cent. on the preferred.

The committee of the directors of the Sheffield Coal & Iron Co. appointed by the executive committee in November to work out a plan for the relief of the company's properties, some of which have lain idle since November, 1910, sent out a circular to stockholders recently giving balance sheets as of May 1, 1909, when the company in its present form began business, and of Jan. 2, 1912. There is a decrease in assets of $112,595 in the period. An accompanying statement of resources and their application shows for the period, losses on operations totaling $245,793. It was the default in the payment of $63,580 January interest on the first mortgage bonds and the approaching maturity of $82,000 of the company's notes on Apr. 1 which has brought matters to a crisis.

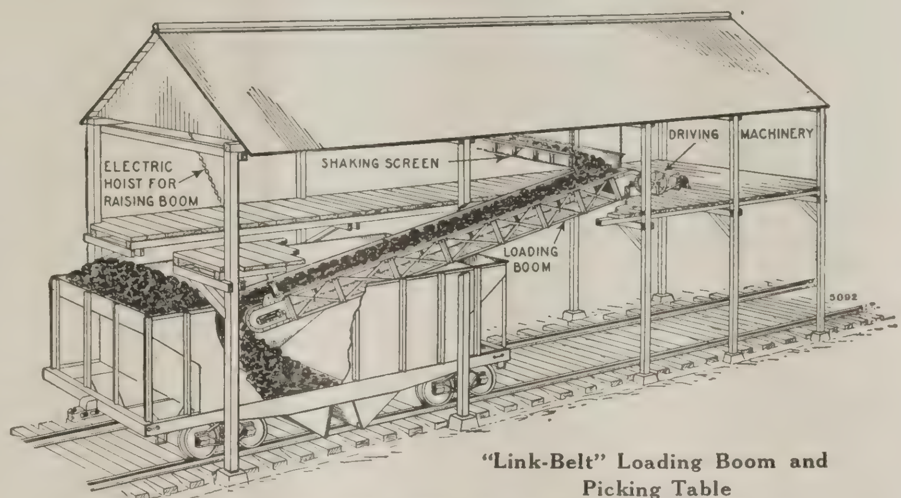
Deliver Clean, Unbroken Coal

To meet the present demand for clean, unbroken coal, the "Link-Belt" arrangement of Loading Boom and Picking Table has proved to be the most effective means of reducing breakage and delivering coal free from foreign matter.

As shown in the illustration, the coal is received from end of Shaking Screen and delivered to railroad cars with practically no breakage, as it is lowered—not dropped—to the bottom of the car.

Let our experienced engineers give you some practical suggestions for reducing the breakage of your coal to a minimum.

Write for Bulletin No. 133



"Link-Belt" Loading Boom and Picking Table

As installed for the United States Coal and Oil Co., Holden, W. Va.

"Link-Belt" Picking Table

We Design And Construct

Coal Tipples, Coal Washeries, Retarding Conveyors, Screening Equipments and machinery of every description for the handling of coal.

Our 88-page book No. 111—"The Handling and Preparation of Coal at the Mine"—illustrates the character of our work. A copy will be mailed postpaid upon request.

LINK-BELT COMPANY

PHILADELPHIA — CHICAGO — INDIANAPOLIS

New York, 299 Broadway
Boston, 131 State Street
Buffalo, 601 Ellicott Square

Pittsburgh, 1501-3 Park Bldg.
St. Louis, Central Natl. Bank Bldg.
Seattle, 118 King Street

Denver, Lindrooth, Shubart & Co.
San Francisco, Eby Machinery Co.
New Orleans, Wilmot Machinery Co.

Alphabetical Index to Advertisers

Classified Index to Articles Advertised

Fairmont

Endless Cable Car Hauls for Slopes

Endless Cable Car Retarders for Inclines

Strongest and Best

Install one and boost up your output

Steel Tipples and Complete Equipments

Write us before buying.

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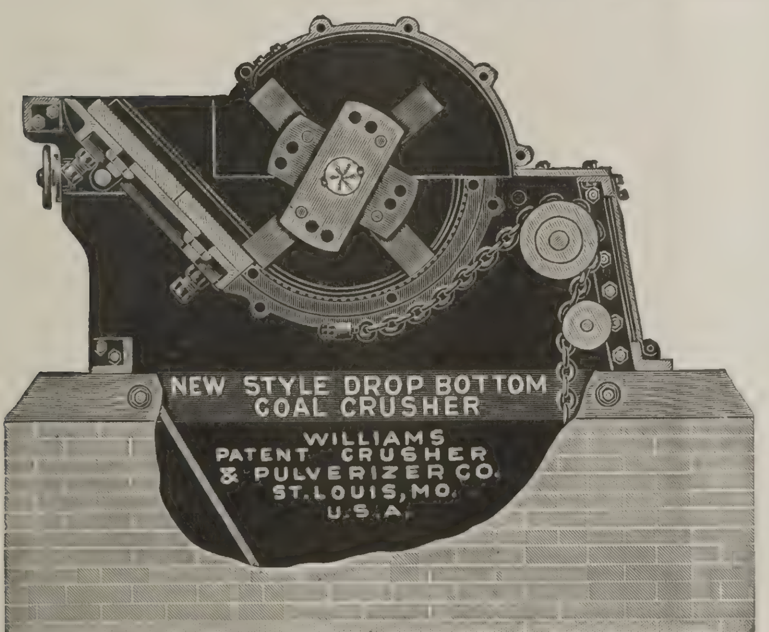
Marion Gas Coal Company, Enterprise, W. Va.

Fairmont Mining Machinery Company

Fairmont, W. Va., U. S. A.

A Better Method of Crushing And Its Better Results

Williams Coal Crushers



THE METHOD. The Hinged Hammer method of Coal Crushing is a succession of rapid impact blows caused by centrifugal action and heightened by the flexibility of the hammers which, with each revolution, strike the material between the points of the revolving body and the breaker plates and cage. The cage is the stationary grinding surface. Every other method of crushing is a constant rubbing between the grinding parts which creates friction and uses up power. In Williams Crushers every wearing part is adjustable to itself, to wear, and to every other wearing part.

THE RESULTS. Williams Patent Hinged Hammer Coal Crushers can crush more coal with less power and lower cost of maintenance than any other crusher on the market—and because of the feature of adjustability, the product is always uniform. That is why there are more than 2,000 in daily use. Our Catalog No. 5 gives full information. Write for it.

Manufactured and Licensed Under 87 Separate and Distinct Patents.

The Williams Patent Crusher & Pulverizer Company

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POSITIONS VACANT

Advertisements under this heading 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Wanted—An experienced mine electrician who can wind armatures and keep in thorough repair, a half dozen direct current generators, a dozen locomotives, and several motors located at different mines; salary $100 per month; location a plain mining camp, on short branch in central West Virginia. Wanted, by same company, a superintendent-foreman for small mine having an output of 400 tons per day, man who can survey preferred; state age, experience fully, where obtained, in what positions, education and where obtained, married or single, teetotaler or otherwise, and salary expected. Address Box 16, Coal Age. Mar. 9.

SITUATIONS WANTED

Advertisements under this head 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Position wanted as mining engineer by young man, 25 years of age; technical education; five years' experience as engineer of mines in operation and construction of new mining plants in the bituminous coal field; open for engagement April 1. Address Box 15, Coal Age. Mar. 9.

Commissary man wants position; if you have an opening for a store manager, write to the National Commissary Managers Association, 801 Manhattan Building, Chicago; good men will be recommended without charge; inquiries treated confidentially if desired. Mar. 23.

Experienced store manager desires to make a change; has made good record; will furnish best references. Address Box 14, Coal Age. Mar. 23.

Moments with the Advertising Editor

A Department for Subscribers Conducted by the Service Department of Coal Age

No good paper is owned by its advertisers. The readers hold title—free, clear, paid-up and no assessments beyond the subscription price.

And this is as it should be—and often is not.

Because there are certain classes of advertisers who seem to think that payment for space in the advertising pages entitles them to the use of the reading columns, and to dictate the policy of the paper, the color of the cover, the cut of the editor's clothes and the nature of his religion.

And there are some publications weak-kneed enough to fall for this sort of dictatorial policy on the part of big advertisers, with the result that the paper loses its greatest asset—the confidence of its readers.

And with the loss of the readers' confidence goes the value of the paper to advertisers.

No useful engineering paper can be established and prosper long that is not published first, last and all the time for the reader, that is not helpful to him, honest with him, showing him how to better his work or his condition. One that will take the side of a reader as against its best advertiser when the reader's interest is at stake.

And this is the principle upon which Coal Age is published—and we want readers to know that such is a *principle* with us and not a "happen chance."

We say that the confidence of readers is not to be trifled with, and that the placing in the reading columns of manufacturers' cuts and fulsome praise of their output is trifling with the reader and belittling his intelligence. Is it interesting and informative, is it new and news?—that is the measure which must decide, and the editors must be the judges and writers and the paper must make and pay for the cuts.

And Coal Age does these things, not because it likes to spend money, but because it knows that it is the best thing to do.

Every "house organ," every catalog, every circular holds a brief for the fellow who publishes it—and that is natural, and fair enough when the advertising is naked and not disguised in false whiskers and green goggles.

You accept the statements of manufacturers only after you have sifted and weighed their claims.

You look upon the editorial statements as authoritative because you know that the editors aim to make them such, and that they have the resources and knowledge necessary.

And so the good paper, the worth while paper, draws the sharp line between its reading and advertising pages and says, "Thus far and no farther."

If this sounds like a reflection upon the advertising pages it is poor shooting. We're proud of them.

We know that no technical paper carries a better lot of advertising, and none has better concerns represented. We know that, as a rule, the advertising is interesting and informative.

We believe that every advertiser has grasped and applied the fundamental principle of profitable advertising—sincerity and truth.

We have confidence in our advertisers and want our readers to share it.

But advertising in this paper must be done in the name of advertising, and not try to sneak in at the back door.

Then the readers win—they know where they're at; the advertisers win—they share the readers' confidence. The paper wins—its stand is recognized and appreciated.

And *that* is a trinity, close-knit, that carries no such word as failure in its lexicon.

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 23.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, MARCH 16, 1912

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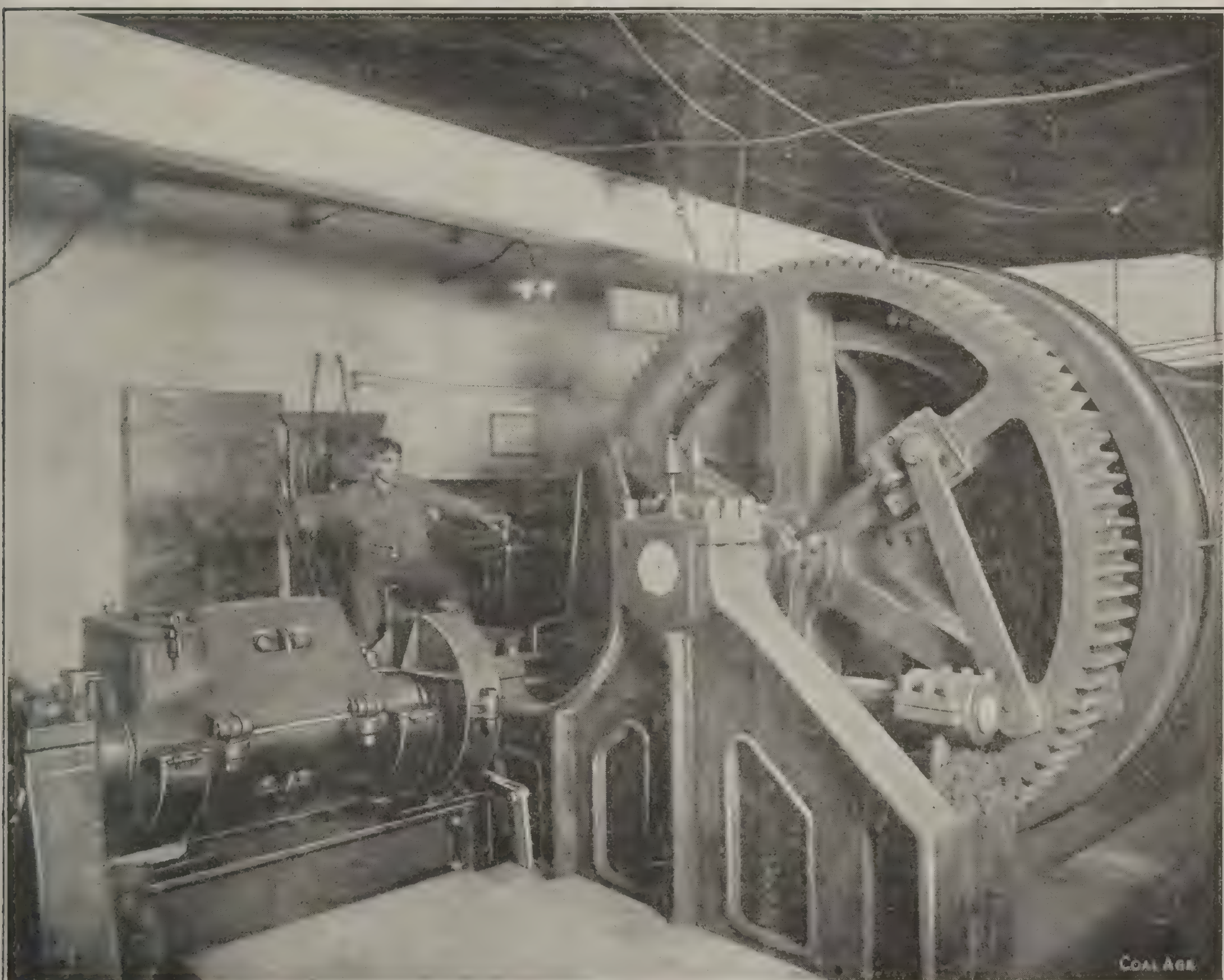
Canada, $4; Other Countries, $5.



An Electrically Driven Slope Hoist in the East Cooper Workings of the D. L. & W. Company's Woodward Mine, Kingston, Penn.

This hoist handles 5-car trips at a speed of 500 ft. per min. It is equipped with a 6-ft. diameter drum, which winds 3600 ft. of 1-in. rope, and is driven by two 80-hp., 500 volt, totally incased motors. A clutch drive and band brake permit the length of haul to be adjusted, and a load to be lowered, without operating the motors. The motor casing forms a guard for the transmission gears as well as a protection for the electrical parts. This installation illustrates the application of an electric drive to an equipment formerly operated by steam power.

COAL AGE

Vol. 1 NEW YORK, MARCH 16, 1912 No. 23

THE anthracite mines in Pennsylvania are practically the only important collieries in the world that are operated under a system where the state inspectors are selected by popular vote instead of appointment. The latter plan was abolished in 1901 when the Pennsylvania Legislature amended the anthracite law in compliance with the demands of the miners.

The present statutes, like those formerly in force, provide that no man is eligible to serve as an inspector until he has answered ninety per cent. of the questions propounded at a specially authorized examination. Nominations for party election, therefore, have to be made from among those who have successfully qualified for the position.

The former system, based on selection by appointment, was not perfect, but when compared with the present vicious practice, founded on the uncertain whims of temporary political fancy, it was as the sublimity of virtue contrasted with the evil of vice.

In seeking the change, the miners were led to believe that their interests and safety would be better guarded if inspectors were elected. It was asserted to them that the new scheme would eliminate corporation control of the men chosen, and that the proposed plan would open the way to quicker advancement for ambitious miners.

The plain truth is that the standard of mine inspection in the anthracite field has been lowered. What was intended to be a remedy has proved nothing less than a worse disease. The dignity of the office has been reduced and efficiency and independence largely destroyed.

Under the present plan, the inspector must cater to the wishes of political leaders. He is often made the instrument of retaliation, and at times is obliged to leave his post of duty, and precipitate himself into the midst of a political campaign, spending weeks in electioneering and thus neglecting the work for which the state pays him.

Furthermore, the perniciousness of such an election system doesn't end with inefficient colliery inspection; it extends to the actual operation of the mines, in that it has a direct bearing on the selection of mine foremen and firebosses. The inspector is a member of the examining board, and recent cases have occurred where candidates unqualified in training, but possessing political influence, have secured foreman and fireboss certificates when all facts argued their incompetency.

Interested parties backed by certain papers have recently suggested a still further step toward the complete demoralization of the anthracite inspection service. They advocate that all mine foremen be made eligible for election as inspectors, and recommend the abolition of the present system whereby only candidates who have successfully passed an examination, are permitted to go on the ballot.

In addition to all that has just been stated, the present method of choosing the inspectors is unfair. Instead of the voters in a certain district electing their own inspector, the people (including farmers and tradesmen) in another nearby district, vote for the candidate who aspires to serve at mines in which they have no interest or acquaintance.

Laws are of no avail unless they are enforced. If the public approves an inspection system that encourages laxity in the observance of vital legislation, then the people, or rather their representative, the state government, should assume responsibility in case of accidents.

Last year in New York City, there were 35,000 burglaries—how many more were not reported we hesitate to guess. This record of crime, which in comparison, makes Hell's Kitchen, Arizona, look like a Sunday meeting of the Y. M. C. A., was caused by corrupt politics. Each man from the top official down to the lowliest patrolman is so busy "getting his" he hasn't any time to do duty as a policeman.

In contrast, look at our fire departments. Here "big business" has stepped in and declared: "We can't have fires; millions in property are at stake." What is the result? Efficiency, courage and an "always on the job" spirit pervade the service. Politics hasn't been permitted to embrace the department in its deadly clasp, and the men are seldom changed. By years of service they become experts in execution and models in obedience. Start to a New York fire and ten to one you will meet the engines coming back.

Why is it we view the safety of life in our anthracite collieries with less concern than we do property values? And why do the men themselves, who are most vitally concerned, permit self-interested leaders to hoodwink them into advocating and supporting a system fraught with danger to mines and men? Let us have any system, where the candidates are examined and appointed by the governor in the order of merit, rather than the present practice, where an inspector is liable to be ousted just when he has become familiar with his properties, and is prepared to be of maximum service to all concerned.

What do our readers think about this question?

Mining Methods in Illinois

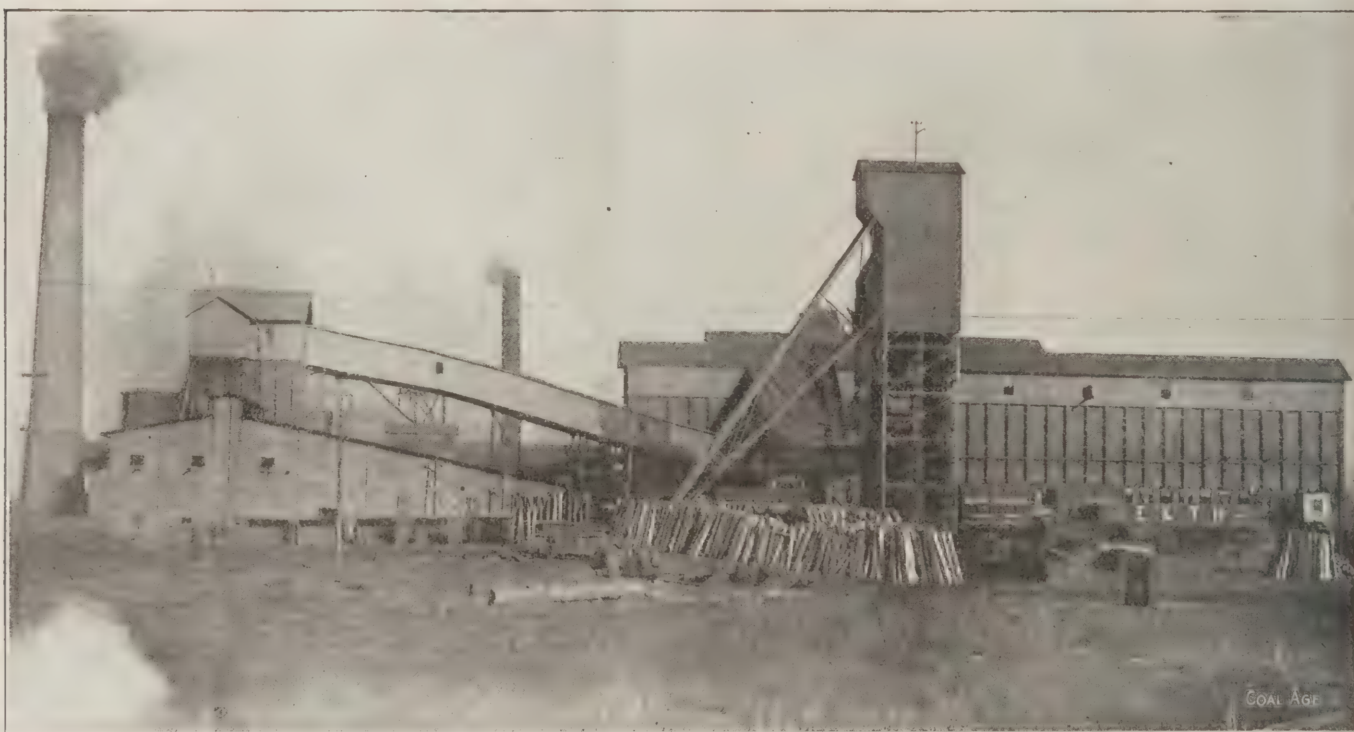
By M. F. Peltier*

A general description of one of the most important fields in Illinois. The equipment of the plants is modern in every respect and large tonnages are produced. The mines are mostly shaft openings, but comparatively shallow.

*Mining engineer, Peabody Coal Co., 2535 South Park Ave., Chicago, Ill.

The Williamson County coal field or, as it is better known, the Carterville Bed, underlies the whole north half of the county and is found at different depths up to 200 ft. This field belongs to the Eastern Interior Coal Field, and the seam is designated by the Geological Survey of Illinois as the No. 7 seam. The thickness is from 8 to 9 ft. throughout the developed portions of the seam.

The salient feature of the field is an elongated basin, toward which the strata dip from every direction. The highest portion of the basin is in the southern part of the county. The coal outcrops about 1½ miles north of the city of Marion. The central part of the field is disturbed by a sharp fold or fault, with a down-throw of several feet. This fault extends from the outcrop in a northerly direction, and crosses the property of the Chicago & Big Muddy Coal Co. near their main shaft. The displacement at this point is nearly 50 ft., which necessitates using an incline to handle the coal.



Surface Plant at the Peabody Coal Co.'s Mine No. 3, Marion, Ill.

Historical

The exact date of the discovery of coal in Williamson County is not known, but as early as 1850 coal was mined on the farm of Elijah Spiller, at Spillertown. The methods employed in mining, those days, were primitive. The coal having a light cover, they usually sunk a shaft about 8x10 ft., and mined out only a small portion within easy reach, abandoned the shaft, and sunk another.

This coal was used only for smithing purposes, wood being so abundant at that time that coal was not used for fuel. It was hauled by wagons to Franklin, Saline and Jefferson Counties for the leading blacksmiths, and was known as the Famous Peacock Smithing Coal, on account of its peculiar formation and beautiful coloring effects.

The first incorporated company and shipping mine was formed in 1872 at Carterville, and was known as the Carbondale Coal & Coke Co. This mine was operated as a slope and very primitive methods of mining were employed. The mining was all done by hand, powder or other explosives not being used; only screened coal was marketed, the slack and dust being left in the mine. The Herrin field was opened up in 1896, the Big Muddy Coal & Iron Co. being the first to operate a mine in this district.

The first railroad built in the county was known as the Carbondale & Shawneetown R.R., and extended from Carbondale to Marion, a distance of about 18 miles. This road was completed on Jan. 20, 1872, at Marion, and later was extended to Paducah, Ky. The road changed hands several times and was finally taken over by the Illinois Central R.R., the building of which caused considerable activity in coal mining in this region.

Production and Quality of the Coal

The Carterville bed is remarkable, not only for its variations in quality and thickness, but also because it is free from horsebacks, slips and other irregularities, encountered in other fields. This and the Franklin County field are considered the most important in the state. The coal shows a calorific value as high as 13,000 B.t.u. The following analysis of a sample from the Peabody Coal Co.'s Mine No. 3, at Marion, may be taken as typical of the field as a whole:

Moisture	5.70
Fixed carbon	55.31
Volatile combustible	32.00
Ash	5.91
Sulphur	1.08

Williamson County is the largest producing county in the state, and according to the Illinois Coal Report produced 5,908,544 tons of coal last year; this is considered a remarkable record, in view of the fact that the average number of working days during the year was only

161. This reduction in work at the mines was caused chiefly by the delay in the operators and miners reaching an agreement upon a wage scale because of which mining was suspended from Apr. 1 until Sept. 10, 1910.

There are 38 shipping mines in the county and 17 small local mines. Williamson County has advantages over other mining districts, in regard to transportation, having six large railroads traversing it, which not only insure a good supply of cars, but give the operators an unlimited market for their product.

System of Working

A general uniformity in mining methods prevails throughout the county, with the exception of slight modifications which are rendered necessary where the seam dips from 2 to 3 per cent.; then the main entries follow the dip and the side, or stub, entries are turned off at angles to secure easy haulage and drainage. The room-and-pillar system is universally used throughout the entire field. The mines are nearly all opened by shafts, although there are a few local mines opened by drifts where the position of the outcrop renders it possible.

The majority of the mines are laid off in panels. The main and stub entries are driven 12 ft. wide and 20-ft. pillars are left between entries. Rooms are turned off the stub entries at right angles on 34-ft. centers and driven 250 ft.; they are 20 ft. wide, have 14-ft. pillars, and crosscuts every 60 ft., as prescribed by the state mining law. The main and side entries are protected by a barrier pillar from 50 to 100 ft. in thickness.

Pillars are not drawn in this field, but when a room is completed a start is made from the face and a slab taken off along the rib, leaving only a thin pillar to support the roof. Complete robbing of the pillars has not been very successful, owing to the thin covering and weak roof; when there is a large space left open it generally caves to the surface, giving considerable trouble, due to surface water.

The roof throughout the different mines is considered only fair; the majority of the operators leave a portion of the top coal in the entries to support the roof and when this gives way immediate timbering is necessary to secure the slate above it. At the main landings, near the shaft bottoms, the roof is supported with steel I-beams on masonry walls, or heavy white-oak posts. The rooms are all timbered with a double row of posts spaced at least 6 ft. apart.

Water Problems and Mining Methods

Most all the mines have considerable water to contend with. Small pumps are used to collect the water from the workings near the coal face and deliver it to a large sump, which is generally located at some convenient place near the shaft bottom; from here the water is thrown to the surface by a single large pump. There are a great many different types of pumps used, the electric being one of the favorites for inside work.

The mining conditions in general are quite favorable for both picks and machines. In the pick mines, the coal in the rooms is all blasted from the solid with black powder. The entries are cut or sheared in the center by the miner, who uses a light short pick for that purpose. The cutting is made from 8 to 10 ft. long, and only sufficiently wide to admit the miner.

An Underground Scene at the Peabody Coal Co.'s No. 3 Mine

In the machine mines the undercutting is done in the bottom coal, both in rooms and entries. The electric chain breast machine seems to be preferred, although there are a great many punching machines used, which are operated by compressed air. Over 33 per cent. of the entire tonnage was cut by machines in Williamson County last year, notwithstanding the unfavorable machine mining rate, there being a differential of only 7c. per ton between machine and pick mining. The pick miner receives 54c. per ton of mine-run while the machine runner, helper and loader receive a total of 47c. per ton.

The holes for blasting are drilled with the usual hand drills; the depth of the holes depends entirely on the length of the cutting. The amount of powder used is measured by the number of inches in the length of the cartridge; a 2-in. cartridge, which is generally used, contains a little over one pound to the foot. The miners are not very particular in regard to the amount of powder they use, as they are paid on a mine-run basis, and the more powder they use in blasting and breaking up the coal, the less the labor of producing it.

Map of the Peabody Coal Co.'s No. 3 Mine, in Williamson County, Illinois

Mining Details

According to the Illinois Coal Report, there are 24 mines in which machines are not in use; 6 mines in which machines are used exclusively, and 9 in which both pick and machine mining are used. There was approximately 1,832,915 tons mined by machines and 3,714,443 by hand. After the Cherry mine disaster the state legislature passed a law, compelling all operators to install telephones in the different mines, for use in case of accidents or fires. The telephones are used, not only for communicating in cases of threatened danger, but also in the general operations of the mines.

There are two different kinds of haulage in common use in the mines, mule and electric. The mules are used for gathering the cars from the coal face and delivering them to a parting; the electric motors take the coal from the partings to the shaft bottom where it is hoisted to the top. Gathering motors, used instead of the mules, would be of material advantage, owing to the fact that most of the mines use a large mine car, some of which have a capacity of from 3½ to 4 tons.

In all of the large mines the track on the main haulage roads, where motors are used, is laid with 35- and 40-lb. steel on large white-oak ties. The side entries and rooms are laid with 16-lb., and the bottom partings at the shaft with 60-lb. steel.

There are two methods employed in caging the coal. In some mines the coal is caged on both sides of the shaft while in others all the caging is done on one side, the empties being taken off on opposite side. The method of caging on one side is more generally favored. The mines throughout Williamson County are well ventilated. The type of fan generally used is the blower, and is generally reversible. The mining laws of the state require that the quantity of air in circulation shall not be less than 100 cu.ft. per minute, for each person, and 600 cu.ft. per minute, for each animal in the mine.

Preparation of the Coal

A great deal of attention is paid to the preparation of the coal, every precaution being taken to see that the product is well cleaned and sized. The coal is all hoisted with self-dumping cages, dumped from the mine car into a weigh pan, and then passes over a double shaker screen. The top screen has 3-in. perforated-plates that allow the nut and slack to fall through on the bottom screen, which separates the nut

from the slack, or collects the two together as may be required. The portion of the coal that goes over the 3-in. perforated-plate, then passes over a section of 6-in. perforated-plate, making a 3-in. egg and a 6-in. lump. Four railroad cars are loaded at one time by this method.

Coal washing is carried on extensively throughout the field; at mines, where they have washing plants, all of the 3-in. or small coal is washed. The principal impurities in the coal are ash, in the form of slate, and sulphur in the form of pyrites. The large pieces of slate and sulphur can be removed from the egg and lump by hand picking. After the coal is thoroughly washed it is carefully separated into different sizes. Washed coal finds a ready market, as it has a greater calorific value.

Summary

The mining districts throughout the county are all pleasantly located, especially at Herrin and Marion. Marion is the county seat and is an enterprising city of nine thousand inhabitants. The miners are of superior intelligence, mostly Americans. The majority of them own their own property.

The shafts throughout this field have double hoisting compartments, and the tipples are built mostly of steel and equipped with all modern appliances to handle and screen the coal with the least amount of breakage. The engine houses are generally built of fireproof material and first-motion engines are mostly used. The boiler houses also are built of fireproof material and are usually equipped with tubular boilers.

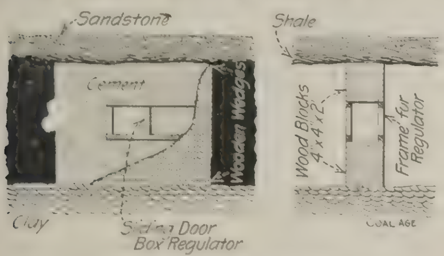
The same conditions exist in this district as in the whole competitive field, that is, the output far exceeds the market requirements. The competition is so keen and the selling price so close to the actual cost of production that there is often nothing left to take care of the depreciation of the plant and equipment, much less a fair interest on the investment. The chief beneficiaries of these conditions are the railroads, who generally name the price they will pay for coal.

Wood Block Stoppings

By Joseph Daniels*

Although gob, brick and concrete are widely used for mine stoppings, the use of timber blocks for this purpose is by no means common. In the mines of the Roslyn Fuel Co., at Roslyn, Wash., however, wooden blocks, 4 in. square and 2 ft. long, are in general use for building stoppings and dams.

The floor in the crosscut, or passage, in which the stopping is to be erected, is leveled off and the rib coal is cut away to a depth of 4 in., and for a distance of 2 ft. along the length of the passage, 2 ft. being the length of the blocks used. Also, the roof is straightened up as well



Wood-block Stopping

as possible. A course of blocks is laid on the floor and in each succeeding course the joints are broken or staggered. The 4-in. notch in the rib coal permits of a better bond than would otherwise be possible, and when the courses of wooden blocks are laid up to the full height of the opening, wooden wedges are driven in around the sides and top of the stopping to make the whole mass as compact and secure as possible. Later, both faces of the stopping are covered with a cement mortar, mixed from one part cement and two parts sand.

When the stopping is part of an overcast, the construction used is practically the same as described above, except that wooden stringers are placed on top of the stoppings to carry the bottom timbers of the overcast proper.

In some cases it is necessary to provide a door regulator in the stopping. With the wooden-block form of construction, this is easily accomplished by making two frames of the desired cross-section and placing these in position when building up the blocks. The necessary opening is thus left and the usual sliding door for regulating the amount of air is placed on the outside of the stopping, as is common practice.

The advantages claimed for this method of building a stopping are: 1. Low first cost; an ordinary workman can erect a stopping 6 ft. wide and 5 ft. high in eight hours, and the cost of materials, wood and cement facing, are exceedingly low. 2. The stopping is absolutely airtight and any squeeze or pressure coming on the wall compresses it and holds it together better than would be the case with other materials. For building dams, a similar method of construction is employed, the size of the blocks and their length being varied to suit the particular conditions existing at the mine.

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Coal Famine at Butte, Mont.

Editorial Correspondence

Our worthy contemporary, *Fuel*, says in a recent issue:

> While there never was what might be truly termed a coal famine in Butte, Mont., there have been times in past winters when there was danger of one. Since the Roundup Coal Co. commenced to send its supply to Butte, however, all danger of a coal scarcity was eliminated. The late W. W. Taylor, general superintendent of the coal property of the Milwaukee R.R. Co., once said that all along the line of the road in this state there never would be a scarcity of coal, even if the road had to buy its own fuel. His statement has been borne out by facts and over the Milwaukee line, from the famous Bull Mountain field, has since come a continuous supply of coal which has increased in volume from month to month. The figures for all the months of the winter show large increases over last year. Even if less coal is consumed on the hill at the present time on account of the use of compressed air for hoisting purposes supplied by electricity, the diminished demand for coal has not affected the Roundup company.

With due respect to Mr. Taylor as a man who stood at the top of his profession in the West, other operators in Montana will probably take exception to the above statements.

In the fiscal year ended Oct. 31, 1911, Musselshell County, in which the Roundup mines are located, produced 643,648 tons. During this same period, Cascade County produced 948,823 tons while Carbon County showed a production of 1,226,783 tons, or nearly twice that of Musselshell County; in fact, the production of Musselshell County is only a trifle over one-fifth the total output of the state, and in addition to this, heavy tonnages of Wyoming coal are shipped into Montana.

Despite the reassuring words of *Fuel*, we do not believe that any particular congratulations are due the consumer in Butte because of the Roundup mines.

Anthracite Storage Possibilities

Apropos of the impending strike, facilities for accumulating surplus supplies are of interest. Eliminating the storage facilities in yards and on piers at seaboard or lake points (for which there are no figures), it is estimated that the storage capacities of the principal operating anthracite companies are as follows, in long tons:

Lehigh Valley R.R.	1,585,000
Reading	1,110,000
Pennsylvania (Susquehanna Coal Co.	880,000
Erie (Pennsylvania Coal Co.)	565,000
Central R.R. of New Jersey (Lehigh & Wilkesbarre Coal Co.)	560,000
Delaware & Hudson	270,000
Lehigh Coal & Navigation Co.	240,000
Lackawanna Coal Co.	200,000
Ontario & Western	180,000
Total	5,590,000

Coal Mining Institute of America

A meeting of the board of directors was held in the office of S. A. Taylor, Pittsburg, Mar. 9. Seven members of the board were present. It was decided to hold the summer meeting of the institute in Johnstown, Penn., June 19 and 20, and to confine the sessions to a discussion of practical problems.

Electrical Machinery for Coal Mines

By Sydney F. Walker*

The shunt-wound continuous-current motor and the three-phase induction motor are the types best adapted for general use in colliery work. The similarity of the two forms, their advantages and disadvantages, are here discussed with special reference to their constant speed and self-governing properties.

*Bloomfield Crescent, Bath, England.

For practical purposes, the shunt-wound continuous-current motor and the three-phase induction motor, are best adapted for use in colliery work. Series-wound, and compound-wound continuous-current machines are, of course, readily obtainable, but except in special cases, the shunt-wound continuous-current type is the one most suitable for almost every kind of colliery work that can be named.

Comparison of the Two Types

The shunt-wound continuous-current motor and the three-phase induction motor have gradually forced their way into general use, not only in coal mining, but in a great many other industries. There is a striking similarity in their behavior, particularly in the matter of government. The shunt-wound continuous-current motor, and the three-phase induction motor are the most perfect self-governing machines for the delivery of power, that have been devised up to the present.

It will be remembered that when driving machinery with steam engines, even those having the latest modern governors, a certain sensible time is required to admit the additional steam demanded with an increased load, or to shut off the steam that is not required with a decreased load. Further, it will also be remembered, that while steam engines are now made to maintain a uniform speed within about 2 per cent. of the normal, government for an increase or decrease of load is always preceded by a slight slowing up or increase of the speed of the engine, the speed returning to its normal value only after the new conditions of steam requirements are accomplished. The same remarks apply to engines driven by compressed air. And the reason for this is that there are three or four sets of apparatus which have to take part in the operation.

In the case of a steam engine, for instance, if the load increases, the engine slows slightly; the governor balls fall inward slightly, and either the throttle valve is opened a little more, or the slide valve or its equivalent, is caused to remain open for a little longer portion of the stroke. In any case, the operations one after the other take a certain sensible time, and while they are going on, the driven apparatus has its speed varied

With the shunt-wound motor, and the three-phase induction motor, the operation is practically instantaneous, and is perfectly automatic. In the case of both machines, with an increased load, the rotating portion slightly decreases its speed and this decrease of speed allows the necessary increase of current to pass through the coils of the machine to furnish the increased power required. With a decrease of load, the rotating portion slightly increases its speed, thereby automatically cutting off the excess current that is now no longer required. In both cases there is a difference in the speed at which the motor runs with different loads, but the difference throughout a wide range of variation of load, is trifling.

In the case of the three-phase induction motor for instance, what is called the slip is never more than 4 per cent., except when an excessively abnormal load is being driven. As explained in a previous article, the motor will go on slowing up, and will deal with largely increased loads at lower speeds, but for ordinary work, such as would be dealt with by a well governed steam engine, the variation of speed between no load and full normal load, is trifling. For all practical purposes the speed is constant. In the case of both classes of motor, it can be made absolutely constant, if the machine itself is made large enough.

How the Government Is Accomplished

As mentioned above, the governing is perfectly automatic; it depends upon the application of the same principles in the two machines, but in a slightly different manner. The government of the shunt-wound continuous-current motor depends upon the fact that the armature of the motor, when revolving, creates a reverse pressure, tending to reduce the current passing through the motor coils. When the motor is at rest, the whole pressure of the service, if allowed to do so, would drive a large and destructive current through the motor coils. To prevent that, the well known starting switches and resistances are employed, which reduce the pressure applied to the motor on starting, and until it has come up to its normal speed. The conductors upon the armature of the shunt-wound motor, being in motion in the magnetic field in which the armature as a whole revolves, obey one of the laws of magneto-electric induction, and create an electrical pressure in their own coils, directly opposing that of the current which is causing them to rotate.

The working current with a continuous-current motor is the difference between the service pressure, and the reverse pressure created by the armature coils when running. This difference of pressure is usually a very small percentage of the service pressure. The energy taken by the motor, and converted to mechanical power, is measured by the electrical pressure delivered to the terminals of the motor, multiplied by the current passing through the motor coils; but the current passing through the motor coils is due to only a small pressure, usually a few volts. The electrical resistance of the armature coils of a continuous-current motor is small, and therefore a small pressure is sufficient to drive the necessary current through them. Hence it follows that a very small increase or decrease of the pressure causing the current to flow through the armature coils, is sufficient to cause a comparatively large increase or decrease of that current. Hence the automatic and perfect government.

The Government of the Three Phase Induction Motor

In the case of the three-phase induction motor, the currents passing in the rotor coils are due to the difference in the speed of rotation between the rotor itself, and the revolving magnetic field. This difference is called the slip. If it were possible to eliminate all the load upon the rotor, it would revolve at the same rate as the magnetic field, and the current created in the coils of the rotor would be nil. With a light load, the rotor increases its speed, and thus decreases the slip, and with it the current created in its own coils. With an increased load, the rotor increases its slip, and with it the current created in its own coils.

Again the electrical energy delivered to the three-phase induction motor is measured by the pressure at the terminals and the currents passing. To find the actual amount of energy, the power factor, and another factor required by the three-phase system, have to be taken into account, but they need not be mentioned here. The currents passing in the rotor coils are "induced" in them by the variations in the currents passing in the stator coils. The action is exactly like that in the stationary transformer, with the difference that in the case of the three-phase induction motor the secondary coils are in motion, whereas in the ordinary static transformer they are fixed. The same series of operations, however, goes on.

The quantity of current passing in the stator coils is determined by the load upon the rotor, and this again determines the amount of slip between the rotor and the revolving field. While the variations of the currents passing in the stator coils induce the currents in the rotor coils, the latter also react upon the currents in the stator coils. When the slip is small, that is to say, when the load is light, the inductive effect of the rotor coils upon the stator coils tends to decrease the current passing in the stator coils, by causing an increase in the reverse pressures, much as with the continuous-current motor. When the load is increased, and the slip is increased, the inductive effect of the rotor coils upon the stator coils is lessened, with the result that more current flows through the latter, the effect being the perfect self-government that has been mentioned.

Another Point of Similarity.

Another important similarity between shunt-wound continuous-current motors and three-phase induction motors, but one which so far has not had any appreciable effect in colliery working, so far as I am aware, is the fact, that both machines are reversible in the sense of working as either a motor or a generator. When furnished with an electric current, they will deliver mechanical power; and, on the other hand, if driven by mechanical power, they will furnish electric currents.

The shunt-wound continuous-current machine is made originally to be used either as a motor or a generator. Its reversibility comes into play in a case where it may be driving some machine as a motor, and under certain conditions, the machine takes charge of it. The electric tram car illustrates this point. If shunt-wound continuous-current motors are employed in driving tram cars, they furnish mechanical power, under all conditions, except when going down hill. When descending a steep gradient, it should be possible to use them as efficient brakes. The power delivered to them by the descending car, should pump current back into the trolley line. It has been found somewhat difficult, however, to arrange for this in practice.

The three-phase induction motor will behave in exactly the same way, although I believe there have been no cases where this property has been made use of. It might be, however. It should be mentioned that all motors and generators are interchangeable; that is to say, they will all work as motors or generators, but the conditions of working, the conditions under which they will produce motive power or current, are usually different from those ruling with shunt-wound continuous-current, and three-phase induction motors. The great advantage about these two forms of motor is the practically constant speed. As mentioned above, it is not actually constant. It varies with the load, but only slightly; and when reversal of operation takes place, when a machine that has been running as a motor, furnishes current as a dynamo, its speed should be approximately the same.

Speed Regulation of the Two Types

This is the point at which the two forms of apparatus part company. The speed of the shunt-wound continuous-current motor can be regulated within wide limits. The shunt-wound motor, as ordinarily constructed, can be made to vary its speed 25 per cent. on either side of the normal, if required, by varying the current passing through its field-magnet coils. Weakening the current passing through the field, allows the motor to run faster; and if more current is at the same time allowed to pass through the armature coils, more work will be done, and *vice versa*.

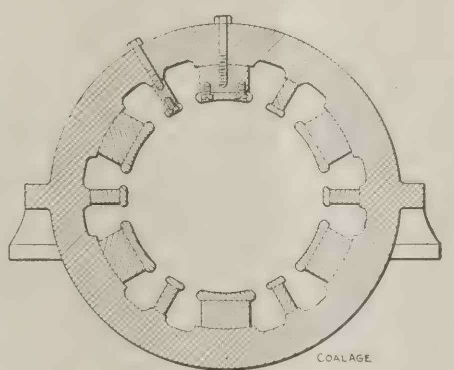


Fig. 1. Field of Interpole Type of Motor

There is a limit, however, to varying the speed of the shunt-wound motor, owing to the increase of sparking at the brushes. The brushes are mounted upon a rocking arrangement, which allows them to be adjusted to meet the difference in the strengths of the magnetic fields produced by the field magnets, and the armature. It may be mentioned that it is the struggle, as it were, between the magnetic fields created by the two parts of the machine, which leads to a certain amount of the sparking. When the magnetic field of the electro magnets is decidedly predominant, sparking is reduced to a minimum. It increases with everything which lessens the difference between the strengths of the two fields. Hence, when the current in the field-magnet coils is reduced, and that in the armature coils is increased, the tendency to sparking also increases.

The sparking is reduced by moving the brushes through a certain arc, but a limit is found when reduction of sparking is no longer possible. For shunt-wound motors which require to have their speeds regulated between wide limits, special provision is made by the addition of what are called commutating poles, or interpolar field magnets. Small electro magnets are fixed on the inside of the containing cylinder, , pointing radially inwards, similar to, but smaller than the field magnets proper. The office of these is to neutralize the excessive sparking, by practically suppressing the current which passes in each coil as it moves under the brush. With commutating poles, the speed of shunt-wound continuous-current motors may be varied in the ratio of 1 to 6; that is to say, a machine running at 400 r.p.m. may be run at from 100 up to 600. Fig. 1 is a cross-sectional view of the containing cylinder and field magnets of an interpolar machine.

It should be understood that the shunt-wound continuous-current motor has two properties. When furnished with its normal field-magnet current, it will run at an approximately uniform speed, varying only slightly with large changes of load. It can also be arranged to have its speed varied within the wide limits mentioned above, and the two properties can be combined in the same machine.

It also has another property. It will go on furnishing power when demanded, by steadily slowly up, and allowing more and more current to pass through its armature coils, until the heating effect of the current is so great that the insulation is destroyed.

Speed Variation of the Three-Phase Induction Motor

With the three-phase induction motor, the means of varying the speed are but meager. Certain fractions of the normal speed may be obtained by cutting out a portion of the magnetic fields. It was mentioned above that there are several sets of coils in the slots of the drum forming the stator. Each set of coils and the set on the opposite side of the drum, represent a group of magnetic fields and a pair of magnetic poles. By cutting down the number of pairs of poles by half, the speed at which the motor runs is reduced in the same proportion. Similarly by cutting it down 25 per cent., the speed is reduced by 25 per cent.

The speed at which the motor runs depends upon the number of pairs of poles in the stator, and the periodicity of the currents. The usual periodicity with modern alternating-current machines is 50 periods per second, or 3000 per minute. For a machine to run at 500 r.p.m., therefore, there will be six pairs of magnetic poles, twelve sets of currents. By cutting out two sets of poles, the speed would be reduced by 33 1/3 per cent and so on.

News of the Coal Strike Situation

Special Correspondence

The demands of the anthracite miners have met with a blunt refusal; and modifications must be discussed or a strike called. The bituminous fields await the result of the joint conference in Cleveland, Mar. 20. Progress of strikes in Great Britain, Germany and France.

Over 1,000,000 miners have been on strike in Great Britain since Feb. 29; about 200,000 men are now striking in the Westphalian coal fields of Germany; two-thirds of all the French coal-mine workers recently indulged in a 24-hour exhibition strike to proclaim their unity in support of certain demands; 45,000 miners in Belgium now threaten to strike; and in the United States "coal strike" is being talked of from one end of the country to the other.

There is little doubt that the strike of British miners has exerted at least a moral influence in bringing about the minor demonstrations in Germany and France. It may be expected that it will also, to some extent, have a similar influence in the United States.

The demands of the anthracite miners in this country have met with an unqualified refusal from the operators, as was more or less expected by everyone concerned. The operators make it known, however, that they will consider any modified demands that the miners may arrange to present.

No definite conclusions regarding the outcome of the controversy in the bituminous field can well be drawn until after the joint conference, in Cleveland, on Mar. 20. Even if a basis of agreement is reached at this meeting, there will scarcely be time enough before Apr. 1 to arrange the various state contracts, but, it is just possible that in such an event, there will be no general suspension of work on the expiration of the present agreements.

The Illinois miners have, however, voted to go out pending the adjustment of a wage scale, and the Iowa and Indiana organizations are confidently expected to follow suit. Similar action has also been customary throughout Pennsylvania and Ohio. The mine workers of Missouri, Kansas, Texas and Oklahoma are bound by agreement to remain at work for at least 30 days after Mar. 31, pending a negotiation of the new contract.

Anthracite Conference

At the conference of anthracite operators, held in New York City, Mar. 5, a large number of independent coal men were represented, as well as officials of all the larger mining companies. The conduct of the meeting was reported to have borne some evidence of prearrangement. It was agreed to refuse the demands of the miners *in toto*; and a committee of ten was appointed to present this reply to the miners' representatives at the joint conference in New York on Mar. 13.

The opinion of the conference was unanimously expressed as against a one-year agreement, and although a five-year term was advocated by some, the majority favored a three-year contract. The demand for an eight-hour day was opposed on the ground that, to reduce the hours, means an increase in wages and a reduction of output. Recognition of the union and the "check-off" was refused partly because these provisions would virtually amount to making the operators act as agents to help support the Union. The abolition of the conciliation board was opposed on the ground that this board has proved itself an efficient means of maintaining stable conditions in the industry.

The demand for an increase of 20 per cent. in wages was declared by the operators to be exorbitant. However, the advisability of offering a 5 per cent. increase has received serious consideration from the heads of some of the large coal companies.

Bituminous Conference

Representatives of bituminous-coal operators and miners met in Chicago, Mar. 5, and agreed to hold the second joint-scale conference in Cleveland, Mar. 20. W. K. Field, of Pennsylvania; E. A. Cole, of Ohio; J. C. Kolsen, of Indiana, and H. N. Taylor, of Illinois, represented the operators. John H. Walker, of Illinois; Francis Feehan, of Pennsylvania; John C. Moore, Ohio, and W. D. Van Horn, Indiana, together with John T. White, president of the United Mine Workers, represented the miners.

The demands of the bituminous miners are briefly as follows: (1) Payment on the mine-run basis; (2) flat increase of 10c. per ton; (3) seven-hour work day, five hours on Saturday; (4) 20 per cent. increase for all day labor; (5) weekly pay days; (6) no limit to the deductions made by employers for miners' organizations; (7) readjustment of the machine differential at the basing points in the competitive states.

Illinois Convention

The convention of Illinois miners adjourned, Mar. 1, after adopting a scale of wages prepared by its scale committee, and after voting to quit work, Mar. 31, pending the conclusion of an agreement with the operators. The schedule of wages adopted would have the effect of adding about 2c. a ton to the present cost of mining even before the percentage increase is added that is called for by the demands of the national convention.

After a short session, Mar. 1, the conference between representatives of the miners in Missouri, Kansas, Texas and Oklahoma, and representatives of the Interstate Southwestern Coal Operators Association adjourned, subject to recall at any time. No steps of any consequence were taken in regard to deciding on an agreement, but it is expected that another meeting will be held in Kansas City as soon as some definite action has been taken in the central competitive field.

In strong contrast with reports from other fields is the news from Colorado that the strike of two years' duration in the northern field has been settled so far as the eight mines of the American Fuel Co. are concerned and several hundred men at Lafayette and Louisville have returned to work.

The British Strike

The British Government has been trying to bring the coal miners and owners together, and has at last succeeded, although the acceptance of the miners' delegates was coupled with the reservation that the principle of a minimum wage should be excluded from discussion. This, however, does not imply that the schedule of rates drawn up by the miners will not be discussed. The miners' representatives are not authorized to agree to any reduction of the federation's schedule of wages or to any scheme for determining these rates, without a new ballot by the miners.

Strike in Germany

A coal strike went into effect in the Westphalian coal fields, of Germany, Mar. 11, when more than 50 per cent. of the 350,000 miners, there employed, obeyed the call of their leaders to cease work. In some districts the cessation of work was practically complete, while in others only from 15 to 30 per cent. of the men went out. Several riots and numerous attacks on the men who continue at work and on the police are reported.

There is every probability of a coal strike throughout Belgium that will affect 45,000 colliers. The miners in the Liége basin have charged their delegates to ask for higher wages, and those in the vicinity of Charleroi have unamimously decided to ask for a 15 per cent. increase. If their demands are not granted they all threaten to go on strike.

A Successful Type of Rotary Dump

By A. E. Lindrooth*

The large number of disastrous mine explosions that have been caused by dust during the last few years has awakened the attention of mine operators to the need of controlling this source of disaster, particularly as regards accumulation of dust along the main haulage ways; and naturally, one of the most efficient ways to control dust is to prevent its formation. On haulage roads, a great part of the dust is caused by leakage of coal through the car doors, this coal being ground in the course of time into explosive powder.

The rotary dump shown in Figs. 1 and 2 was designed by the Link-Belt Co. for the Consolidated Fuel Co. of Hiawatha, Utah. It has now been in successful operation for the past 18 months and has entirely solved the question of leaky cars at this mine.

No motive power is required for operating this device. The pit cars are run onto the dump platform, which is equipped with locking horns and angle bars to keep the cars from falling off when overturned; and being pivoted on a shaft that is set somewhat off center, as soon as the foot brake is released the dump revolves and empties the car. After dumping, the counterweight causes rotation in a reverse direction and brings the empty car to an upright position, after which it is bumped off by the next following loaded car just as in the working of the ordinary cross-over dump. The operation is rapid, and is always under control of foot brake.

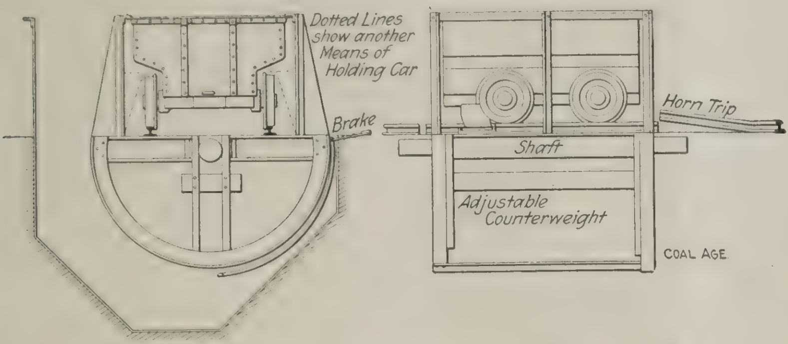


Fig. 1 Rotary Dump for Mine Cars

Fig. 2. Two Views of Rotary Dump, Showing Car in Normal and Dumping Positions

The advantage of this style of dump over the old-style end-tip dump is twofold. First, the elimination of the end door makes possible a perfectly tight car and thus entirely stops the leakage of coal along the haulage roads, a feature which is of obvious value in preventing waste and danger of explosions. The second point of advantage is the increased strength of the car. Without question, the weak points of the average mine car are the door and the door latch. Eliminating these two points, the car is made much stronger and entirely freed from the annoyance due to loose doors and broken latches.

This style of car dump has been in use for some time at other mines also and it is reported that the breakage of coal is no greater than with the ordinary end-tip form of dump.

*Boston Building, Denver, Colo.

Effect of Panama Canal on Shipping

When the Panama Canal is opened in the month of June, 1913, steamers *en route* from Europe to San Francisco will no longer go via Cape Horn, a route of 13,621 sea miles; but will save 6200 sea miles via the canal route. Steamers proceeding from Montreal to Sydney now cover 13,690 sea miles; but in the future will be able to do so over a route of 10,952 sea miles.

It is difficult to predict the effect of the canal upon freight traffic between Europe and Valparaiso, the Cape Horn route being only 2100 miles longer than the canal route. Passenger ships probably will pass through the canal, while the East coast of South America will be served by auxiliary ships sailing from West Indian ports. It is assumed that a part of the business from New Zealand to Europe, which today comes via Cape Horn, will pass through the canal hereafter, saving 1600 sea miles. The chief part of the steadily increasing business between New York and New Zealand should, therefore, proceed via the canal, rather than by the Cape of Good Hope, thus saving 2300 sea miles.

The probable changes in navigation routes will create equally great changes in the distribution of the coal trade, for which British firms are already making preparation. It is stated that British firms are now making arrangements to open a coaling station at Nukulopa, the capital of the Friendly Islands, and upon Pitcairn Island.

West Virginia Coal Mining Institute

The next semiannual meeting of the institute will be held during the second or third week of June in Charleston, W. Va.

The Japanese Coal Industry

By H. F. Bain*

The equipment of the Japanese mines is modern throughout. Larger volumes of water are handled as a rule than at any other collieries. Excellent sociological regulations are in force.

The Miike colliery, visited by one section of the American Institute of Mining Engineers, belongs to the Mitsui family, which, because of its wealth and age, has been not inaptly characterized as the "Vanderbilt family of Japan." The Mining Department of the Mitsui Gomei Kaisha (Mitsui firm) operates both metal and coal mines; and it was to the most famous among the latter that the visitors were taken.

Historical

The Miike colliery is situated on the Gulf of Ariake in the island of Kyushu. Coal has been known to occur at this point for many years, and was mined a little by native methods, even before the government in 1873 took possession, and under an English engineer opened the first modern pit. In 1889 the property was transferred to the Mitsuis, who made radical and extensive changes, opening new pits in succession, until there are now six working mines, with an average daily output of 6,000 tons. In 1910 the total output of the Miike mines was 1,799,489 metric tons, of which 41% was exported.

The Miike coal has a well established and enviable reputation throughout the Far East, for both its steaming- and its coking-quality. There are eight beds on the concession; but mining is, as yet, confined to the Miike or upper seam. This averages something over 9.5 ft. in thickness, has no clay bands, a hard sandstone roof and a firm fire-clay floor. The coal has been mined for a distance of nearly two miles along the strike, and is open nearly as far down the dip, which is 10 per cent. The deepest shaft, the Manda, which is 41x12 ft. in cross-section, is 900 ft. deep. From the bottom the workings extend down the dip to a total deph of 1132 ft. below sea level.

Large Volumes of Water

As the overlying material is a soft Tertiary sandstone, the amount of water to be handled is unusually large. Only in the Pennsylvania anthracite district are there any American collieries where the ratio of water to coal is comparable, and even there it is less.

At the Miike mines, 12 tons of water must be raised for each ton of coal won. At the Manda shaft alone, the ratio is 20 to 1, and roughly 1000 cu.ft. per minute were being pumped on the day we visited the pit.

To raise such a quantity of water from such a depth requires large and expensive pumps, and those at the Manda shaft are said to be the largest at any colliery in the world. The most impressive are the 4 Davey Cornish pumps, with compound steam-cylinders, of which the high-pressure is 45 in. in diameter, the low-pressure 90, the water-ram 22 and the stroke 12 ft. The pump has a speed of 8 to 10 strokes per minute, and two of the pumps are held in reserve. In addition, there are 5 Janesvilles, each capable of handling 300 cu.ft. per minute against a head of 900 ft., and various smaller pumping engines.

*667 Howard St., San Francisco, Calif.
Note—Abstract of paper in the January number of the Bimonthly Bulletin of the A. I. M. E.

Map of Japan, Showing Railroads and Mines

The final capacity of the pumps at this shaft is to be 3000 cu.ft. per minute against a 1000-ft. head. An aggregate of over 16,000-hp. is used in pumping, but, despite this, less than 10% of the coal mined is used at the colliery. Coal is also burned to generate steam for many purposes. The amount will be reduced when improvements now under way are completed. At present coke is made in beehive ovens, of which 60 are in operation, burning 300 tons of coal per day and making 180 tons of 48-hour coke. About one-half of the gas is now used. There are now building, however, Coppee ovens; and with the gas from these two, 2000-kw. gas-engines, will be driven to supplement the five 1000-kw. Curtis steam-turbine generator-sets now in the central power station.

Mining Methods and Sociological Conditions

The coal is worked on a retreating pillar-and-room system; the roadways being 20 ft. wide and spaced at 130 ft. intervals. The coal has an extremely irregular cleavage, and is mined without either powder or shearing. The miners (called "hewers" as in England) pick the coal from the face with small single-pointed picks, and are paid by the ton, as in America. The coal is forked into cars holding 1400 lb. and taken to the shaft by means of horses and endless rope. The close cleavage and the system of mining give a large percentage of fine coal, there being 45% of lump over a 2-in. screen, 10% of nut, between 2-in. and 7/8-in., and 45% under 7/8-in. The lump coal is sent over a picking belt, where women take out the slate. Nut coal is washed, and the fine coal is made into coke.

There are 11,700 mine workers, of whom 33% are women. The miners work in 8-hour shifts, but surface workers put in 10 hours. Nominally, wages are low, miners getting 35 to 40c. per day and women coal-pickers about half as much. This, however, does not tell the whole tale. For example, house rent is free in some cases, and nearly so in others. Food sold at cost or below. For rice, the staple food, the price is fixed; varying only with the term of service of the employee. Miners who have been with the company for five years are now buying their rice at about one-third what is costs the company in the open market.

There is a charge of 7½c. per month for sanitary service; but the boiled drinking-water is furnished to all miners' houses. Schools, hospitals, a day-nursey for children, sick-benefits, accident and

death-benefits, and amusements are all provided by the company; and, to serve miscellaneous wants, a store is maintained, with prices so regulated that in three years the total profit was less than $8. This is not the American way of doing things, but quite accords with the Japanese notion of regarding a business as a family enterprise and the employees as members of the family.

Excellent Management

The yield of coal per miner is about 2 tons per day, or 1 ton per employee. A larger supervising staff is employed than in the United States, there being 40 bosses for 2200 men. All the work about the shaft and indeed the whole property, has been excellently designed and executed.

A particularly commendable feature is the permanent character of the steel tipples, brick stations and stables, heavy rails underground, set on large ties and with rock ballast. When it is remembered that a modern colliery lasts 40 to 50 years and often longer, the real economy of such features, coupled with retreating mining, is apparent. That in a country of high interest charges such as Japan, the directors should go to expense in this direction, is especially striking.

The technical work at the mine is under the direction of a skilled force of engineers, graduates of the Imperial University of Tokyo. Among those at the mine may be mentioned Messrs. H. Uyeki, Vice-manager of mines; J. Fujioka, Mining Engineer; T. Tomita, Superintendent at the Manda shaft; T. Takasu, Superintendent of Transportation; D. Kurita, Superintendent of the Harbor; and K. Akabane, Manager of the Sales department.

The Practical Side of the Engineer

By H. G. Haffner*

Some notes and observations on the relations of the engineer to the underground officials. Maximum efficiency in mining is attained only by those in each department having a thorough understanding of the work done by the other branch of the industry.

The mining engineer should have two main objects in all his dealings with inside foremen and other inside employees:

First, their safety from any accumulated bodies of water, or gas, in any old workings of their own, or adjoining collieries.

Second, that the mining and robbing be done in such a manner that the greatest possible percentage of coal is removed at the least possible expense.

In order to see that the first object is carried out, the engineer should give the foreman safe distances to drive, when approaching old or abandoned workings containing accumulations of water or gas; also give courses, distances and dips at which to drill holes to tap these bodies of gas or water.

He should also give lines for driving all places along barrier pillars between his own and adjoining collieries for the present, as well as the future safety, of the inside employees.

His Responsibility

At many collieries, now working in this field, and operated years ago by individual owners, there are a large number of crop falls made in the Mammoth and Buck Mountain veins, which are now filled with water. The engineer should see that the inside foreman's attention is called to any workings approaching these crop falls, and have the water removed from them either by pumping it out or filling in; where practical, they can be filled with silt.

The engineer further aids the foreman by furnishing him with blueprints, to the scale of 100 ft. to 1 in., of all workings, or, better still, tracings which are posted every three months. Tracings are better for the foreman, as by having them he can, by fitting one over the other, see how the workings in one seam are in relation to the others. The prints, however, have the advantage that they can be taken into the mine and examined on the job. Personally I feel that the foreman should have both.

*Mining engineer, with Lehigh Valley Coal Co., Wilkes-Barre, Penn.

Note—Abstract of paper read before the Shamokin Y. M. C. A. Mining Institute, Mt. Carmel, Penn.

In flat or pitching seams, the engineer should place lines for driving all breasts. Where two or more splits of any seam overlie each other, with small partings of rock or slate between, breasts should be driven over breasts, and pillar over pillar, in order that the overlying strata be better supported, and the robbing of pillars carried on to the best advantage. Where the foreman wishes to drive counter gangways, for the purpose of reclaiming pillars lost in previous mining, the engineer can aid him by giving the proper elevation at which to start.

The engineer can also aid the foreman by seeing that the robbing is carried on systematically; that is, that the overlying seams are robbed in advance of the underlying.

He can also establish chain pillars for the support of the upper gangways, protection of tunnels, shafts and surface improvements, such as boiler houses, breakers, engine houses, etc. Where silting is to be done, he can lay out plans for the method of conducting the material to the different areas to be silted. After silting is completed, it should be carefully marked on the maps and tracings, in order that the foremen can readily see which areas have been silted in relation to the removal of the pillars.

The engineer should also keep the foreman advised as to where surface falls, from mining or robbing, are likely to occur adjacent to any bodies of water, culm, railroads or other surface improvements; where mining is done under towns this is a serious and difficult matter. It seems as though practically all the towns in this section of the anthracite coal fields were built over the coal basins, thus entailing an enormous additional mining expense to the coal companies, as well as the loss of considerable crop coal left in for the support of surface improvements.

Assisting the Foreman

In estimating the cost of new improvements, the engineer can aid the foreman materially, as these estimates are generally prepared by him and he is familiar with the cost of doing this class of work. This includes work such as tunnels, pumps, engines, column and steam lines, steel timber, etc., and quite often a scheme which looks good is found impracticable on making a careful estimate of the cost.

Steel timber is being largely used in permanent places, such as slope bottoms, turnouts in the main haulageroads, pump and engine houses, etc., in order to save the maintenance cost and decrease the fire risk. The foreman, wishing to place steel timber in any given location, will state the size of good timber, which he would suggest using, and refer the requisition to the engineer for figures on the correct size of steel timber.

When the foreman wishes to drive a breast through to the surface, for the purpose of ventilation or for any other reason, he calls on the engineer to place points on the surface so that the work can be done from both ends, thus saving considerable time.

The engineer on his trips to the mines often sees points which, in his opinion, could be improved, and he should offer suggestions to the foreman in regard to them. This should be done, however, not in a spirit of criticism, but only with the thought in his mind that they are both doing what is to the best interests of their employer.

Electrical Equipment, D.L. & W. Mines

Special Correspondence

The electrification of the D. L. & W. coal properties is unusually complete and extensive. Motors are installed, having a total rated capacity of 27,618 hp. The central-station and substation practice and the distributing system are here outlined as are also the applications of electric power to haulage, hoists, pumps, and other auxiliaries. The equipment of the Truesdale colliery is taken up in detail.

The electrical equipment of the collieries of the Delaware, Lackawanna & Western R.R. Co. is unusually extensive and the central-station and distribution systems are excellent examples of modern engineering. About 20 collieries are comprised in the operations of this company, all of them situated in Lackawanna and Luzerne Counties, in the northern, or Wyoming, anthracite coal field of Pennsylvania, their output for the year 1910 being approximately 8,000,000 tons. All these collieries, with two exceptions, use electricity for both light and power, and even these two have small isolated generating plants for lighting service only.

Most of the mines have had electric service for a number of years, the original equipment consisting of direct-current engine-driven generators, some of which are still in operation, while others are now held merely as reserves. The main sources of electric supply, at present, are two central stations, equipped with steam turbine-driven generators; one of these serves the upper district in the vicinity of Scranton, and the second supplies the lower district around Nanticoke.

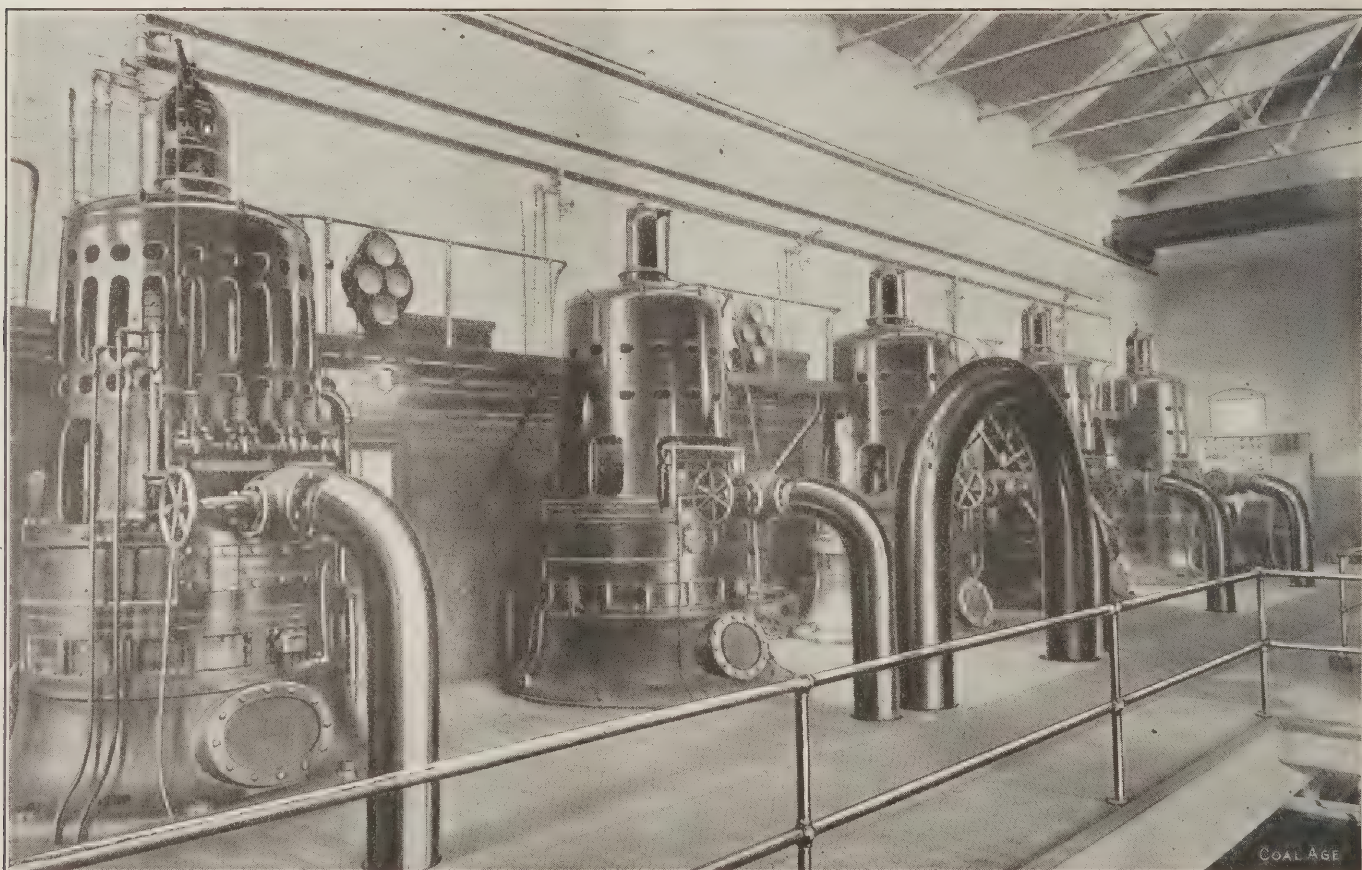
At the Hampton station, in Scranton, current is generated at 2300 volts, three-phase, 60 cycles, while the Nanticoke alternators are 4150-volt units. Three potentials are used in transmission. They are: 2300, 4150 and 16,000 volts. The capacity of the Hampton station is 6500 kw., that of the Nanticoke power plant is 2500 kw., and, in addition to these, there are engine-driven sets having a rated output of 2390 kw., so that the aggregate available generator capacity is 11,390 kilowatts.

Twenty-one rotary-converter substations are located at the various collieries, while a few of the more distant mines are not supplied with converters, but continue to operate the old engine-driven generator sets. The total number of rotary converters at present installed is 26, and their rated capacity is 6650 kilowatts.

Mine Haulage

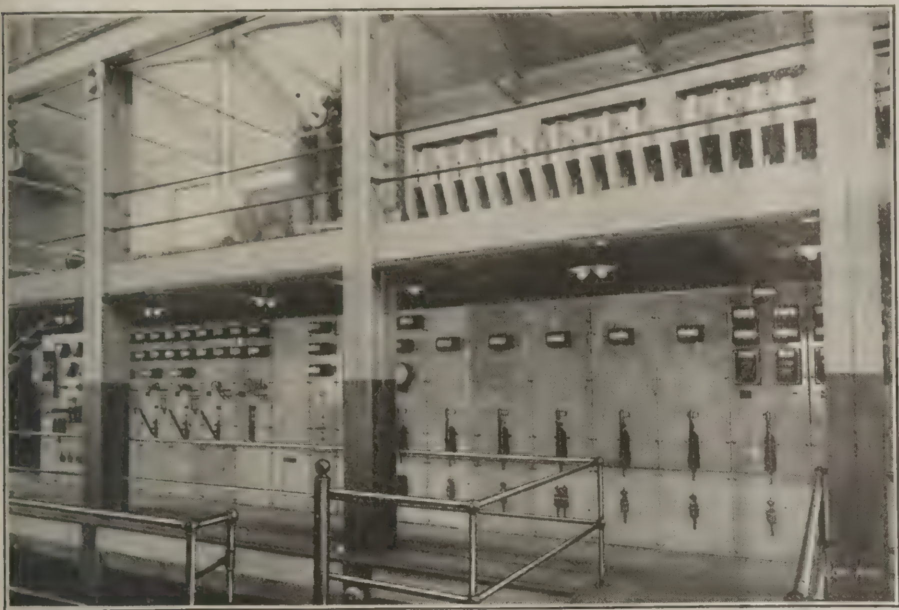
Electric mine locomotives are extensively used by the Lackawanna company, there being 170 now in service; 125 of these are 6½-ton cable-reel motors, and 45 are 10-ton straight-haulage units, making a total motor capacity of 10,750 hp. A large number of these locomotives operate at 250 volts, and current is normally supplied at 275 volts in order to take care of the line drop involved by the length of the feeders. In one mine 550-volt current is used for this service, and in five of the mines, direct current for haulage is supplied through a three-wire system at 275 and 550 volts. Also, five collieries have direct-current engine-driven sets arranged to operate in parallel with the rotary converters, and in this way reduce the investment cost of the current-distribution system. The distance covered by the feeder systems for locomotive haulage is more than 148 miles, while the transmission distances from the turbo-generator stations total about 35 miles.

One of the most important applications of electricity in these mines, aside from



Curtis Turbine Generators, Hampton Power Plant, Scranton, Penn.

that of mine haulage, is found in the use of electrically driven hoists. For these, both alternating- and direct-current motors are used. There are 27 of the former type, having a total capacity of 3570 hp., and 25 direct-current motor hoists, taking about 2420 hp.; an aggregate of about 6000 hp. is required for this class of service.



Switchboard, Hampton Power Station

Pumping Service

The notable improvements in the design of centrifugal pumps during the last few years have resulted in numerous installations in the mines under consideration, both for auxiliary pumps and for operation at the main sumps. As in the case of the hoists, both alternating and direct-current motors are used, although, due to the characteristics of the induction motor, all the newer stationary pumping sets are driven by alternating-current machines. These with their high efficiency at constant speed and uniform load, are peculiarly adapted for the operation of centrifugal pumps.

There are 46 alternating-current motors, aggregating 5670 hp., used in pumping service, and 48 direct-current motors, with a total capacity of 1400 hp., used for driving pumps of both the centrifugal and plunger type. Most of the direct-current sets are small auxiliary units, and a number of them consist in 300-ft.-head portable plunger-pumping outfits mounted on trucks, which can be hauled to various locations in the mines and operated from the locomotive feeder wires.

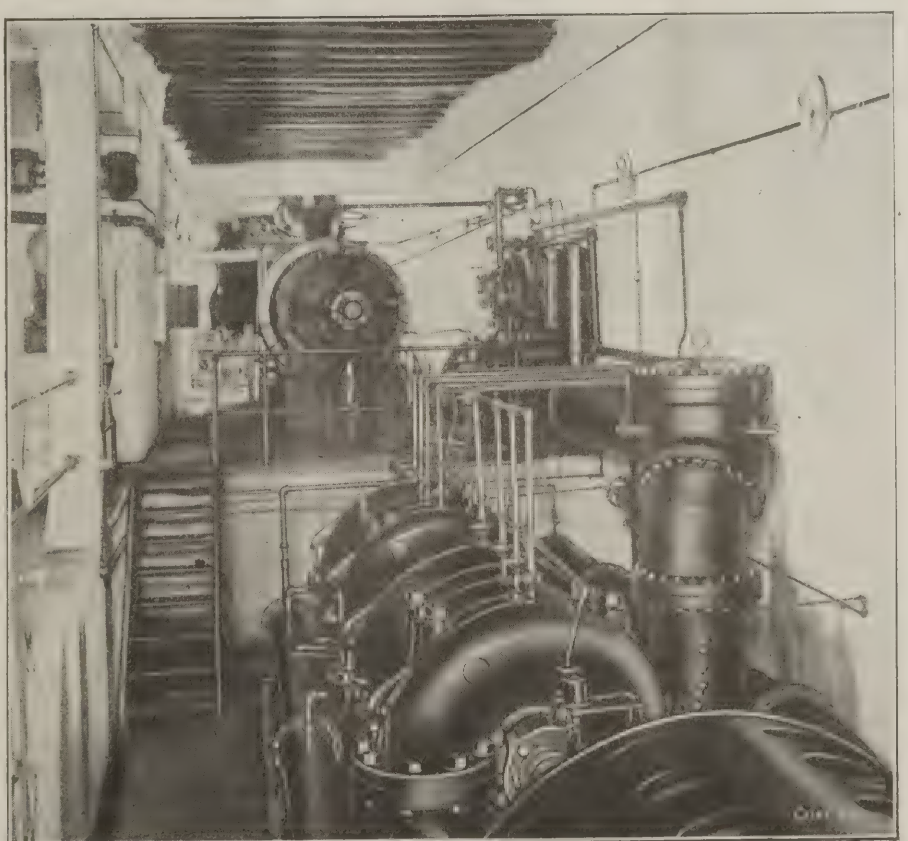
In addition to the motor-driven water-hoisting equipment, the sump at Hampton is served by two six-stage centrifugal pumps operating at 720 r.p.m. against a 500-ft. head. Each pump delivers 5000 gal. per min., and is directly driven by a 1000-hp., 2300-volt induction motor. Inasmuch as these two centrifugal pumps and the water hoist represent a total demand of 2800 hp., they constitute a most important factor in determining the peak load of the Hampton generating station, and for this reason they are normally operated at night, the sump being of sufficient size to take care of ordinary drainage during the day time. As the demand on the power station diminishes toward the end of the working day, the load on the generators is brought up to approximately normal level by successively throwing into service the two centrifugal pumps and the water-hoisting outfit.

The water which is elevated from the Hampton sump is utilized in various ways before it is discarded. It first passes to a reservoir where it is used for the operation of barometric condensers in connection with the steam-turbine plant; and from the condensers it passes to a washery, being thereafter used for slushing ashes, crushed rock and other mine refuse through bore holes into worked-out sections of the mines.

Breaker Drives and Auxiliaries

In addition to those already enumerated, there are 127 alternating-current motors, aggregating 530 hp. in capacity, and 12 direct-current motors, totalling 225 hp., that are used for auxiliary service at the mines and collieries. Fifteen of these are employed to drive rock crushers, by means of belt drives, and a number are belt-connected to fans, although most of the ventilation in these mines is still carried on by means of engine-driven fans.

An interesting application of individual motor drive is found in three of the breakers operated by the Lackawanna company. These are equipped with induction motors, direct-connected to various driving shafts, thereby minimizing the number of belts required, and reducing the friction losses inseparable from the operation of breakers by means of



Six-stage Motor-driven Centrifugal Pumps

steam engines. Individual drives for these breakers were adopted about seven years ago, and their efficiency is indicated by the records of the Truesdale breaker, which handles between 3500 and 4000 tons per day with a power consumption of approximately one kilowatt-hour per ton of coal, including the hoisting of the coal to the top of the breaker.

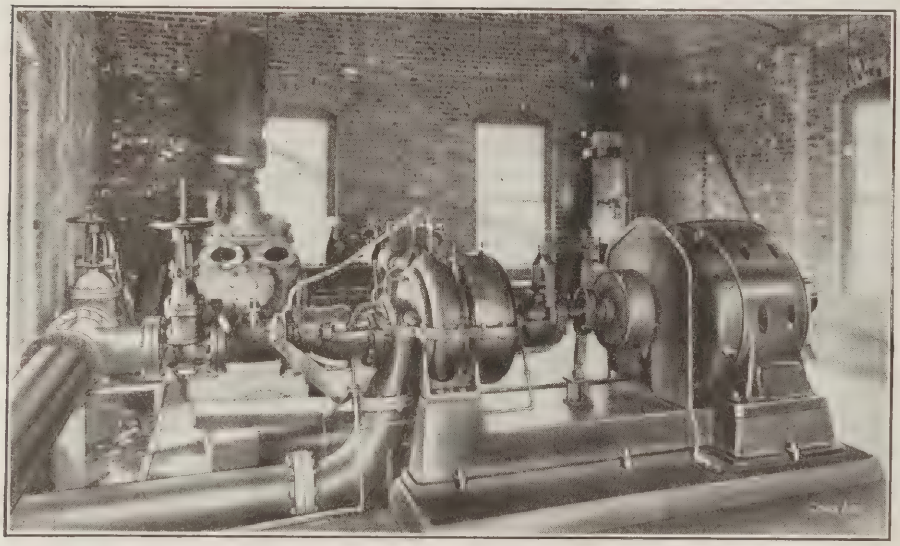
The extent to which electric drives have been adopted at these collieries is shown by the following list of aggregate motor capacities:

	Hp.
Direct-current locomotives	10,750
Alternating-current hoists	3,571
Direct-current hoists	2,420
Alternating-current pumps	5,670
Direct-current pumps	1,402
Alternating current, miscellaneous	3,580
Direct current, miscellaneous	225
Total, alternating current	12,821
Total, direct current	14,797
Grand total	27,618

third of this being required for the breaker.

The local current distribution and control are provided for by means of a switchboard containing a totalizing panel, and feeder panels for the various alternating- and direct-current circuits.

There are 16 locomotives in operation at this colliery, having a total capacity of 1150 hp., but, as they constitute an intermittent demand, the 500-kw. rotary converter is of ample capacity for their operation, and in addition it serves five motors with a total rated capacity of 937 hp. for driving car hoists on slopes. When the day load diminishes, the direct-current equipment is switched over to the 200-kw. rotary converter, which was originally of ample capacity to carry the entire load, but is now normally held for night operation or emergency service.



Two-stage Motor-driven Pump, Truesdale Washery

Truesdale Colliery

The electrical equipment of the Truesdale colliery will serve as a typical example of the substation practice of the coal department of the Delaware, Lackawanna & Western R.R. Co. Power is transmitted at the generator voltage from the Nanticoke station and received at a transformer substation located at the colliery. The substation equipment includes stepdown transformers and two six-phase rotary converters, one of 200 kw. and one of 500 kw. capacity. The current, which is received at 4150 volts, is stepped down in the transformers to about 200 volts for the operation of the rotary converters, and separate transformers supply 440-volt circuits for the induction motors.

Steam is still used at Truesdale for hoisting in the shafts, operating ventilating fans and heating the breaker, but all other operations are carried on electrically. The total current consumption averages 12,000 kw.-hr. per day, about one-

Of the 13 pumps at this colliery, which have a total capacity of 610 hp., all but one are located in the mines. The track or portable pumps are driven by direct-current motors, while all stationary units are of the induction motor-driven centrifugal type.

Three 250-kv.-a. 4150- to 440-volt transformers are provided for the alternating-current circuits on which 30 motors, with a total capacity of 700 hp., are operated. Most of these are used for individual drives in the breaker and the remainder operate the conveyor lines, a rock crusher and ventilating fan.

In the operation of the breaker improved working conditions have been attained by the installation of a 75-hp. motor, which drives an exhaust fan for clearing the breaker of dust.

Improvement of Power Factor

Owing to the number of induction motors used at this colliery, the question of maintaining a high power factor is an important one, and it has, therefore, been decided to substitute a 100 kv.-a. synchronous motor for the 75-hp. induction motor now driving the fan. This will mean that the synchronous motor will be loaded to approximately 70 per cent. of its capacity, and the necessary leading current for raising the power factor locally will be most economically obtained.

Practically all the transformers used in this equipment are three phase, 60 cycle. The cables are carried into the mines through bore holes or down the hoisting shafts where they occupy space that could not otherwise be utilized. The electrical apparatus described above was supplied by the General Electric Co., Schenectady, N. Y.

The Fuel Situation in California

Oil is used almost exclusively in the state of California for the manufacture of gas and, with a few exceptions, for generating steam in stationary plants, railroads and on the coast steamers. The bulk of the ocean steamers trading regularly at San Francisco, San Pedro and San Diego are also equipped for oil burning. Also the Southern Pacific, Union Pacific, Santa Fé and Western Pacific railroads use absolutely no coal on their Pacific Coast divisions; consequently this latter fuel is practically eliminated as a factor in steam producing and its use at the present time is confined almost entirely to household requirements.

To meet this demand, since there is no local coal, other than a second-grade lignite, this market is entirely dependent on foreign and Rocky Mountain coals. Twenty to thirty years ago considerable house coal was imported from Great Britain, chiefly English Cannel, Scotch Splint and Westminster Brymbo, but since the opening up of the British Columbia coal fields the bulk of the domestic fuel has come from that source. For the past ten years a high-grade domestic coal has been imported from Australia which has found solid favor in this market. The f.o.b. price of this coal is now, and has been for the past five years, $2.70 per long ton, and its delivered value is naturally dependent on fluctuations in freight rates.

Accurate data as to Rocky Mountain coals coming in by car are unobtainable, but there is little doubt that it is making considerable headway, especially the Wyoming and New Mexico products; this is due to their cleanliness and comparative freedom from soot and also to the high prices of the British Columbia and Australian products which ruled in this market for some time.

Never hook a trolley feeder around a trolley clamp. This practice, common in mines, is a sure source of trouble as they are almost certain to work loose.

Some Coal Statistics for 1911

Special Correspondence

Some of the more important statistics of fuel production and transportation for the year 1911. The volume of coal handled as a whole shows little change over the previous year. A new high record was established in anthracite, while the coke industry showed a falling off in sympathy with the curtailment in the production of pig-iron.

Note—Excerpts from the "Monthly Summary of Commerce and Finance," including the completed statistics for 1911.

The volume of coal traffic during the past year, as reported by the leading Eastern coal-carrying railroads, shows but little change from the high figures of the preceding year. The same is not true of the coke movement, which, in sympathy with the curtailment of pig-iron operations, shows a considerable decline.

The anthracite coal shipments from Eastern producing territory aggregated during the past year 69,954,299 long tons, the largest annual total recorded during the past decade, and exceeded by over 5,000,000 long tons the high record of the preceding year. Over 20 per cent. of the total shipped, namely 14,651,441 long tons, was handled in and around New York for shipment to New York proper or to New England destinations. Coastwise shipments of anthracite from Philadelphia during the past year totaled 2,197,750 long tons, while similar shipments from Baltimore are stated as 257,025 long tons. The domestic Lake shipments of anthracite coal during 1911 amounted to 4,374,100 short tons, of which 4,074,383 short tons proceeded from Lake Erie and 254,419 short tons from Lake Ontario ports, the 1911 shipments by Lake showing about the same rate of increase as the total and coastwise movements.

The movement of bituminous coal, as reported by 12 leading Eastern coal-carrying roads, totaled 144,623,992 short tons in 1911, as compared with 141,901,097 short tons in 1910 and 122,057,662 short tons in 1909. Coastwise shipments from the five principal Atlantic seaports totaled 26,986,348 long tons in 1911, compared with 25,835,029 long tons in 1910.

Of the total for the year, 10,749,988 long tons are credited to New York, 4,856,626 long tons to Philadelphia, 4,002,809 long tons to Baltimore, 2,678,156 long tons to Newport News, and 4,698,769 long tons to Norfolk, all the ports except Newport News showing larger figures for 1911 than for the preceding year. The largest relative gain of over 1,000,000 tons is reported by Norfolk, and is due mainly to the increase in tidewater shipments by the Virginian Ry. from its Sewell's Point piers.

The Lake shipments of soft coal for the past year, 17,081,355 short tons, show a considerable shrinkage from the 1910 figures of 18,406,469 short tons. It should be remembered, however, that the demand for soft coal at the upper Lake ports in the year 1910 was exceptional, owing to the shortage in the supply of Ohio, Indiana and Illinois coal during part of the year, as the result of the miners' strike. As a matter of fact, the 1911 shipments by far exceed those of any previous year except the year immediately preceding.

The coke movement from the Connellsville district in 1911 is reported to be 16,334,174 short tons, compared with 18,689,722 short tons shipped in 1910 and 17,785,832 short tons shipped in 1909. The number of active ovens reached its maximum about the second week of April, when out of a total of 39,399 ovens 28,514 were in blast. Since that date the proportion of active ovens has varied between 60 and 70 per cent., being about 68 per cent. at the end of the year.

STATEMENT OF THE OHIO COAL TRAFFIC ASSOCIATION FOR DECEMBER AND THE YEARS 1910–11 IN SHORT TONS

Railroads	December		Year	
	1910	1911	1910	1911
Hocking Valley	475,500	315,268	4,777,478	3,621,794
Toledo & Ohio Central	179,336	158,401	2,186,435	1,902,304
Baltimore & Ohio	217,484	181,016	2,455,473	1,828,320
Wheeling & Lake Erie	312,704	321,117	3,771,737	3,674,694
Cleveland, Lorraine & Wheeling	240,856	222,993	3,053,998	3,018,267
Zanesville & Western	156,656	102,568	1,245,103	1,151,434
Toledo Division (Pennsylvania Co.)	262,021	198,255	2,331,160	1,942,145
Lake Erie, Alliance & Wheeling	162,212	113,895	1,328,594	1,256,636
Marietta, Columbus & Cleveland Ry	4,059	5,772	94,101	30,313
Wabash, Pittsburg Terminal Ry	1,220	823	63,291	53,920
Kanawha & Michigan Ry	....	16,935	....	121,682
Total	2,012,078	1,637,043	21,307,370	18,601,509

MOVEMENT OF FUEL ON VARIOUS TRANSPORTATION LINES, 1910–11[1]

Railroads	1910	1911
Baltimore & Ohio[2]	36,714,732	35,321,771
Buffalo, Rochester & Pittsburg[3]	8,256,501	8,223,617
Buffalo & Susquehanna[3]	1,764,637	1,951,256
Chesapeake & Ohio[2] [4]	15,012,006	14,939,143
Chesapeake & Ohio (Dec.)[4]	16,247,268	16,488,024
Huntingdon & Broad Top Mountain[2] [3]	1,305,801	1,148,675
New York Central & Hudson River[4]	7,997,871	8,108,738
Norfolk & Western[2] [3]	20,096,153	20,954,839
Pennsylvania (east of Pittsburg & Erie)[2] [5]	65,916,840	65,015,701
Pittsburg & Lake Erie[2] [5]	17,637,805	16,090,905
Pittsburg, Shawnut & Northern[4]	1,266,577	1,459,637
Southern[4]	3,940,451	3,498,537
Virginia[2] [3]	1,691,066	2,817,201
Western Maryland	3,231,676	2,673,183
Rivers and Canals	**1910**	**1911**
Barren River Lock No. 1	3,092	2,315
Black Warrior River Lock No. 12	5,664	4,342
Canals and Falls at Louisville	896,317	1,378,333
Chesapeake & Delaware Canal	102,319	138,352
Chesapeake & Ohio Canal	190,898	186,440
Davis Island Dam	1,774,760	2,816,975
Green River Lock No. 1	34,137	28,464
Kanawha River	1,229,660	1,317,660
Kentucky River Lock No. 1	66,676	95,862
Monaghela River	9,460,695	9,197,292

[1] Figures throughout this table have been reduced to uniform basis of short tons
[2] Includes coal received from connecting lines.
[3] Includes company's coal.
[4] November and 11 months' figures.
[5] Does not include company coal hauled free.

SOUTHWESTERN PRODUCTION, 1909–11

States	1909 Tons	1910 Tons	1911 Tons
Missouri	2,574,873	1,901,967	2,447,477
Kansas	5,779,397	3,328,569	4,823,929
Askansas	2,090,540	1,437,739	1,495,379
Oklahoma	2,554,566	2,167,014	2,603,762
	12,999,374	8,835,289	11,370,547

ATLANTIC COAST DOMESTIC SHIPMENTS, 1910–11, IN LONG TONS

	1910	1911
New York	24,423,062	25,401,389
Philadelphia	6,672,712	7,054,376
Baltimore	4,174,274	4,259,834
Newport News	3,163,798	2,678,156
Norfolk	3,644,561	4,698,769
Total	42,078,407	44,092,524

MONTHLY RECAPITULATION OF DOMESTIC LAKE COAL TRAFFIC, 1910–11, IN SHORT TONS

	Receipts		Shipments	
	1910	1911	1910	1911
Jan.	103,663	57,924	111,396	65,210
Feb.	107,134	92,535	113,437	101,142
Mar.	113,423	42,384	125,336	50,282
Apr.	970,787	490,383	1,385,425	839,843
May.	2,408,205	2,327,829	2,741,255	2,652,838
June	3,156,970	2,918,613	3,750,667	3,192,596
July.	3,403,591	3,558,441	3,581,569	3,845,321
Aug.	3,219,993	3,382,481	3,475,868	3,645,423
Sept.	2,770,177	2,784,901	3,124,049	3,012,984
Oct.	3,156,462	2,702,841	3,338,916	2,791,513
Nov.	2,676,369	2,363,066	2,808,380	2,652,745
Dec.	483,861	724,256	124,643	298,404
	22,570,635	21,445,654	24,680,941	23,148,301

Our Noncontiguous Possessions

The following is a comparative statement of fuel shipments to the noncontiguous territories of the United States for the years 1910-11, in long tons:

	1910	1911
Alaska (coal)	28,659	28,799
Alaska (coke)	174	261
Hawaii (coal)	61,655	1,713
Porto Rico (anthracite)	3,035	2,414
Porto Rico (bituminous)	105,070	101,385
Philippines (bituminous)	118,389	

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

New Safety Catch for Cage

The following is a translation of an article by Guido Nirtl, superintendent of the Austria Shaft III, near Karbitz, Austria, and extracted from the *Zeitschrift des Zentral-Verbandes der Bergbau-Betriebsleiter*.

The idea which led me to the design of my safety catch for cages was to make a mechanism which, in contrast to those at present commonly used, would be entirely independent of the hoisting rope, and which would act not only if the rope should break, but also should the cage attain more than a certain maximum velocity in descent. My catch depends on the resistance which the air opposes to a rapidly moving body.

The plate A, lying free at the bottom of the cage, will be raised up when a certain velocity, which can be chosen at leisure, is exceeded. The plate will thus strike against the latches B and C, whereby the springs are released and the catches are made to engage.

The theoretical basis rests on the following calculations: The air resistance in a shaft is

$$R = 0.000531\, Sv^2$$

in which S is the surface moved in square feet and v the hoisting velocity in feet per sec. at that time. To take a convenient example, I choose:

$S = 1$ square foot;
$v = 45$ ft. per sec.;

so that we get

$R = 0.000531 \times 1 \times (45)^2$;
$R = 1.075$ lb. per sq.ft.

A plate which weighs 1.075 lb. per sq.ft. would, therefore, be balanced by the air resistance if it attained a descending speed of 45 ft. per second.

The construction of the safety-catch mechanism is as follows:

It should first be stated that the mechanism for restraining the fall of the cage is placed not, as is now general, under the roof, but under the cage bottom.

A rectangular frame of channel iron is fast connected to the cage bottom, and on this, the iron plate A lies free, being merely guided when it lifts by the four guide rods D.

Four eccentric catches E are placed outside, below the cage bottom. Each pair is joined by an eccentric rod F, which can turn in the bearings G. On each of the eccentric rods are keyed two crank pieces H, which are linked with the crossheads I by connecting rods J, which are keyed to the crossheads. Through the crossheads pass the piston rods K, which belong to the movable pistons L, traveling in a wrought-iron cylinder M.

The ends of the two piston rods form engaging blocks N by which, through the latches B and C, which can turn in the bearings O, these piston rods are so pulled that the pistons hold in compression the buffer spring P in the cylinder, making them press against the cylinder heads.

If now, as already suggested, the hoisting-cage safety catch comes into action through the plate A being raised by the air resistance and brought against the latches B and C, then the piston rods are unlatched, the pistons thrust together by the liberated springs, and the eccentric rods, by reason of their connection with the piston rods, are compelled to turn through a certain angle, whereby the eccentric is made to press into the guides.

The movement of the latches is seen in Fig. 3; that of the pistons and eccentrics in Fig. 2.

The compression of the spring after each action of the safety device is performed by auxiliary cords fastened to the piston rods and passing over the rolls Q, and over similar rolls below the cage root and connected with the hoisting rope. By the tension of the hoisting rope, the auxiliary ropes are tightened, and with them the springs.

For the regulation of the compression of the springs, the piston rods are connected to the crossheads by a screw thread, the middle part of the crossheads

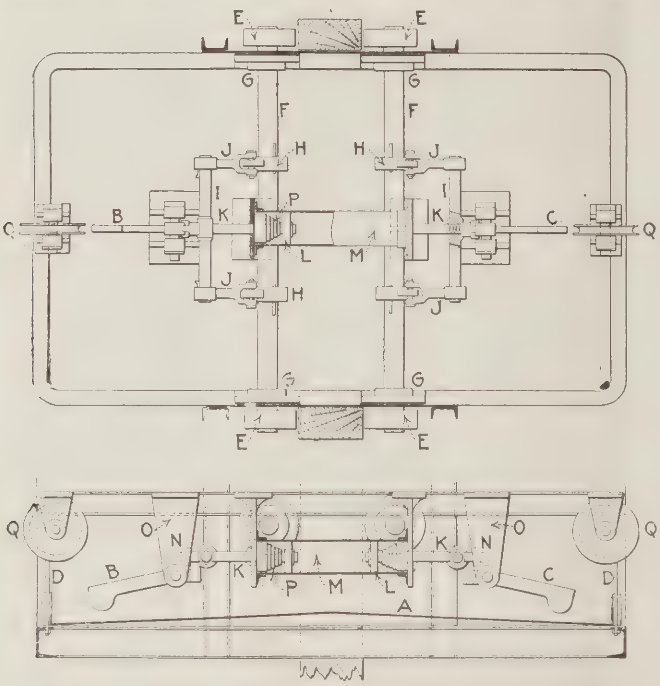


Fig. 1. General Arrangement of Safety Catch

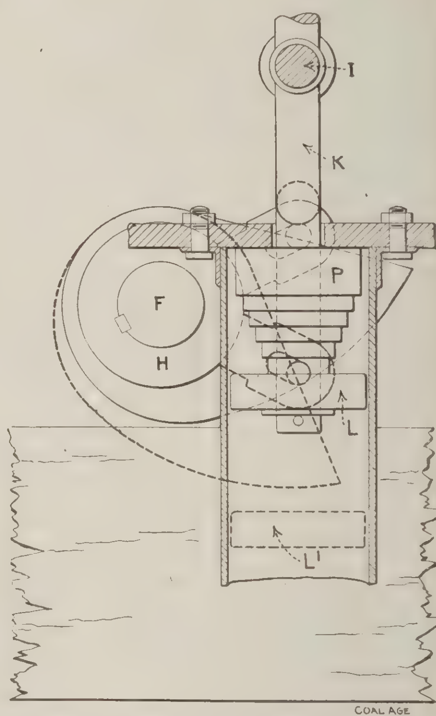


Fig. 2. Pistons and Eccentrics

forming the nuts in which the piston rods can be turned.

The advantages of my construction are as follows:

1. It removes the uncertainty connected with safety catches that are actuated by the breakage of the rope, that is through its relaxation of tension. 2. Joints are avoided, so that a failure to act by reason of foulness is prevented. 3. The springs are inclosed in a cylinder, so that they are protected from external influences, especially dirt. 4. The safety catch consists of two entirely separate halves. If, therefore, through breakage of the spring or other part, one half refuses to act, the other half will nevertheless take hold. 5. The entire construction is simple and easy to inspect, also easy to control, and it can be applied to any existing cage. 6. The prescribed tests of its action can be made simply by bringing the cage down on a post, whereby the bottom plate is raised and the entire mechanism made to act.

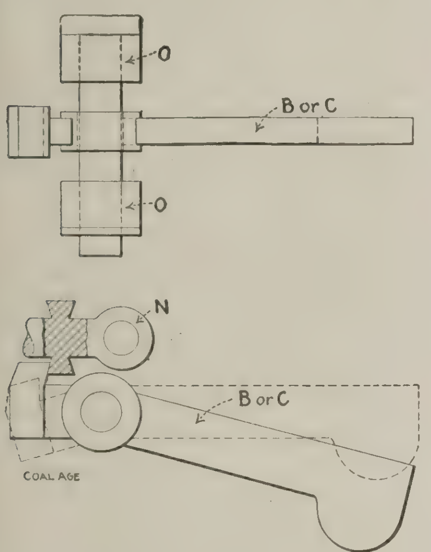


Fig. 3. Latch Movement

Plates of different weight can readily be adjusted to the bottom of the cage, so that the speed limit may be suited to varying conditions. Adjustable valves could be placed in the plate *A*, and by these speed at which it would act might be regulated.

This safety catch of improved design could be used when hoisting men in addition to the ordinary safety catch, so as to provide increased security. When hoisting material, the plate can be fixed by an appropriate appliance, so as to be temporarily out of service. Tests of its principle, which already have been made, have given good results.

The general manufacturing right on this hoisting-cage safety catch has been acquired by the "Erste Brüxer Eisengiesserei, Kesselschmiede und Maschinenfabrik in Brüx."

Natural Oil in Coal Mines

When the Yorkshire section of the Society of Chemical Industry held a recent session at Leeds, J. B. Cohen and C. P. Finn read an article on "Paraffins from a Yorkshire Coal Seam," from which we have abstracted the following observations:

"About three years ago, our attention was drawn to a curious oil which dripped from the roof of the Haigh Moor seam, of the Hemsworth collieries. This oil, it was stated, had been running for about seven years, and at one time there was such a quantity that the workmen had been in the habit of using it as a lubricant. It was further stated by the officials who were connected with the colliery before it was sold to its present owners, that when a road was driven through the place mentioned, what they expressively described as 'balls of vaseline,' were found. As the flow at this time (1908) was slow, arrangements were made to collect a supply of the oil, but a fall of roof caused the breakage of the collecting vessels, and as the place had to be timbered up, the opportunity was lost.

Oil Oozed from Fault

"A description of the position where the oil was found will be of interest. The two shafts of the Hemsworth collieries pass through several seams of coal, the principal being the Shafton, Barnsley and Haigh Moor beds. At present only the two last mentioned are being worked, at depths of 1839 ft. and 2058 ft., respectively. A fault is observed in all these seams. Its maximum throw is only 11 ft. The oil was found in the Haigh Moor seam, at a place where the road from the pit bottom crossed the fissure of the fault. This was at a depth of about 2070 ft. from the surface, and in a bed of bluestone bind, part of which contained ironstone bands and was interstratified by a white, soft and permeable sandstone rock. At first sight, it seemed that the oil had an origin in some stratum above the Haigh Moor seam, and that it had come down the fissure of the fault. As it was not found in the Barnsley seam, it possibly came from the strata near or below that bed.

"Early in 1911 it was decided to drive a drift, which would cross this fault in another place. While this was being done, a careful watch was kept for any possible flow of oil. The expectations were fulfilled, and where the drift crossed the line of fault, the surrounding strata were found to be saturated with oil. The oil as it ran out was of a yellow color, but turned a dark brown on exposure to air. No evidence of any natural gas was found.

"Previously recorded instances of oil occurring in the coal beds of Great Britain are few outside of the historic find by Young near Alfreton, in Derbyshire.

Briceville Disaster

Joseph A. Holmes, the director of the Bureau of Mines, addressed the Southern Appalachian Coal Operators' Association, at Knoxville, Tenn., Feb. 13, on "Some Lessons from Recent Mine Disasters." After reviewing the subject of mine accidents in general, in referring to the recent Briceville disaster, he said:

"There should be at every mine or group of mines a sufficient number of men equipped with breathing apparatus, who can begin rescue work in a mine as soon as a disaster occurs, with the expectation of being relieved or aided when other rescuers arrive.

"The more training and experience a miner has in this new type of rescue work, the more efficient he becomes, and the more he can accomplish within a given space of time; and the less is his risk of losing his life. But even after a week's training, such as is given by the government mine-rescue car, a miner should be further trained if he is to take part in the actual rescue work following a mine disaster. Under no ordinary circumstances should a man who has had no previous training in wearing the helmet and its outfit make a trip to a remote part of the mine filled by poisonous gases. This should be done only by men who have already had training for at least a week.

Helmets of No Value to Untrained Men

"The number of men trained and supplied with modern rescue equipment should be rapidly and greatly increased in every important coal field. It is hoped that within a few years more, this system will be developed to such an extent that should such a disaster occur as that which happened at Briceville, within a few hours after its occurrence there can be assembled on the ground from 50 to 100 men, who are well trained and fully equipped with special breathing apparatus; and who are also fairly familiar with the immediate mining district.

"With a force of this kind it would be possible, within a few hours, to reach all the remote portions of the mine. With the present limited number of trained men in different parts of the country, this is impossible. At no disaster previous to that at Briceville, have we been able to bring together within a short time as many as a dozen experienced and well equipped men. For a short time at Briceville, there were as many as 20 men who had some training in the use of helmets, but one half of these were without experience in actual rescue work, and not one of them was familiar with the mining conditions in that region. A week was therefore required to accomplish results, which should have been accomplished in less than 24 hours."

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

There is one other man who knows as much about mining anthracite coal as does our friend Sam D. Warriner, but I have forgotten his name and can't remember his address. And right here let me remark that "S. D." is a living, forceful, convincing refutation to the popular idea that no man hampered with a university training can carry this burden and at the same time climb the ladder to success.

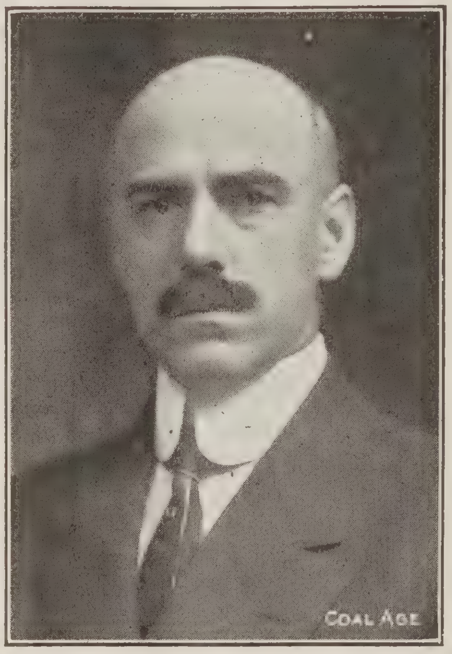
Of course, I don't mean to insinuate that it's as easy for a fellow to succeed when he has been loaded down with a college degree, as when his handicap in the way of an education has extended only as far as elementary algebra in the red school house on the village green. Nor would I have you believe that a sheepskin signed by the president of a great university is equal in value or force to the diploma carefully deposited on your right jaw and bearing the signature of the left hind hoof of a husky pit mule. In truth, it's a fact that some managers owe their running start as well as their later rapid advance to the vigorous reactionary tendencies of an argumentative mine mule.

However, in defiance of revered tradition, and despite adverse odds in the form of a professional training supplied by an indulgent father, who, by the way, was a country minister, Mr. Warriner has measured up to expectations ana smashed all time records in getting to the very front of the procession.

Living up to the idea that, "champion once in one thing, champion always in everything," he has pitched curves around the heads of his competitors, just as he used to deliver fadeaways when occupying the box on the Lehigh University ball team. And with "S. D.," this matter of being a champion isn't confined to some specialized line of effort; with him it's wholly a question of season and style. I haven't the slightest doubt but that he would make as good a blacksmith, ping-pong player or ambassador as he is coal-mine manager.

Fancy a sitting of the anthracite conciliation board with Warriner pitching and Richards, of the Reading Company, catching. Can you imagine there would be many base hits on the part of the representatives of the Union? Someone told me a short time ago that the batting average of the miners on the board during the past decade figured out at minus twenty-three.

After graduating at Amherst, Sam Warriner took his E. M. degree at Lehigh in '90. No time was lost in useless meditation, and a few weeks later, he was busily occupied mining iron ore down in Virginia. No man is half an engineer today unless he has mined iron ore in Virginia, gold in North Carolina, or coal in California.



SAMUEL D. WARRINER

"S. D.'s" stay south of the Mason-Dixon line was limited, and before a year had passed he was back in Pennsylvania acting in the capacity of mechanical engineer for the Lehigh Valley Coal Co. Under the tutelage of that "maker of mine managers," W. A. Lathrop, Mr. Warriner advanced rapidly, and before leaving the anthracite field to take charge of development work at the Calumet & Hecla copper mines, in Michigan, he had won recognition as a clever engineer.

The years spent in Northern Michigan with the "C. & H.," furnished Sam Warriner the opportunity to prove his worth. That he discounted and cashed all chances, and at the same time sailed true to the compass, was evidenced by his being called back to Wilkes-Barre, to succeed Mr. Lathrop as general manager of the Lehigh Valley Coal Co.

Some twelve years ago, when Mr. Warriner thus returned to his first love, President Walters, of the Lehigh Valley, said: "As for those coal mines of ours, Sam, if you can only wipe out the annual deficit and split even on the deal, we'll be mighty pleased with the result." Suffice it to say, that last year the coal department of the Lehigh Valley earned a little more than 100 per cent. on its capitalization, and although the latter is small ($1,250,000), the progress made in a dozen years is quite remarkable.

I have hesitated all through this little story to start talking about Sam Warriner's head, and I am afraid now if I commence to write on this subject, the remainder of the page will be quickly filled. However, a sketch of "S. D.," without some remarks concerning his "thought factory," would be as incomplete as a picture of Theodore Roosevelt with mouth closed and teeth invisible.

The fellow who first remarked about a long-headed man was looking straight at Samuel. His forehead begins at his eyebrows and ends on the back of his head just above his collar. His thoughts have been so intense and so frequent in recurrence, that only one hair, which the artist has failed to bring out in the accompanying photograph, remains as a silent monument to the fact that other hairs once resided in the same vicinity.

Mr. Warriner's head would be the delight of phrenologists. Nothing could he hide from them when his hat was off, although it's a notorious fact that in everyday life he has been able to hide all things he didn't want the other fellow to know. Of those matters in which "S.D." is proficient, the art of listening is strongest developed, and if "silence is golden" then Samuel is a mint. Years ago he read the proverb, "A Quiet Tongue Shows a Wise Head," and the thought so impressed him, be became chief exponent of the idea in practical life.

Of all Mr. Warriner's opinions, none is more interesting than his belief that welfare work must be coöperative on the part of the company and the men. He says any other plan robs the men of self-respect and creates paupers.

In conclusion, let me say there is one sure way to make "Sam D." speak, and that is to mention the "check-off" system the miners are now demanding. If you think the subject of this sketch lacks in determination, or has any ring in his nose by which he is led, just watch the positive, direct-connected action of his jaws when he replies: "We'll close our mines forever before we agree to any such principle." And even when you have thus touched Sam on this particularly tender spot, his eyes are quiet and a little cold, in no way showing the fire that smoulders underneath. This ability to disguise every feeling is the most noteworthy characteristic of the man.

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Of this issue of Coal Age, we will print 7000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

What a Strike Will Mean

Should both the anthracite and bituminous operators and miners fail to reach an agreement by April 1 the largest industrial suspension in the history of the country will be precipitated. The anthracite and most of the bituminous agreements expire simultaneously at this time, and approximately half a million men will be immediately affected. Through the curtailment in fuel supplies, and consequent restriction of operations at steam plants generally throughout the country, more than twice this number of men will be indirectly affected in a comparatively short time.

If the labor leaders control the situation to the extent they claim, and there are no reasonable grounds for belief to the contrary, 64.5 per cent. of the productive capacity of the country would be affected. In this estimate is included the entire state of Pennsylvania, with the exception of the Connellsville region, Ohio, Indiana, Illinois, and the Southwestern district, including Missouri, Kansas, Arkansas and Oklahoma. The Central district of Pennsylvania and the state of Iowa are not in the tri-state agreement, and while the former may possibly reach an independent settlement and continue at work, the latter will doubtless be governed by the results of the tri-state convention.

Of the remaining 35.5 per cent. unaffected by the strike, only 23.6 may be regarded as accessible to the markets supplied by the union mines. This includes the Connellsville district, West Virginia, Kentucky, Tennessee and Maryland. In event of urgent demand, some of the Alabama fuel might reach portions of the affected area, but with its total production of only 3.2 per cent. the amount would be negligible. The Rocky Mountain States, with their production of 5.7 per cent. of the country's total, may be regarded as too remote to offer any relief to a shortage in the Eastern markets.

The possibilities of obtaining assistance from foreign countries are *nil*. With the British miners out, and the German production seriously curtailed, the European stocks are being depleted, and in any event, sufficient coal could not be transported from those markets to be of material assistance. Local points along the north Atlantic coast will no doubt obtain some relief from Nova Scotia, but with the entire Canadian production equal to only 2 per cent. that of the United States, this will not affect the situation in general.

From this summary it seems fair to assume, as stated, that only 23.6 per cent. of our productive capacity will be available to supply markets with a consumption of 64.5 per cent. Nor can this 23.6 per cent. be regarded as surplus coal since there must already be a natural consumption for it, and only the overproduction will be free for use in other markets. In view of the well known and deplorable conditions existing in West Virginia as a direct result of over-production, and the extensive developments recently inaugurated in the Kentucky fields, we venture to assume that, under pressure, this 23.6 per cent. output may be doubled, leaving that amount available for other markets, and reducing our total fuel shortage to 40.9 per cent. What the effect of a forced reduction in fuel consumption of 40 per cent. will be on the industrial world remains to be seen.

From a monetary standpoint, the possibilities are even more alarming. For each working day our fuel production is curtailed 40 per cent. the miners will sustain a loss in wages of eight hundred thousand dollars. On the same basis the value of the product at the mine per working day is one million two hundred thousand dollars. This is the real loss which the industry will sustain if a suspension occurs.

It is not within the scope of this journal to pass judgment on the comparative merits of the issues under contention. But it is within our province to urge upon the contending principals the grave responsibilities of their position and the national importance of their deliberations. Labor has learned an important lesson from syndicated capital with its interlocking di-

rectorates, alliances, etc.—and has, in fact, become syndicated labor, with a latent brute power of passivity no longer denied. And between labor and capital there is a third, and entirely helpless and innocent party, who must eventually pay the enormous bill—the public.

In conclusion, we wish to express the belief that a national coal strike in this country is unlikely. Work in either the anthracite or the bituminous field may be suspended, but the chances of a shutdown in both branches of the industry are remote. The hard-coal operators will never consent to the check-off system demanded by the miners, and, for this and other reasons, it is probable the chief trouble will take place in the anthracite districts.

Coal Mines and Health

Some time ago Coal Age published a series of articles by Edwin M. Chance, entitled "Pathogenic Mine Atmospheres." Before publication, the title was carefully considered and finally the decision was made that as the caption was a brief of the original title under which the paper thus abstracted was read before the Franklin Institute, it would be well to retain the word "pathogenic" of the original manuscript, using the word in about the same sense, for instance, as it was used by Hahnemann and the original homeopathists.

In former years, the word "pathogenic" lay, in recognized usage, nearer its Greek origins. Later bacteriologic research which has absorbed the brightest thought of modern students of disease has made the word slip its anchor and it is less often used today than formerly to express broadly all forms of the quality of causing suffering. The average present day practitioner would in common parlance limit its reference more specifically to the quality of carrying germs, which have a distressing effect on the human organism. Thus we term the air exhaled by consumptives, the defecations of typhoid patients and the sloughings of those who suffer from small-pox, pathogenic bodies. Many harmful yet germless mediums are not regarded, in the modern sense, as pathogenic at all. They are called poisons, mild or severe. Few would now regard salicylate of soda, for example, as a pathogenic substance. So that viewed from this new standpoint, we would be inclined to state that the mine atmosphere is not pathogenic. It is rather germicidal as is the drug just mentioned.

It is customary to represent the mines as prejudicial to the health of the miner. We have never been able to accept that dictum in its application to American mines, which are not deep and therefore not warm. The heat of our mines is not sufficient to aid the growth of such germs as will thrive in the blood warmth of the human body. Those impurities which the air contains are usually harmful only as they create in the blood undesirable chemical conditions, or as they dilute that constituent, oxygen, on which the health of the human organism depends. In fact some have suggested that a slight depletion of oxygen has its advantages and may have a marked deleterious effect on certain micro-organisms which have a narrower range of accommodations to atmospheric change than is possessed by man.

The higher altitudes where the density of the air is less than at sea level are favorable to consumptives. Whether the relief they afford is mainly due to the physiologic effects on the patient or to like effects on the patient's deadly enemy, we do not know, nor does it concern us, but if the effect of rarefaction of air on the consumptive depends on the reduction in the oxygen density, we can readily see some justification for those who do not look with disapproval on slight depletions of that constituent.

The miner has always declared the mines unhealthy. Much the same has been said on the dangers of night air. A century past, sea air was also declared extremely unhealthy and the rich recuperated at inland watering places. The rugged health of the sailor might have borne witness to the contrary, just as the miner is a living confutation today of his own ill considered theories. But all evidences were long unheeded; the thrice-breathed indoor air and the heavy air of closed-in valleys were preferred. Yet today nearly everyone sleeps with open windows and crowds of health seekers throng the seaside boardwalks. The time is coming when we shall view the average mine, above sea level, as dangerous indeed to life and limb, but not biochemically unfavorable to the happy continuance of life and health in the animal organism.

We have heard almost all hygienic ills, thoughtlessly attributed to the mine water, coal dust and the mine atmosphere. An evil looking trinity it must be admitted they make, yet if you attack the coal miner's statement he will nearly always begrudgingly admit that his fellow workers are really not unhealthy and are subject less to rheumatism and consumption, for instance, than men in other occupations. As a matter of fact, hard as it may be to explain, neither of these ills, to both of which one would, *a priori*, expect him to be subject, often afflict the coal miner.

With lungs filled with dust, stooped by shoveling, greviously cramped in undermining, often doubled like a jackknife for eight long hours, the coal miner nevertheless resists consumption well. Working in water, in a continual draft of air, making long tramps from the mines to his home with his clothes frozen stiff over his body, we may be sure that differences of temperature in two adjacent parts of his skin must occur and this thermal inequality is by many thought to be if not the primary at least the accessory cause of rheumatism.

The miner is also subject to frequent skin abrasions. Dirt is an essential part of his toil and this dirt enters his wounds and though in the open air these conditions favor the pus-forming germs, no such results appear to follow in the mines. Not only do trifling abrasions heal without painful complications, but it has been noted by M. J. Shields of the American Red Cross Society, and the conclusion has been fortified by his diligent inquiries, that major accidents with accompanying crushings and manglings never result in lockjaw unless the injured mine workers are hurt in underground stables.

The air, the coal dust and the water which are the three ills confronting the coal miner are all probably rendered antiseptic by the pyrites in the coal. This pyrites turns to iron sulphate by oxidation, dissolving in water; reactions take place precipitating ferric hydrate and leaving the water impregnated with sulphuric acid. This evaporates slowly and the vapor probably renders the air and coal dust germicidal.

Small quantities of nitrous fumes from some explosives add a trifling amount of nitric acid to the air, though the comlete combustion of blasting powder and nitroglycerin does not exhibit such an action, the nitrogen being freed entirely.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Shot Firing in Mines

(*Continued from March 9*)

Letter No. 4—In answer to the question from Seanor, Penn., regarding the disadvantage in the simultaneous firing of shots, I do not believe there is any disadvantage. Also the article on page 642, by W. Hartman, in which he states that electrical firing is more complex and expensive than by the old fuse method, seems exactly opposite to my experience.

In the first place, I have found it far easier, and quicker, to punch a hole in the dynamite, insert the wired detonator, than to peel off the fuse, slip the cap over the end, press it on, and then tie up the package. From a standpoint of cost, it certainly is far cheaper to fire with an electrical detonator than to buy, say, 10 ft. of fuse and a cap, the combined cost of which is far greater than an electric detonator to do the same work.

There may be a remote possibility of danger in the simultaneous firing of shots, providing the charges were extraordinarily heavy. This would be due to the interruption of the ventilating current, the compression and reaction tending to disturb the gas in the gob, and also displace doors, brattices, loose roof, etc., in the same manner as a small explosion.

There are several advantages in simultaneous firing, among which are greater safety to the miner, as he is sure the shots will go off at a certain time, and that there will be no "hang fire" caused by "kinked" fuses.

It is also safer from a standpoint of dust and temperature. If shots are fired in rapid succession, the first makes a certain amount of dust and a certain increase in temperature; the second results in two volumes of dust and two increases in temperature, and the firing goes on until we have dust and heat conditions which are ideal for an explosion.

Shots fired simultaneously perform greater work than when fired separately, that is, their efficiency is increased, and their yield in coal almost double. Therefore fewer drill holes are required, not so much powder, and there is less smoke, time and expense.

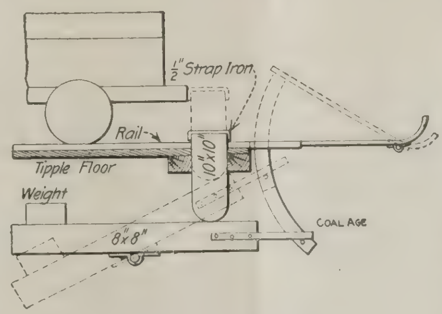
Summing it all up, I am of the opinion that the simultaneous firing of shots has all the advantages, and none of the disadvantages of the fuse and cap system of firing.

R. Z. Virgin.

Johnstown, Penn.

A Novel Safety Device for Tipples

I hand you herewith sketch of a stop I have applied to a tipple which I find works satisfactorily and has saved me considerable time and delays by runaway cars striking the sword of the tipple dump. I believe the sketch is self-explanatory.



Sketch of Car Stop

When the dump is in a dumping position, the block is raised so that it will catch the bumpers of the car. When the dump is released to receive another car the block falls back in place. It is not an expensive construction, as it can usually be placed on timbers used for the construction of the tipple. By having the 8x8-in. timber properly balanced it does not interfere with the dump in any way.

G. M. Shoemaker,
Mgr., The Virginia-Lee Co., Inc.
Pennington Gap, Va.

Seismic Unrest and Falls of Roof

The editorial on danger periods in mines, in Coal Age, Dec. 16, was highly interesting and recalled some suggestive coincidences in the possible existing relationship between seismic disturbances and coal-mine holocausts, a matter upon which scientists and coal-mining authorities generally are divided.

It would appear that the evidence so far collected is regarded as being not quite sufficiently convincing to convert the entire community to this theory. However, whereas only a few years ago the bare mention of the possibility of such a connection was openly ridiculed, the correlation of certain facts, has resulted in the adherence to the seismic theory by a goodly number of scientists. There is also reason to believe that not a few mining professors and experts are inclined to accept the view, but it is not openly acknowledged because of the fear of being regarded as faddists by their constituents.

Admittedly the solution of this problem presents many difficulties to the ordinary man, and as colliery people have a way of regarding themselves as eminently practical, "new fangled notions" are looked upon by them with a certain amount of suspicion. There was abundant evidence of this when the coal-dust theory was propounded. Discussion raged furiously and there were not a few departures from friendly relationships. It is interesting to recall that this was less than four decades ago and today the man who doubts the theory is looked upon as old-fashioned and behind the times. Can it be that history may repeat itself in regard to the seismic theory?

There certainly seems to be a fairly general agreement that atmospheric changes and local emissions of gas from the mines have a close relationship, and in Great Britain, barometrical fluctuations are carefully recorded, warnings being periodically issued to mining communities when the conditions presage special danger from outbursts of gas. Beyond this it may be advanced that the theory holding the spasmodic or irregular earth breathings responsible to some extent for explosive conditions in mines, may not after all be wholly unreasonable.

Mine Inspectors Instituted Inquiries

Mention may be made of the fact that eight years ago the British inspectors of mines instituted inquiries—unfortunately neither uniform nor conclusive—to ascertain whether earth tremors had any tangible effect upon falls of roof in mines. They appear to have taken this course because, notwithstanding the adoption of new special rules to secure systematic timbering, falls of roof and side continued to be as fruitful a source of accident as in the pre-systematic days. Indeed this remark, after the lapse of a number of years, may still be held to apply.

So far as they go the results secured by the mine inspectors may be summarized: W. N. Atkinson selected a period of two months in the year 1902 and observed that 33 earthquakes were registered at the Kew Observatory. Mark-

ing upon a large chart the exact times of 156 accidents from falls in six inspection districts, he says he relinquished his inquiries because "there did not appear to be the slightest indication to coincide, between the times of the earthquakes and those of the accidents."

A diagram was prepared by A. H. Stokes which seemed to indicate that the winter months was the period of the year in which most accidents from falls occur, but he could not convince himself that climatic changes have a material influence upon the death rate therefrom. He was inclined more to the view that the increased time worked in the winter period was responsible for the increased death rate.

Not satisfied with that evidence, John Gerrard sustained the earth-tremors theory, and Henry Hall was severe upon the mine management in the statement of his conclusion that "we suffer from the fact that no very direct responsibility in these cases rests upon any individual officer."

That it was quite possible seismic movement of the earth's crust might be a deep seated and unsuspected cause of many accidents from falls, was admitted by W. H. Pickering. As he remarked, earth tremors, reaching the dignity of earthquakes, pass at times across the British Isles—but hitherto they have never been considered to be a factor in mining accidents.

London, England. S. T. A.

Vertical Curves to Prevent Derailment

Your readers may be interested in a method of calculating vertical curves that is better known to municipal engineers than to those who follow their profession in the mining fields. Curves of this kind are useful in preventing derailments and save a lot of grading by trial and error, which is too common where a true curve is not predetermined. To make a clear illustration, a somewhat extreme case is taken.

The plane to be built is 520 ft. long. The lower end has a 2 per cent. grade, the upper a 50 per cent. The plane starts at station 0 and the point of intersection of the two grades is 3 The profile drawn has vertical scale $2\frac{1}{2}$ times as large as the horizontal, resulting in a vertical distortion of $2\frac{1}{2}$. The elevations, above tide, of the subgrades at the ends of the plane and at the point of intersection are marked, as is customary, with small flags; the heights of the subgrades, that is, the elevations at which the ties are to be placed, as a result of calculation, are marked on the profile, in the appropriate places, without the use of flags.

To shorten the solution it will be assumed that a break in grade is made every 100 ft., though it would be well to make the break at intervals of 25 ft. The principle is the same. The point of vertical curve (*P. V. C.*) is chosen at a distance 200 ft. from the point of vertical intersection (*P. V. I.*), that is, at station 1. So the projected length of the curve will be 400 ft., the point of vertical tangent (*P. V. T.*) being at station 5.

Gradient at *P. V. C.* is 2 per cent., or 2 ft. per station.

Gradient at *P. V. T.* is 50 per cent., or 50 ft. per station.

The difference is $d = 48$ ft. per station.

The number of stations covered by curve is $n = 4$.

We obtain a value x from the equation

$$x = \frac{d}{2n} = \frac{48}{8} = 6.$$

Subgrade at *P. V. C.* = (Subgrade at Sta. 0) + 2 = 1107.9 + 2 = 1109.9.

Gradient at *P. V. T.* is $\frac{50 \times 25}{100} = 12.5$ ft. per station.

Algebraic difference (d) is 12 ft. per station.

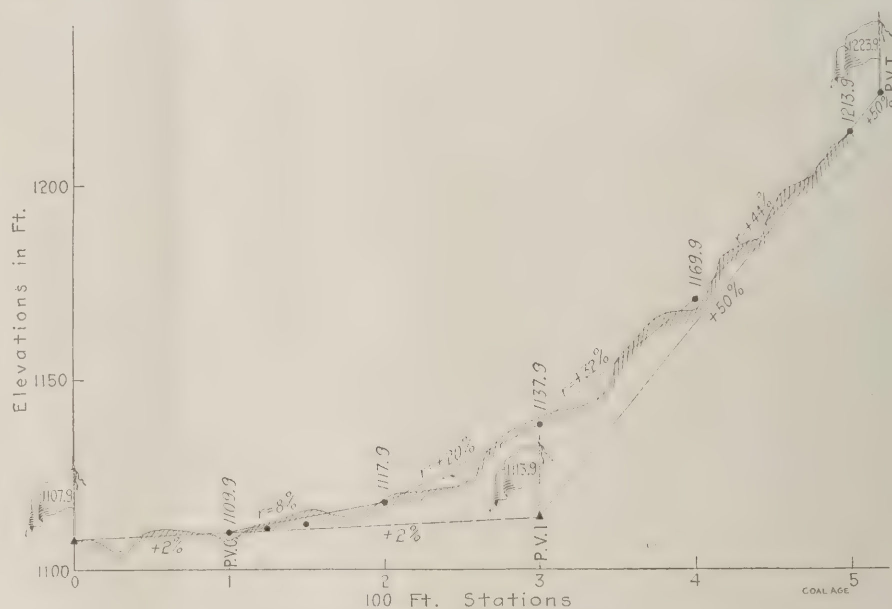
The number of stations covered by curve is 16.

We find, therefore, that

$$x = \frac{d}{2n} = \frac{12}{32} = 0.375.$$

The calculation is too long to complete, but commences thus:

$r = 0.5$	
$x = 0.375$	Elev. 1 + 00 = 1109.900
$r = 0.875$	$r =$ 0.875
$2x = 0.750$	Elev. 1 + 25 = 1110.775
$r = 1.625$	$r =$ 1.625
	Elev. 1 + 50 = 1112.400



A Vertical Curve on a Steep Plane

Proceed as follows, making rise per station $= r$.

$r = 2$	
$x = 6$	Elev. Sta. 1 = 1109.9
$r = 8$	$r =$ 8.0
$2x = 12$	Elev. Sta. 2 = 1117.9
$r = 20$	$r =$ 20.0
$2x = 12$	Elev. Sta. 3 = 1137.9
$r = 32$	$r =$ 32.0
$2x = 12$	Elev. Sta. 4 = 1169.9
$r = 44$	$r =$ 44.0
$x = 6$	Elev. Sta. 5 = 1213.9 Check.
$r = 50$. Check.	

This, it will be observed, is exactly the figure given for the *P. V. T.* If the length of the adopted distance between the breaks of grade is 25 ft. instead of 100:

Gradient at *P. V. C.* is $\frac{2 \times 25}{100} = 0.5$ ft. per station.

It will be observed that the first increase of grade is half the second, just as the first chord in a circular curve makes with the tangent an angle half that which it makes with its neighboring chord.

Such a curve will make derailments unlikely. Where rapid changes of grade take place vertical curves should always be inserted. In return car sidings where empty cars run continually into standing trips, it would be well to figure out vertical curves and to model the grade carefully from the beginning, instead of leaving the matter to adjustment by trial and error. It must be remembered that d is the algebraic difference; if one gradient is up hill and the other down hill, d is the sum of the two gradients per station. By taking only two stations, the apex distance can be easily determined. In this example the stations would be 200 ft. long and d would equal 96; $n = 2$, and $x = 24$. The elevation of the curve at the apex would be 1137.9, as already determined for the same curve with 100-ft. stations.

Indianapolis, Ind. F. A. Boag.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

First Aid Methods of Lackawanna Company

By C. E. Tobey*

There was a time—not many years ago, either—when the poor injured miner was dragged out of the mines by willing, but rough hands; his injured parts were crudely wrapped up with a dirty handkerchief or any old piece of cloth available, such as a discarded pair of overalls or working pants, and if there were any open cuts or bruises, these were frequently smeared over with fresh quids of chewing tobacco. For in those days chewing tobacco was supposed to have a wonderfully healing effect, regardless of the mouth from which it was extracted. If any of these cuts severed an artery, the man frequently bled to death before a doctor could be procured to stop the flow of his life's blood.

No special care was taken to splint or support a fractured limb so as to prevent further injury, for the average man knew nothing about the danger of fractured bones piercing through the flesh, or how to prevent such an undesirable result.

Trained First-aid Men of the D. L. & W. Mining Department

The injured man was carried to his home, sometimes thrown over the shoulder of some strong, robust helper; sometimes two of his fellow workmen would carry him by the head and heels. If there was a saloon on the way it was necessary to stop long enough to drown the poor fellow's pain with rot-gut whiskey, and, incidentally, to furnish, in the same manner, more strength for those carrying him. If the patient survived this kind of treatment and was alive when they got him home, it was a question whether he even then got proper surgical and medical attention, as doctors were not as plentiful as they are now and they cost money, and the chances are that some quack heal-all or bone-setter would get hold of the patient and finish him.

D. L. & W. R.R. Rescue Corps

Those days are past. Each and every one of the D. L. & W. mines has one or more First Aid Corps, composed of six or eight bright, energetic young men thoroughly drilled and instructed by the best of surgeons in the proper manner of rendering first aid in all kinds of fractures, cuts, bruises, shocks, etc.

These men are equipped with all the necessary paraphernalia to give prompt assistance in time of injury. They have stretchers, splints and blankets, as well as a box containing antiseptic gauzes and bandages, and when a man is injured, word is immediately sent to one or more of these men, and they get to the scene of the accident with all possible haste, and assume charge of the injured. They first make him as comfortable as possible, and then locate the injury. If it should be a broken leg, they immediately rip open the trouser leg to see that no bones are protruding. The fracture is reduced, if possible, and the leg supported and bandaged so as to prevent any further injury in moving the patient.

A Frame for an Injured Leg

We have for this purpose in our mine hospitals a frame made of light rod iron, passing down each side of the leg and around the foot, and when the leg is securely bandaged in this frame you could safely throw the patient out of the window without the least possible danger of further injuring that leg. It is not absolutely necessary, however, to have these regular frames, or to delay the work until something of the sort can be procured, as the meaning of "First Aid" is the assistance of the patient and the making of him comfortable with such means as are available until such time as a regular surgeon can be reached, and even a pick or sledge handle can be made to answer the purpose of splint or sup-

*Superintendent coal department, D., L. & W. R.R.

Note—Address delivered at Penn. State Y. M. C. A. Convention, Bradford, Penn., on Feb. 23, 1912.

port, providing it is properly secured by bandages to the limb. Neither is it necessary to await the arrival of a regular stretcher, as a very comfortable appliance can be improvised quickly by placing two rods or sticks through the sleeves of two or three coats or jumpers.

If there should be any open cuts or wounds to contend with, our First Aid boys are fully alive to the dangers of infection and blood poisoning from the many germs lurking on their dirty hands and clothes. As the Irishman explained to his friend: "Pat, did you ever know that the doctors now claim that all diseases and sickness are caused by a 'bug'? If yez cut off yer thumb and die of lock-jaw, it was a 'bug' that done it. If yez catch cold on yer lungs and ye're carried off by consumption, it was a 'bug' that done it. If yez get hay-fever, it's a 'bug', and if yez has the grippe its another 'bug.' In Germany they call these 'bugs' 'Germs.' In France they be called 'Parisites,' and in Ireland they do call 'em 'Mikerobes'."

Our men are careful not to touch these cuts or wounds with their hands or dirty clothes, but they use antiseptic gauze, taken from their sealed packets. If an artery has been severed, our men know how and where to place the tourniquet so as to stop the flow of blood and thereby save the man's life. No liquor is given the patient, but if any stimulant is needed, a little aromatic spirits of ammonia is given in water.

Artificial Respiration for Five Long Hours

If the man has been completely "knocked out" and has the appearance of being dead, as is frequently the case in shocks or after-damp, his heart may continue to beat for several minutes after he stops breathing. Artificial respiration is then the only way of restoring life, and when properly done and persisted in, will force the man to breathe whether he wants to or not. We had a case of this kind in one of our mines when artificial respiration was kept up for three-quarters of an hour, and the patient is working for us today. Everybody but our superintendent pronounced the man dead, but he would not give up; nor would he allow the others to quit. We had another case in our company hospital where artificial respiration was continuously kept up for five hours, and the patient is still living to tell the story.

After the injuries have all been properly dressed and protected from dirt and contamination, the patient is placed on a stretcher, carefully covered with blankets so as not to get chilled, and hoisted to the surface without any unnecessary jars or jolts.

Iron Frame for Injured Leg

The ambulance has already been prepared and is in waiting, and the injured man is conveyed on a mattress to the Moses Taylor Hospital, which is in charge of one of the most skillful and capable surgeons in this country. There the patient is left under the watchful eye of a trained nurse, and is not allowed to leave the hospital until all danger is past.

The Hospital Car at Kingston, Penn.

The Interior of the Kingston Car

The Hospital Car

In our Wilkes Barre district, where the mines are located some 16 or 20 miles distant from the company hospital, we have a regularly equipped hospital car standing at Kingston Station under heat, and ready at a moment's notice to convey injured employees to the Scranton hospital.

If a regular passenger train is due at the time, this car is attached to that train, but if between trains, and the condition of the injured will not warrant delay, a switching engine is immediately attached and the car hurried to Scranton as a special. This car has cots and blankets and everything necessary to the comfort of the injured while being transported, and, if the conditions warrant it, the company surgeon located at Kingston, accompanies the patient to Scranton, and has been known to successfully reduce fractures and perform amputations and other operations while *en route*.

In conjunction with this hospital car we also have a rescue car fully equipped with helmets and rescue appliances, oxygen, etc., and at most of our important mines we have rescue stations similarly equipped and manned by employees thoroughly drilled in the use of these helmets and pulmotors. These men have been confined in sealed rooms filled with sulphur fumes and required to saw timber, shovel coal and dirt, crawl through low places, carry stretchers over obstructions, etc., while wearing these helmets, and they all have the necessary strength and nerve to enter a burning mine and rescue the men. This car was rushed to the scene of the terrible Pancoast disaster last spring, but, unfortunately, did not get there in time to save any of the 73 unfortunates who lost their lives.

We also have another car located at Kingston fully equipped with all kinds of fire fighting appliances, and, in case of a bad accident or big mine disaster, this special train, consisting of rescue car, fire car and hospital car, is immediately dispatched to the scene.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Handling a Mine Fire in a Gassy Mine

Referring to the accompanying sketch, which shows a fire started at the face of the intake gangway in a mine, what would be the best method of fighting this fire so as to insure the greatest amount of safety to the men? As shown in the sketch, there are eight chambers driven to the rise of the gangway. In six of these chambers there is gas given off at the face. The direction of the air current is shown by the arrows and it will be noticed that the gas given off at the face of the chambers is being carried toward the fire. This question has caused considerable warm argument here and developed a great diversity of opinion among practical mining men.

ROBERT WILLIAMS.

Wilkes-Barre, Penn.

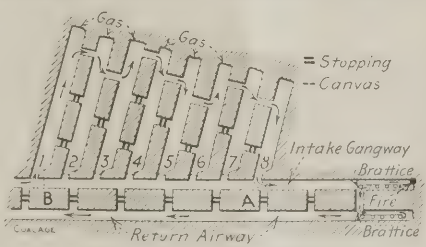
The first consideration, after withdrawing all men from the mine, is to keep the gas from the fire and to accomplish this before anything else is done the stopping at *A* should be partly opened. This would short-circuit the air at this point, and the gas being generated at the face of the chambers will be conducted directly into the return airway.

Since there has been, as yet, no explosion of the gas contained in the air current passing over the fire, it may be assumed to be safe to allow this air to circulate past the fire for the present and not to short-circuit the whole of the air current. For this reason the stopping at *A* should be opened only sufficiently, at first, to reduce the quantity of air passing the fire. Reducing thus the quantity of air will, to some extent, dampen the fire.

The next step is to arrange so as to carry all of the gas-laden air coming from the chambers, through the crosscut at *A*. This, however, cannot be done with safety until a portion of the intake current entering chamber No. 1 can be conducted through the canvas at *B* and along the gangway to the fire, so as to dilute the gases formed by the fire, which will rapidly become explosive when the current is reduced. This current will be fresh air containing no gas and will eventually replace the air from the chambers containing gas which is now feeding the fire.

In order to accomplish this it will be necessary to construct a box of sufficient size to conduct the air from the chambers across the gangway to the crosscut at *A* through which it passes into the return airway. This box can be constructed quickly by nailing canvas to suitable crossbars in the gangway. This box will form a sort of air bridge, at the roof of the gangway, and is represented by the dotted line drawn from the mouth of chamber No. 8 to the crosscut *A*. Before constructing this box or air bridge it will be best to open the canvas at *B* sufficiently to divert a portion of the air passing up the chambers, into the gangway. How much this current can be reduced in the chambers should be determined by a fireboss, who must watch the gas at the face of the chambers, and especially the condition of the current in chamber No. 8.

As soon as the air bridge at crosscut *A* is completed the air reaching the fire will



SHOWING LOCATION OF FIRE AND DIRECTION OF AIR CURRENT

be practically fresh air containing little or no gas. This current, however, should be only sufficient to allow men to approach close enough to the fire to extinguish the flame, and to avoid the possible formation of an accumulation of explosive gases (carbon monoxide), in the region of the fire.

All of the work should be done with safety lamps and every precaution should be used to protect all approaches to the return airway and prevent anyone from entering the return current. In the meantime, arrangements will have been made to conduct water to the fire.

Ventilating Pressures

If the water-gage reading taken on the fan drift is 2.2 in.; (*a*) What is the unit of ventilating pressure? (b) What is the mine resistance indicated by this reading if the fan drift, at this point, is 12 ft. wide and 10 ft. high? (c) What is the absolute pressure on the mine air at an elevation of 1000 ft. above sea level?

Fairmont, W. Va. J. B. W.

The unit of ventilating pressure is

$p = 5.2 \times 2.2 = 11.44$ *lb. per sq.ft.*

(b) The area of the fan drift is $10 \times 12 = 120$ sq.ft.; and the mine resistance is then

$R = pa = 11.44 \times 120 = 1372.8$ *lb.*

(*c*) The atmospheric pressure, at an elevation of 1000 ft., is 2041.1 lb. per sq.ft., and the unit of ventilating pressure being 11.44 lb. per sq.ft., the absolute pressure is $2041.1 + 11.44 = 2052.54$ lb. per sq.ft.

Pumping into Tank

We expect to pump water into a large tank 25 ft. above the ground. Would it be better to run the discharge line or column pipe to the top of the tank where it would have a free discharge, or to enter the pipe at the bottom of the tank? What would be the advantage in either case?

Dubois, Penn. MINE FOREMAN.

Although, by far, the most common practice is to enter the column pipe and terminate it at the bottom of the tank, this is not the absolute rule, as there are numerous advocates of extending the pipe up the outside and allowing it to discharge into the tank at the top.

Entering the pipe at the bottom reduces the head under which the pump must work when the tank is not full. There is a less length of column pipe to protect from freezing and a corresponding decrease in frictional resistance in pumping. The resistance to discharge at the end of the column pipe is practically the same in either case, whether the pipe discharges into the body of water in the tank or against the atmosphere at the top of the tank.

Pumping in Shaft

The column pipe in a shaft 200 ft. deep is 16 in. in diameter; and all the pumps are arranged to discharge into it. When not required, all the pumps are stopped but one, which has a 2-in. discharge. Would it be better if this pump had its own discharge or column pipe to the surface or will the pump do as well when discharging into the large 16-in. pipe?

MINE SUPERINTENDENT.

Pittsburg, Penn.

It is often the case that pumps arranged to discharge into the same column pipe do not work satisfactorily, when operated together. The fault is due generally to improper design. In the case in hand, the single pump having a 2-in. discharge will work as well or better when discharging alone into the large 16-in. pipe. The pipe friction will be less, for the same flow, than in a pipe of smaller diameter.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions Asked at Fireboss Examination, Held at Cumberland, Wyo., Jan. 29-31, 1912

(Continued from March 9)

Ques.—What are the dangers attending windy shots and how would you guard against them?

Ans.—A windy shot always produces a large disturbance of the mine air; and, in case dust is present in considerable quantity in the working place, a cloud of dust is raised and a local dust explosion may be produced, the fine dust floating in the air being ignited by the flame of the shot. If, as is often the case, gas has accumulated in the space over the waste or gob, this gas will be ignited and a local explosion produced. A windy shot often loosens the roof at the working face. Where safety lamps are used, the concussion of the air may force the flame of the lamp through the gauze and ignite the gas. The best way to guard against these dangers is to avoid producing a windy shot.

The following precautions are suggested: Avoid an overcharge of powder; drilling the holes too deep on the solid; drilling a "dead hole," by which is meant a hole perpendicular to the face of the coal. Such a hole has no opportunity to work, unless a suitable mining or side cut is made extending nearly or quite to the depth of the hole. Avoid locating a charge too close to a hard roof or near to a boulder. Cut away all projecting tops and bottoms that would prevent the shot from doing its proper work. Avoid firing two or more shots in quick succession in a close place. Never place one shot dependent on the work of a previous shot and fire these two shots at the same time expecting one of them to explode first, the work of the second depending upon that of the first. Where gas is generated always test the face of the chamber for gas before firing a shot. Avoid all accumulation of fine dust and coal, at the working face.

Ques.—What is meant by splitting the air current and what are the advantages of so doing, if any?

Ans.—By splitting is meant dividing the air current into two or more separate currents, each of which will ventilate its own section of the mine from the moment it leaves the main intake until it reaches the main return. By this means the ventilation of the mine is under better control, since the air current can be divided in proportion to the requirements in each section of the mine. Better ventilation is afforded at the working face, since the air is fresher, contains less gas, smoke and dust and travels at a more moderate velocity. Any explosion of gas occurring in one section of the mine is generally confined to that section. A larger quantity of air is circulated by the same power; or for the same quantity of air required the power producing the circulation is reduced. Splitting the air current in a mine reduces the number of doors required, but generally requires the use of regulators and the construction of air-bridges.

Ques.—How would you proceed to clear a shaft that is filled nearly to the top with carbon dioxide, without the use of a fan?

Ans.—In a deep shaft the removal of the blackdamp might prove a difficult operation and in most cases a fan would be needed for that purpose. Assuming, however, a shallow shaft and barring the use of a fan, recourse must be had to such simple methods as the emptying of several barrels of water into the shaft, in quick succession; the use of large bailing buckets lowered and hoisted rapidly; the use of a steam jet or blower at or near the bottom of the shaft. If there is a partition or manway extending down one side of the shaft, advantage can often be taken of the wind pressure by erecting a canvas or cowl, so as to deflect the surface wind into the shaft. It will, however, generally be difficult to remove a large volume of blackdamp from the shaft without the use of a fan, the employment of which would save much time and expense.

Ques.—How would you remove an accumulation of gas from a mine, with safety?

Ans.—Everything will depend on the character of the gas, its location in the mine and the strength of the air current. Assuming, however, a body of marsh gas (CH_4) accumulated at the head of a steep pitch, which is the probable meaning of the question: First, notify the men on the return of the air current and, if the body of gas is large, withdraw all the men from the mine before attempting its removal. Having done this and having stationed reliable men at all points necessary to protect the return airway and prevent persons from entering the same, increase the quantity of air passing in the affected portion of the mine, as much as possible. Then, having brought the air in sufficient volume to the foot of the pitch and having the necessary material at hand, proceed to erect a temporary brattice, to conduct the air current up one side of the chamber, allowing it to return down the pitch, on the other side of the brattice. Only safety lamps must be used and the work must all be done on the intake side of the brattice. Sufficient time must be allowed for the air current to sweep away the gas each time that the brattice is extended; the work is necessarily slow. All lamps should be kept at a safe distance back from the ends of the brattice. In this manner, the work should be extended up the pitch until the face is reached and the gas removed.

Ques.—If you were about to examine a mine for explosive gas, what would you consider your first duty as a fireboss before you entered on your rounds through the mine?

Ans.—Having filled and properly cleaned his safety lamp, the fireboss, before entering the mine, should ascertain that the ventilator is running at its usual speed. After lighting and carefully inspecting his lamp, on entering the mine, he should proceed at once to the foot of the downcast shaft, or to the nearest point accessible on the main intake airway; and, here, before proceeding further on his rounds, he should assure himself that the usual quantity of air is passing in the airway. In a very gassy mine or where the mining laws or mine regulations require, the fireboss should place a suitable danger signal at the mine entrance, which will remain there as a warning to all persons not to enter until he has returned from his examination and removed the signal. Before examining a gassy mine it is well, if the fireboss is able to do so, to make a special test of his lamp before entering the mine.

Ques.—If it is found necessary to increase the quantity of air in a mine, how would you do it without increasing the speed of the fan?

Ans.—Remove all obstructions from airways; clean up any roof falls; enlarge all breakthroughs or crosscuts and straighten the airways and shorten the distance the air must travel wherever this is practicable. Split the air current whenever this can be done to advantage or without reducing the velocity of the air current to a point too low to sweep away the gases and provide good ventilation at the working face.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Strong interest is felt in government circles with reference to the British coal strike and its reflex effects upon our own coal trade. The immediate influence of the strike, as observed here thus far, has been the stimulation of export business. While full figures are not yet available at the statistical offices, it is known that large quantities of coal are being loaded at Atlantic ports for South American and European points which are usually supplied from English mines.

Should it prove possible to avert a coal strike on this side of the water it is believed that a large, and possibly permanent, gain in our foreign business will be secured. This makes it doubly desirable, according to the views entertained here, that there shall be no violent disturbance of existing conditions in our coal industry. Government officials incline to the opinion that, in view of the circumstances, the operators can afford to make some concessions in order to secure for themselves a valuable opportunity to expand their business in this new direction.

It is well understood here, of course, that the bituminous mines of the country have not been in a money-making position for some time, and this fact has been brought out repeatedly during the past few weeks, not only by statements before the Interstate Commerce Commission in connection with pending coal cases, but also in arguments before committees of Congress in connection with various bills under consideration.

Reports received in Washington, are to the effect that a month's supply of coal is already in sight at different points, and that heavy outputs will be maintained from now until the end of the current month, when prevailing wage agreements expire.

Altogether, the coal situation is regarded here with considerable anxiety and a good deal of attention is being paid to it in Congress. While it is believed that an agreement will be reached on some basis through the submission of modified demands by either side, there is not a little anxiety lest some serious dispute should be precipitated. Should difficulties of an acute nature arise, the national government, it is felt here, would almost necessarily intervene, perhaps along the same lines that were followed under the Roosevelt administration, for the purpose of effecting an adjustment. Such plans are, of course, purely tentative, but the fact that they are being talked of with seriousness is considered decidedly significant.

Provision for Government Coal Business

A specially interesting feature of the new Panama Canal bill, so far as the coal trade is concerned, is that portion which is intended to give the President power to sell coal and other supplies to passing vessels. This provision is found in Section 6 of the bill and reads as follows:

> The President is also authorized to establish, maintain, and operate drydocks, repair shops, yards, docks, wharves, warehouses, storehouses, and other necessary facilities and appurtenances for the purpose of providing coal and other materials, labor, repairs and supplies for its own vessels, and, incidentally, for supplying such at reasonable prices to passing vessels, in accordance with appropriations hereby authorized to be made from time to time by Congress as a part of the maintenance and operation of the said canal.
>
> Moneys received in the ordinary course of business from the conduct of said business may be expended and reinvested for such purposes without being covered into the Treasury of the United States; and such moneys are hereby appropriated for such purposes, but all deposits of such funds shall be subject to the provisions of existing law relating to the deposit of other public funds of the United States, and any net profits accruing from such business shall annually be covered into the Treasury of the United States. Monthly reports of such receipts and expenditures shall be made to the President by the persons in charge, and annual reports shall be made to the Congress.

Alabama

Birmingham—The Corona Coal & Iron Co., which L. B. Musgrove and associates have been operating for some years, was recently purchased by Edgar L. Adler of Birmingham, the price paid for the corporation and its physical holdings being approximately $1,000,000. The property includes about 45,000 acres of the Corona seam, which is a high grade domestic coal. The new owner expects to spend about $250,000 in betterments to the present equipment and for new openings, in an effort to produce 1,000,000 tons of coal annually. Heretofore about 500,000 tons have been obtained each year. The plants now in operation include the Corona, Coal Valley and Patten mines.

The bee-hive coke ovens of the Tennessee Coal, Iron & R.R. Co. at Bessemer and at Alice Furnace, Birmingham, have been put out of commission by the firing of the first battery of the company's new Koppers byproduct ovens at Corey. Other bee-hive ovens will be shut down as the balance of the new plant is finished, during the next few months.

Colorado

Meeker—A contract has been awarded for the immediate construction of a railroad from Rifle to Harvey Gap, which will tap the coal beds at the latter point. This line is being built by the Garfield Coal Co. and will open up deposits of coal that are among the largest in the state.

Denver—By an agreement entered into, Mar. 5, between officials of District No. 15, United Mine Workers of America, and the American Fuel Co., the strike in the Northern coal fields, which has been in progress for nearly two years, is virtually settled so far as the eight mines of this company are concerned. As a result, about 300 men have returned to work in Louisville and Lafayette and it is reported that nearly 1000 will return to work in the Northern field before long. Under the agreement, the men are given an increase of 3c. a ton on the run-of-mine coal and of 5 per cent. on day work. They asked for an increase of 5.55 per cent. on all work.

Fort Collins—The proposed development of a coal mine at Fort Collins has fallen through for lack of funds needed to purchase the property. Outside capital refused to invest in the company and it was compelled to relinquish its holdings.

Illinois

Chicago—Announcement was made recently that the Chicago & Eastern Illinois R.R. had purchased approximately 28,000 acres of coal land in Montgomery County, Illinois, for $2,500,000. This is regarded as the largest coal-land deal negotiated in Illinois for a number of years. The property was sold by A. R. Bird & Sons of St. Louis and the transfer was handled by the banking firm of Kuhn, Loeb & Co. of New York. The new acquisition increases the coal-land holdings of the Chicago and Eastern Illinois road to 38,000 acres. The purchase represents five mines. The railroad, however, will not operate these but will continue the present leases for a number of years. The property was acquired in order to in-

sure and safeguard the railroad's fuel supply, according to a statement made by the president of the company.

Representatives of the coal operators of western Pennsylvania, Ohio, Indiana and Illinois met with representatives of the United Mine Workers in Chicago, Mar. 5, and arranged for a conference of the joint scale committee to take place in Cleveland Mar. 20. Briefly, the demands of the miners are that the present working day of eight hours be decreased to seven hours, with five hours on Saturday at full pay, and a 10 per cent increase of the present wage scale.

Duquoin—The Chicago and Carbondale coal mine, at Ward has been taken over by the Mississippi Valley Mining Co. for a consideration of $75,000 and is now in operation. The town of Ward was almost depopulated on account of this mine not working during the past year. The mine had filled with water and was generally run down but the work of reclaiming has been going on rapidly and it is expected that an output of 500 tons a day will soon be attained.

Centralia—The Junction City mine of the Marion County Coal Co. recently broke its own record by attaining a production of 1800 tons in one day. The mine employs 375 men.

Streator—The Chicago, Williamson and Vermillion Coal Co. is putting down a number of bore holes northeast of here in hopes of locating a bed of coal that will justify opening a new mine. This company's present No. 3 mine, near here, will probably be worked out during the year.

Indiana

Logansport—In order to be prepared for a possible strike of the coal miners of the country, an official of the Wabash railroad recently made arrangements to store here a large quantity of coal for the railroad's use. The Wabash intends to store coal all along the different divisions and at all its terminals.

Terre Haute—Miners are in great demand in this vicinity, some coal companies advertising that they require as many as 80 additional men. A strike or suspension on Apr. 1 is regarded as inevitable and every effort is being made to get out as much coal as possible before that date.

Princeton—The Princeton Coal Company's mine, here, has been sold to the Deep Vein Coal Co., of Terre Haute.

Brazil—The Clay County board of mine examiners has secured an opinion from Attorney-General Honan, holding that the examining boards established by the last general assembly cannot legally issue certificates to mine workers except at the regular meetings of the board. In regard to apprentices, Mr. Honan holds that an apprentice must work under a qualified miner for two years and cannot legally be employed elsewhere in preparation for a certificate.

Indiana coal operators have sent a petition to the Indiana railway commission asking for secrecy regarding their daily reports to the commission which give the number of cars received and loaded, and the number of hours of work at each mine. The order requiring the reports to be made provides that they shall be made public property. The operators say that under the order, coal brokers are enabled to keep in touch with conditions at the mines, and, on that knowledge, often take advantage of shortages in cars or shutdowns to interfere with the sale of coal by the operators.

Iowa

Des Moines—A recent strike at the Ray coal mine southwest of here, originating in differences with regard to the double work system employed at the mine, was soon settled by an amicable agreement. It is said that there is not an idle miner in the Iowa fields at this time, unless it is because of accident or other special reason. The maximum amount of coal is being mined daily in order to store away as much fuel as possible. Operators estimate that in case the miners suspend work Apr. 1, there will not be enough coal stored away to last more than a month or six weeks.

Kentucky

Louisville—Information from Pikeville is to the effect that Congressman John W. Langley, of the tenth Kentucky district, and Congressman James A. Hughes, of the fifth West Virginia district, will wage a vigorous fight to secure appropriations of $50,000 each for dams on the Levisa and Tug forks of the Big Sandy River, in the annual rivers appropriation bill of Congress. The War Department, after assisting last year in securing the insertion in the rivers bill of authority for the building of these two dams has now concluded that a resurvey should be made before the projects are pushed to completion. These dams will be of inestimable value to the coal industry in western West Virginia and eastern Kentucky, and a delay of one, two or three years would be a serious matter to mining interests. Messrs. Langley and Hughes, in discussing before the House committee the need of appropriations for these two dams, pointed out that they would be of considerable value in demonstrating the importance of the further development of such projects along the Big Sandy.

Whitesburg—It is believed that a number of new towns will spring up this year in the vicinity of Whitesburg, as a result of the expenditure of millions of dollars in development work by the Consolidation Coal Co. and other concerns now active in this field. The Consolidation company has announced that it, alone, will spend $4,000,000 in development work. Jenkins will have 8000 population by Sept. 1, it is estimated. McRoberts, on Wright's Fork, is growing rapidly, and another town is planned for a point farther down on Boone Creek. Dunham and Burdine are growing fast and the Mineral Development Co., a Philadelphia concern, contemplates building a model mining town along Moore's branch, on a large area owned by the company.

Ohio

New Salem—Fire, Mar. 2, destroyed the large wooden tipple of the Buck Coal Co., just east of here. No water was available for fighting the flames but the fire did not spread from the tipple to surrounding buildings. The mine had been shut down for some time.

Alliance—Subdistricts 4 and 5 of District No. 6, United Mine Workers, held their convention here recently and elected officers but refused to discuss the probabilities of a strike, prior to the conference of higher authorities.

Columbus—The hearing before the Federal Court in Columbus of the suit brought by the Federal Government to compel the dissolution of interests alleged to exist between certain railroads and coal companies was brought to a close recently. During the hearing, several prominent coal men were on the witness stand. In summing up for the prosecution, the representatives of the government claimed that in spite of the defendants' pretense of complying with the antitrust laws, the competition which existed in the Hocking Valley coal fields previous to 1899, at which time the combination was formed, has never been restored. The government claims that this combination is still in force under cover, and that there has been at attempt to conceal the fact by a juggling of professed ownership among the various units of the big syndicate.

Oklahoma

McAlester—The 445,000 acres of segregated coal and asphalt lands of the Choctaw and Chickasaw nations will be sold to the highest bidders as soon as the departmental regulations can be put into effect and a land office opened in this city.

Pennsylvania

Bituminous

Brownsville—After a strike, lasting about 10 days, which threatened to involve the Crescent and Vigilant mines, the miners at the Chamouni works of the Monongahela River Consolidated Coal & Coke Co. have made a compromise agree-

ment, lasting until Apr. 1, and have returned to work. About 200 men went out on strike as a protest against the use of safety lamps.

McDonald—About 500 men, employed at the Jumbo mine of the Pittsburg Coal Co., went on strike recently, as the result of an order compelling the machine men to use safety lamps. It was reported that the miners at the company's Champion mine, at Sturgeon, would strike also.

Indiana—A large field of coal is now being optioned in the heart of the coal-producing section of Indiana County. There are no openings in the immediate vicinity. Options have been taken a number of times on this field, but for different reasons the deals were never consummated. The field in question separates large holdings, now owned by the Buffalo & Susquehanna Coal Co. and the Rochester & Pittsburg Coal & Iron Co.

Connellsville—Coke production has materially increased during the past week, and a number of idle plants are being put in shape to start up on short notice. Much new business is expected to come this way in the event of a coal strike.

Uniontown—The McKeefry plant has resumed coking operations, after a year's shutdown.

Scottdale—The Shannon Coke Co., which has been idle for over a year, recently resumed operations by firing 42 ovens.

Fayette City—The Pittsburg & Lake Erie R.R. Co. and the Pittsburg Coal Co. are having a dispute over a right-of-way claimed by the railroad over property owned by the coal company. Recently tracks were laid over the ground of the coal company and later, employees of the coal company removed them. To prevent further work on the part of the railroad, the coal company laid a steam line to the ground in dispute and fitted it out so that a shower of steam can be turned on any invaders.

West Newton—Five hundred and fifty-three acres of Pittsburg-seam coal, in Cross Creek Township, Washington County, were recently sold to Pittsburg interests for $100 an acre. The purchasing company has already begun the erection of a tipple and installation of machinery.

Pittsburg—Rapid progress is being made on the extension of the Monongahela railroad, being built out of Martin, Penn., and running southward to the Pennsylvania and West Virginia state line. It will be operated by the Pennsylvania and the Pittsburg & Lake Erie railroads and will also connect with the Buckhannon & Northern. The road will open up valuable coal lands in Greene County, Penn., and for this reason the New York Central system has been trying to obtain an entrance into the territory for some years. Forty-five miles of road are now under construction. It is expected that the work will be completed by June.

Anthracite

Scranton—The Delaware, Lackawanna & Western company recently became the owner of the Isaac Felts coal lands, in Taylor, some 120 acres in extent and said to contain several millions of tons of coal. The tract will be worked by the Lackawanna company from its Holden mine.

Although only a month has passed since the breaker of the Connell Anthracite Mining Co., at Bernice, burned to the ground, a temporary structure has been erected in its place, capable of turning out 1250 tons of coal daily.

Members of the district executive board of the United Mine Workers announce that active steps are being taken to build up the ranks of the union throughout the anthracite region. Fifteen national organizers have been ordered into Pennsylvania to round up into the union every man now employed.

Wilkes-Barre—The boiler house of Lance, No. 11, colliery, at Plymouth, was recently destroyed by fire. The breaker and adjoining buildings were in some danger but escaped injury.

Five houses were seriously damaged by a subsidence of the surface over old mine workings, at Plains, near here, Mar. 5, due to an extensive cave-in in old workings of a Delaware & Hudson mine.

Conservative estimates have it that fully 2000 foreigners have already departed from the anthracite region. These men are laborers in most instances, but a number of experienced miners also have started back home.

Pittston—Traffic on the Lehigh Valley cut-off was delayed several hours, Mar. 4, by a cave-in under the tracks at a point near the Butler breaker.

Utah

Salt Lake City—The National Fuel Co. has been organized with $1,000,000 capital to develop coal deposits in Carbon County. The company has taken over 1000 acres of land, 14 miles west of Helper, Utah, and announces its purpose of constructing a railroad from this tract to Helper, to connect with the Denver and Rio Grande. It is the intention to begin construction this summer.

The American Fuel Co., of Utah, which owns 1000 acres of coal land in Grand County, recently sold $50,000 worth of stock, and the money accruing from this sale together with that from other sales in process of consummation will be devoted to the construction of a railroad, 5 miles in length, which will connect the company's mines with the main line of the Denver & Rio Grande at Thompsons.

Washington

Palouse—Organization of the Palouse Coal & Oil Co., started last November, was completed recently and officers were elected. The company is capitalized for $500,000 and has taken over leases on 1500 acres of land formerly held by the Palouse River Coal & Development Co. The reports of C. E. Allen and M. M. Waters, who were employed to examine the property, state that a seam of lignite coal, about 6 ft. thick, has been encountered at a depth of 56 feet.

West Virginia

Kingwood—The Preston County Coal Co., operating at Cascade, W. Va., is crippled through lack of labor. Sufficient men are not available to work the plant to its full capacity. The Elkins Coal Co., operating in the same section, is also handicapped by lack of men.

Fairmont—It is reported that the demand for coal is so great that the Consolidation Coal Co. is trying to buy coal to assist in taking care of English contracts. The English government, to supply its needs, has bought 1,000,000 tons of American coal. Contracts are taking up the output to such an extent that little coal is being sold on new orders.

Wyoming

Sheridan—An unprecedented situation in union labor developed here recently when the operators of the coal properties in which the miners are striking brought suit for damages against the union as a body and attached the strike fund of the miners as a guarantee that when the suit is won there will be property with which to pay the damages. The operators allege a regular contract with the union and say the union broke the contract, thereby preventing the company from shipping coal and causing a heavy loss.

Canada

Merritt, B. C.—An explosion of gas at the Diamond Vale Colliery, Mar. 7, killed seven men and injured two. Twenty men, in all, were in the mine; eleven were rescued from another level than that in which the explosion occurred. The men in No. 3 level, the seat of the trouble, had been working with naked lights, and it is generally believed that they struck a pocket of gas.

Halifax, N. S.—It was recently reported that the Allan shafts of the Acadia Coal Co., at Stellarton, were on fire and that it had been necessary to wall off a considerable section of mine.

Personals

F. R. Wadleigh, fuel engineer and assistant general manager of the Chesapeake & Ohio Coal & Coke Co., recently spent several days in New York on business.

H. C. Thompson, of Winchester, and R. L. Thomas, of Lexington, Ky., who are extensively engaged in coal mining and own large coal properties in eastern Kentucky, have opened an office in the Hernando Building, Lexington.

T. E. Jones has been appointed manager of the Cahaba Coal Co.'s property, at Corydon, Ky. Mr. Jones recently made a trip to the headquarters of the company in Birmingham, Ala., and shortly after he returned, his appointment was announced.

W. L. Carter, general manager and part owner of the Barren Fork Coal Co., Pulaski County, Ky., has been made general manager of the Eagle Coal Co., of Alabama and Tennessee, and will move from Louisville, early this month, to take up his residence in Birmingham, Ala.

J. S. Miller, formerly superintendent of the Shumway mine, of the Rocky Mountain Fuel Co., at McGuire, Colo., has been appointed general manager of the Southern Superior Fuel Co.'s mines, near Walsenburg. Mr. Miller will make his headquarters in Walsenburg, although the main offices of the company are in Denver.

W. K. Robertson, E. K. Upton and C. O. Peterson, of Minneapolis, together with R. S. Waddell, G. H. Hutchinson and E. A. Danz, of St. Paul, all officials and engineers of the Northwestern Fuel Co., recently made an inspection of the company's property, at Superior, Wis., and were entertained by B. A. Galleher, superintendent of the local plant.

Thomas B. Scott, Fred Scott and George Cole Scott, of Richmond, Va., directors of the Bryan Coal Corporation, and W. C. Adams, a prominent engineer of Baltimore, Md., recently made a trip of inspection to the Bryan company's coal property, near Birmingham, Ala., in company with Frank Nelson, Jr., of Birmingham, president of the company.

William Hausemann, until recently chief mechanical engineer of the Sloss-Sheffield Steel & Iron Co., has been appointed mechanical engineer for the Pratt Consolidated Coal Co., of Birmingham, Ala., in charge of all mechanical construction at the Pratt company's numerous operations. Mr. Hausemann assumed his new duties on the first of the month.

James E. Roderick, chief of the Pennsylvania department of mines; W. B. Owens, division superintendent of the Lehigh Valley Coal Co., and Peter O'Donnell, district board member of the United Mine Workers, have been named as a committee of the Pennsylvania anthracite mine-code commission, to codify in skeleton form the state laws which pertain to the mining of anthracite coal.

H. G. Davis, division superintendent for the Lackawanna company, Kingston, Penn., and president of the Wilkes-Barre District Mining Institute, recently delivered an address before a meeting and banquet of the institute, in which he made the statement that "many mine foremen hold their certificates not from merit but by reason of other influences." This remark has stirred up a local discussion of considerable warmth.

Construction News

Zanesville, Ohio. The Crooksville Coal Co. has increased its capital stock from $15,000 to $30,000 to provide for enlargement of its plant.

Grand Rapids, Mich. Breen & Halliday, coal dealers, will build a large trestle and coal-storage bin at their Fifth Ave. yards. The plans contemplate a hoisting outfit for delivering cars over the bins.

Indianapolis, Ind. The W. I. Salee Co. will build a reinforced-concrete and steel overhead coal-storage plant of 10,000 tons capacity on its Cornell Ave. property. The plant will be electrically operated and equipped with screens, wagon scales, etc.

Birmingham, Ala. Edgar L. Adler has purchased the property of the Corona Coal & Iron Co., about 45 miles from Birmingham, and will spend about $250,000 in development and betterments to the present equipment in order to increase the output to 1,000,000 tons annually.

Industrial Notes

H. R. Setz, who has been chief engineer of the Struthers-Wells Co., of Warren, Penn., for the last two years, has just accepted the position of chief engineer with the Otto Gas Engine Works, of Philadelphia. Mr. Setz was formerly connected with several of the leading American and European gas- and oil-engine manufacturers. His particular attention will be directed toward the development of a complete line of Otto-Diesel engines of the horizontal type.

The C. O. Bartlett & Snow Co., of Cleveland, Ohio, has increased its capitalization to $500,000 in order to keep pace with its development and the rapid growth of its business. About 25 years ago Mr. C. O. Bartlett, now the company's president and treasurer, laid the foundation of this business. Its operations during the earlier years were the manufacture of general mill machinery. But gradually one line after another has been added, and the volume and importance of the business have increased to such an extent that the company now occupies a prominent position as engineers and manufacturers of all kinds of elevating and conveying machinery, complete coal tipples and coal-handling machinery at the mines and docks and complete coal- and ash-handling equipment in addition to numerous other lines of special machinery for the economical handling of practically all kinds of materials.

Book Review

PROFITS AND WAGES IN THE BRITISH COAL TRADE, 1898-1910, by Thomas Richardson, member of Parliament, and John A. Walbank. Published by N. A. C. C., 34 Grey St., Newcastle-on-Tyne. 4¾x7; 96 pp.; paper cover; 6d. net.

This book flung into the camp of the operator at the eve of a bitter struggle is of no little significance and has been so treated, it having been reviewed by the *Colliery Guardian* and *Engineering* in long editorials. It is an *ex parte* statement.

Let us take an instance from the preface, for the purpose of showing the veracity of these witnesses: "On the general question of the minimum wage it may be pointed out that while the national income increased by £225,000,000 during the 10 years ending with 1910, the share of that which came to the working class in the form of wages was under £6,000,000." Probably these facts are true if the word "British" be placed before "working class," but it must ever be remembered that the greater development of English investment is not in Great Britain but abroad, and the increase in the total wage roll has been appropriately there and not in the British Isles. Should all the increase of income go to the British working man? Rather should not some of it go to the larger body of laborers inhabiting the seven seas? The argument is typically British as it was typically Roman in Rome's decline. Just as "Bread and circuses" were to come from the looting of the Roman provinces, so the comforts of the Britannic proletariat are to come today, not from the earnings of British labor, but from the profits of capital invested the world around. If like agitation continues and British business continues to suffer from competition, it is likely that the wage roll of England will continue to decline as the income of the country rises. The recent social propaganda of Lloyd George is only possible while financed by earnings made in every country under the sun.

It seems that the English mines of the United Kingdom have had to face a decline in price from $2.19 per ton to $1.99 since 1907. Why then do these authors take a 13-year average except for the obvious purpose of making a good case?

We cannot believe any argument of profit, no matter how large, nor any proof of starvation, however distressing, can be advanced justifiably in defense of a *minimum wage*. Both indeed may well be good convincing evidence of the equity of a wage increase, when an increased rate for *piece work* is urged. If either can be proved satisfactorily, no question remains but that the duty of capital and its proved advantage is to share up its profits in the one case and to improve the physical being and, thereby, the efficiency of its laboring force in the other.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The strained condition of the market, as noted in our last issue, continues unrelieved. The preliminary meetings of the operators and miners have been even more discouraging than usual, causing additional anxiety to the consumer, and a further demand for storage coal.

The shortage is most pronounced in the East, particularly at the large distributing centers along the Atlantic coast, where it is being further aggravated by an abnormal demand for bunker coal, because of the general suspension in Europe. Deliveries still continue slow and uncertain at these points, with prices ruling firm or advancing.

Production in the Pittsburg district is estimated to be double that of last September, when the Lake shipments were at their maximum; prices are very uncertain and the market feverish, due to the acute shortage in the East. The car situation continues to be the predominating feature in Ohio. A number of embargoes declared on the Ohio roads were removed for a time, but soon put in effect again, and transportation is still in a semi-demoralized condition. Much of the West Virginia coal, destined for this market, is being diverted to the bunker trade on the coast, which is unusually heavy.

In the Middle West the market is more quiet and easy, although there is an upward trend in prices at Chicago, especially in the steam line. In the Far West the trade is normal and unchanged.

Boston, Mass.

The Eastern market is in a state of near panic, at least so far as concerns soft coal for spot delivery and in small lots. It is probable that were it not for the large off-shore demand and for the stretching of local bunker contracts due to the British strike, prices on bituminous would be little if any higher than a week ago. For small quantities, however, on cars prices have jumped to new high levels. It is only a question of time when larger buyers will have to follow suit, and if the demand keeps up from abroad there is no telling what prices may be reached. Rumors of panic prices at the Virginia terminals and Philadelphia for April and May shipment are alarming, to say the least.

Deliveries all-rail continue to be slow and uncertain. Most of the operators are positively declining orders for delivery after Apr. 1, and high prices still obtain on coal *en route* to the transfer points. The Boston retailers advanced bituminous from \$4.50 to \$5.25 on Mar. 11, and screenings from \$2.75 to \$3.25. In cities like Providence, Fall River, and Portland, the domestic sizes have also been raised from 50c. to \$1. Ordinary grades of Pennsylvania bituminous advanced sharply f.o.b. Philadelphia early in the week, as high as \$4 having been paid for Eastern shipment.

In anthracite there is little change, except that consumption has further reduced stocks. Receipts are still very small. Domestic sizes have been held in cargoes here for prices as high as \$7@7.25, the net circular being \$5.50 alongside. There is much anxiety over shipments for the rest of March. Current prices are about as follows:

Clearfield, or any ordinary bituminous, f.o.b. Philadelphia	\$3.50@4.00
Clearfield, for shipment, f.o.b. mines	2.10@2.50
Pocahontas, New River, f.o.b. Hampton, Roads	3.75@4.75
Pocahontas, New River, Boston, on cars	5.25@6.00
Pocahontas, New River, Providence, on cars	5.25@5.60

New York

The unsettled conditions, bordering on a panic, still prevail in the New York market. The larger companies are hard pressed to meet their contracts and are making sacrifices in order to do so. The older the customer the more consideration he naturally receives, but as a rule allotments are proportioned directly according to the past requirements of the consumer; some consumers are anxious to anticipate a possible shutdown at the mines and are making requisitions for extra supplies which are being refused.

The anthracite companies are inclined to be noncommittal on the outlook but claim that the situation in their department is approximately normal. The demand is heavy, but this is not unusual for this time of the year and wholesale prices are unchanged. Stocks are thought to be rather below normal and it is doubtful if any are being accumulated.

Prices for bituminous rule high and the better grades are practically unquotable. Spot bituminous is variously quoted at \$3.75@4.50 and \$4@5, with prices fluctuating almost hourly. Supplies of bituminous are believed to be only about 50 per cent. normal for this period.

Philadelphia, Penn.

Apparently it is being taken for granted that there is likely to be trouble at the mines on the first of April, judging from the preparations that both the steam users and householders are making. Consumers are awaiting with interest the result of the conference between the operators and miners, and in the meantime, are protecting themselves to the best of their ability. Public institutions and factories are not taking any chances, but laying aside all the coal they can get hold of, and judging from the demand, the egg, stove and chestnut users are of the same mind.

All sizes are in great demand, and what little stocks the dealers have are rapidly dwindling away. Pea coal is a scarce article here, and almost any price is being paid for it; as a matter of fact, there is a premium asked on all sizes in the open market, and little offering at that. Dealers who have been in the habit of shopping around for their supplies, are finding a very rough road at the present time, and paying fancy prices for what they do get.

The wholesale market still has its hands full taking care of the business offered. As far as the steam sizes are concerned, it is useless to tender orders, for they are invariably declined. Contracts already taken cover the entire output, and there is no surplus for the open market.

Pittsburg

Bituminous—Mines are operating up to the limit of car supply. A few have full car supply, but in general the mines are not able to operate up to full capacity, and an approximate estimate would be 80 per cent.; this, however, includes all mines in the district. Last September, when estimates were made of the mines operating at 50 to 60 per cent. of capacity, there were some mines entirely idle, which did not enter into the reckoning, and it is estimated that at present the output of the district is double what it was in September, with Lake shipments in full blast.

Prices are extremely irregular, and chiefly so on account of the irregular tidewater demand, prices in that market rising and falling almost hourly. Little Pittsburg district coal is going in that direction, as other districts have a freight advantage. The Pittsburg district market may be roughly quoted at \$1.40 to \$1.50 for mine-run, although sometimes considerably higher prices are bid, and occasionally sales are made at less than \$1.40. Prices for the tidewater market

are much higher, but it must be remembered that there is a freight advantage with some districts, and in addition the tidewater prices are all per gross ton, Pittsburg district coal regularly selling per net ton. For instance, a number of sales of Clearfield coal have been made at $2 per gross ton, with a freight advantage of 40c. per gross ton over Pittsburg. This price, therefore, would be equivalent to $1.60 per gross ton, Pittsburg district mine, which is equivalent to $1.43 per net ton.

We quote the Pittsburg district market approximately as follows, per net ton: Nut, $1.30@1.40; mine-run, $1.40@1.50; ¾-in., $1.50@1.60; 1¼-in., $1.65@1.75; slack, $1.10@1.25, per ton at mine, Pittsburg district.

Connellsville Coke—The coke market has undergone a sharp advance, with limited sales. Early last week prompt furnace coke was bringing $1.85@1.90 but the market stiffened steadily and at the close of the week nothing was available at under $2, while some odd lots were sold at even higher than this. Total sales were 100 to 150 cars. There has been no negotiating on contract coke as neither buyers nor sellers would be ready to consider contracts at this time. The last quotations on contract furnace coke were $1.80 to $1.90. We quote: Prompt furnace, $2@2.10; prompt foundry, $2.30@2.50.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Mar. 2 at 396,010 tons, an increase of 4757 tons, and shipments at 4521 cars to Pittsburg, 6244 cars to points West and 1125 cars to points East, a total of 11,890 cars, or an increase of 152.

Baltimore, Md.

Not for years has the Baltimore market experienced such activity as was apparent during the past week. Prices went soaring, and the supply of the fuel was by no means equal to the demand. There was an advance of from 25 to 50c. in the price on low-grade coal over that quoted for the previous week, and consumers could not get all they desired then. Last week low-grade fuel was sold at $1.50 per ton. By the middle of the week just ended, this same fuel sold freely at $1.75 and $2 per ton, and buyers were anxious to get it at those figures.

The strike in England has helped the Baltimore market to a great extent. The Consolidation Coal Co. is sending all the coal it can spare to foreign countries which had heretofore been supplied by English companies. The Davis Coal and Coke Co., is now loading 6000 tons of coal at Port Covington in this city for the British Navy. Numerous inquiries have also been received by this company from other sources, and it is believed that these will develop into business. The possibility of a strike in the organized bituminous fields has also helped the local market as the bituminous consumers are not at all certain that an agreement will be reached between the miners and operators.

In the face of the marked activity in the local market, the Baltimore operators have also had to contend with unfavorable car movements. The railroads have not yet been able to procure their full quota of cars from the West, and as a result the shortage in the East still continues. It is expected, however, that the situation will improve during the coming week.

The coke market still continues quiet. Some little coke is being moved under contract, but spot business is practically at a stand still.

Buffalo, N. Y.

There is a regular split in prices as regards Buffalo and other points in this territory, for it is easy to bring in bituminous from the mines, so that the Buffalo prices are easy while at the same time many other points in this district where there is a shortage are paying almost any price. The market is feverish and unsettled and liable to change at any time. The average dealer is getting hold of all the coal he can and selling it at a fancy price. He is, however, confronted by the extra demand from his regular customers, which is so urgent that there is little surplus.

Prices are pretty nearly unquotable, being nominally $2.60 for three-quarter, $2.50 for mine-run and $2.25 for slack. At the same time the consumer who is short will pay almost any price for a quick supply. In some districts there are mills already shutting down because they are not able to get coal at any price.

The railroads are moving freight faster than they did a month ago, but they have not by any means caught up, the worst of the situation being that there are so many empty cars to return to the mines.

The anthracite situation is not much relieved, except that the consumption is reduced. It will be some time before there is any surplus. The demand is heavy and it is going to be heavier in the Lake trade the coming season than ever before. The anthracite authorities claim that they are not likely to be able to meet the demand in this and the Western territory.

Cleveland, Ohio

Conditions in the past week have been even worse than the week previous, on account of the car shortage, and the situation at the present writing looks serious. Unless a better supply of cars is furnished in the very near future, there certainly will be a coal famine, at least in this district.

A great deal of coal has been shipped from the West Virginia points to this market during the winter, and the dealers are expecting to get the greater part of their supply from that district should the expected strike materialize, but in the past week it has been impossible to get quotations from that section, because of the extraordinary demand to supply ocean liners. The West Virginia operators have been getting prices ranging from $2 to $2.25 on mine-run for all the coal they can furnish. The general impression is that should the English miners hold out any length of time, the West Virginia people will not ship coal here when they can obtain such high prices in the foreign markets. While there has not up to the present, been any real suffering, there certainly is great uneasiness for the future.

Prices have advanced in this market from 25 to 50c. per ton on all grades, and are especially strong in slack. There seems to be a varied opinion as to whether a strike will take place, the majority seeming to think it will, while others say that a suspension of two or three weeks will be the result.

Columbus, Ohio

With embargoes on practically all of the railroads running north and west of Toledo, the car situation in Ohio shows little signs of improvement. The congestion at Toledo and other way points is still the worst feature of the coal trade, and it will require a long time to relieve the situation. As a result of this the coal traffic is still in a semi-demoralized condition.

Some headway was recently made at Toledo in clearing away the congestion, and several roads removed the embargo which has been in effect for some time, but within a few days it was again declared. There is believed to be 12,000 cars at least in Toledo for shipment into Michigan and Indiana points, and there is little likelihood of their removal for the time being, at least.

Under these conditions prices have been ruling firm in all grades of coal, and in every Ohio mining district. Spot coal for steam purposes is at a good premium, and the same is true of domestic sizes in certain localities. Only the railroads have been able to store up for a suspension, and manufacturing establishments have had all they can do to get a supply of fuel for their current needs. Mines in most of the Ohio districts have been operated on a 50 to 65 per cent. basis, while at some points they have been compelled to close down entirely for a portion of the past week.

The steam trade is the most active department of the business. Retailers are desiring coal, but their orders in transit are large and they are not placing many new ones at this time.

Retail trade has been rather brisk under the present weather conditions, and dealers have been selling many small orders to tide over consumers. Prices prevailing in Ohio fields are as follows:

Hocking Valley	
Domestic lump	$1.60
¾-in.	1.40
Mine-run	1.15
Nut	1.15
Nut, pea and slack	0.95
Coarse slack	0.85
Pittsburgh, No. 8	
¾-in.	$1.30
Mine-run	1.10
Coarse slack	1.10
Pomeroy Bend	
Domestic lump	$1.75
¾-in.	1.50
Nut	1.30
Mine-run	1.5
Nut, pea and slack	1.00
Coarse slack	1.00
Kanawha	
Domestic lump	$1.50
¾-in.	1.30
Mine-run	1.10
Slack	0.75

Hampton Roads, Va.

It is impossible to give any standard prices for coal at present writing for it is selling at all kinds of prices, without much regard to quality.

Sales of standard New River and Pocahontas coals have been made at $2.85 per gross ton f.o.b. Hampton Roads, while the same descriptions have also brought as high as $4.25. At the present time, it is difficult to get any coal for less than $3.50 f.o.b. Considerable amounts of high volatile fuels have been sold for ships use and such have brought as high a figure as the standard bunker coals.

Coal is moving fairly well to tidewater over all the railroads, but by far the greater part of it is being applied on contracts and there is little free coal; there is still a shortage of both cars and locomotives. The United States Navy has had great difficulty in obtaining any extra coal and it is rumored that some of the present navy contractors will find themselves in a difficult position when the department asks for new bids. There are now a large number of ships lying off the various coal piers and the situation is growing worse every day.

The prospect of a strike in the anthracite and bituminous fields seems more likely and even if the British miners return to work by the end of next week, it will be a long time before conditions become normal again. The large selling agencies are finding it difficult to decide on the best policy to pursue, whether to refrain from making their usual contracts for the coming contract year, in order to have plenty of free coal and take advantage of the present high prices, or to go on and close contracts for the usual amounts. Bids on the Panama Canal contract will be due before Apr. 1 and the figure at which this contract is let, usually determines, to a large extent, the tidewater price for the coming year.

Charleston, W. Va.

As has been the case for several months the output of coal in this state is governed entirely by the car supply. This shortage continues so pronounced that the mines are in operation only about half the time. The demand for coal is good, and the prices are by no means poor when compared with figures of recent years, but with the railroads suffering from a lack of motive power, and unable to keep the cars in motion, the operators are not getting the benefit of the betterment in prices that they feel they should.

The publication of some of the statistics available as a result of the completion of the report by John Laing, Chief of the Department of Mines in this state, for the year 1911, occasioned much surprise in many quarters. Despite the fact that West Virginia is losing hundreds of thousands of tons of coal in trade, it is the belief of the officials connected with the Mining Department that the output for the coming year will show an increase equal to that of the year just closed.

Nashville, Tenn.

The good cold weather still continues here, which is unusual for this section of the country at this time of the year. The car situation has improved a little, and there is still a big demand for coal, which will probably continue up until Apr. 1. After that time, if there is a suspension of operations in Illinois and Indiana, the nonunion fields in west Kentucky will have more business than they can handle and at a very high price. It is likely that the coming week will see quite a good deal of steam and domestic coal shipped from this field, both into Chicago and St. Louis.

The operators all up and down the system are very bullish. Prices are the same as they have been for the past few weeks, except in screenings, which have advanced from 5c. to 10c. a ton over what they have been for the past three weeks, and indications are that they will be much higher the coming week.

Indianapolis

The production of coal and the sale at the mines at good prices, principally for storage purposes, has been carried on at a rather lively pace during the past week. The big demand has given a good tone to the home market, especially in the steam trade, which has largely offset the weakening due to milder weather and the lessening of the demand for domestic. While this demand is general, it is not, according to reports, as heavy as was the case two years ago.

The car situation, while improved, is not satisfactory. Blockades at terminals and way points have delayed the arrivals at destination, and, as a consequence, their return to the mines. Retail dealers are complaining that coal ordered a month ago has not been delivered and their supply is very low. While the big factories are being cared for, the small consumers are suffering because the retailers cannot get the coal. The former are taking advantage of the situation to store up for the strike or suspension, which everyone seems to believe inevitable. Retail dealers say that the railroads are storing and that this is responsible for the car shortage.

Chicago

There is a strong upward tendency in the market for steam coal as a result of the announcement that a suspension at the mines Apr. 1 is practically certain. There is an indication of weakness in the domestic market, the retailers believing that spring and warm weather are not far distant.

A distinct flurry in the steam market is expected within a short time. Prices have already moved up 10 to 15c. a ton, especially on steam lump and screenings. Smokeless coal is practically off the Chicago market except for those shipments which are made to satisfy contracts. Dealers here would be willing to pay $1.25 to $1.35 for smokeless mine-run. Anthracite producers have shipped very little coal into the Western market recently as a result of demands for current needs and storage purposes. There is a strong demand for coke, the supply being short.

Prevailing prices at Chicago are as follows:

Sullivan County:	
Domestic lump	$2.62
Egg	2.62
Steam lump	$2.37@2.57
Screenings	2.12@2.22
Springfield:	
Domestic lump	$3.05
Steam lump	$2.32@2 [illegible]
Mine-run	2.12@2.22
Screenings	2.07@2.12
Clinton:	
Domestic lump	$2.57
Steam lump	$2.3[illegible]@2.42
Mine-run	2.17@2.27
Screenings	2.02@2.12
Pocahontas and New River:	
Mine-run	$3.25@3.55
Lump and egg	4.05

Coke—Prices asked for coke are: Connellsville and Wise County, $4.85; byproduct, egg and stove, $4.95; byproduct nut, $4.75; gas house, $4.90@5.

Minneapolis—St. Paul

Although there is a distinct shortage of coal here, prices are not in proportion to those generally prevailing at this time of the year when stocks are so nearly depleted and with the strike problem confronting the trade. Prices in the Twin Cities on steam coal are not very steady as there has been a lot of surplus coal dumped into this market. Steam consumers are not inclined to accept the strike talk and are holding for low prices.

Dock men say there is very little coal on the docks at the present time and not very much chance of getting any from the East before Apr. 1. Experienced Lake men report that navigation on Lake Superior cannot possibly open up until a few days before June 1, which is fully a month later than is generally the case. Anthracite coal is very scarce at the docks and a number of the companies reported "no stock" on the larger sizes in their March 1 circulars. One and three-quarter million tons of the different sizes of anthracite were disposed of by the docks at the head of the lakes during the past year and one well known authority states that there is not more than 20,000 or 30,000 tons on all the docks and a great portion of that is booked for shipment.

Prices at the docks are very good and there is no necessity to cut as they will have no trouble disposing of what little coal is left in stock now.

St. Louis, Mo.

The St. Louis market on all coals is more erratic than it has been for two years. Last Saturday, Standard lump coal sold as high as $1.85 for 2-in., while Carterville 6-in. was hanging on at from $1.75 to $1.85. Standard screenings went to $1.35, while Carterville screenings were selling at $1.25. This is largely accounted for by the fact that there is only a limited tonnage of Standard on the market, as the railroads are buying it up, whereas there is considerable Carterville, the railroads refusing to touch this on account of the 15c. higher freight rate.

The dealer trade seems unable to get stocked up on account of the prevailing cold weather, the month of March thus far being one of the most severe in a long time. There is a slight chance that the market will break the latter part of the present week, but it opened strong with everything to indicate that it would remain so. It is almost impossible to get Standard screenings, and nut is out of the question. The washed coal market is exceedingly strong on account of the demand for mine-run.

The market opened Monday about as follows:

Franklin County	
Lump and egg	$2.00@2.25
No. 1 nut	2.00@2.15
No. 2 nut	1.85@2.00
No. 3 nut	1.60@1.75
2-in. screenings	1.20@1.25
Carterville	
Lump and egg	$1.85@2.00
No. 1 nut	1.75@1.85
No. 2 nut	1.65@1.75
No. 3 nut	1.45@1.50
Screenings	1.15@1.25
Mine-run	1.35@1.45
Standard	
6-in. lump	$1.90@2.00
2-in. lump	1.75@1.85
Screenings	1.20@1.30
Mt. Olive	
3-in. lump	$1.90@2.00
No. 1 nut	1.60@1.65
No. 2 nut	1.50@1.60

The market is good on anthracite at the circular, and coke is moving freely. There is some smokeless moving in, but not in the volume that it has been in the past.

Portland, Ore.

Winter is now apparently over here and the demand for fuel is accordingly light. Wood has declined until cordwood can now be bought for $5 per cord, delivered in the city, whereas last fall it was quoted at $7 and $7.50. No decline has been noted in coal values, however, but the fact must be considered that at no time during the winter did the price rise above that charged early in the fall. The season has been a dull one for fuel dealers.

San Francisco, Calif.

California has been keeping up its climatic reputation and the weather for the past week has been adverse for the coal men. Apart from kitchen requirements, little coal has been needed to meet domestic wants; consequently the movement has been far from brisk. Heavy rains are expected, however, which will tend to cause an increased demand.

The imports of foreign coal for January comprised 14,690 tons from British Columbia, 9780 tons from Australia, and for February, 11,950 tons from British Columbia and 1620 tons from Australia. Car shipments from the East and Middle West were very light. Dealers had laid in full stocks to meet the winter demand, which did not materialize; consequently they have considerable on hand.

The U. S. Government last year brought into San Francisco 135,000 tons of Pocahontas for navy use, and it is understood that the government has engaged tonnage for about 130,000 tons, for delivery this year. Last week the navy department contracted with a local stevedoring company to discharge the coal at 15½c. per ton of 2240 lb., the department doing the hoisting and taking care of the coal from the ship's hatchways.

Current prices to the trade continue as follows, per long ton:

Wellington (British Columbia)	$8.00
Pelane Main (Australia)	8.00
Eastern	8.50

Production and Transportation Statistics

Pennsylvania Railroad Co.

Statement of coal and coke carried on the Pennsylvania R. R. Co.'s lines East of Pittsburg and Erie for the month of January, 1912, in short tons:

Anthracite	1,040,535
Bituminous	3,581,365
Coke	940,931
Total	5,562,831

Anthracite

Shipments of anthracite in February amounted to 5,875,968 tons, as compared with 5,070,948 tons in February, 1911. This is an increase of 805,020 tons and sets a record for the month of February. The Philadelphia & Reading led in volume of shipments last month with 1,202,536 tons; the Lehigh Valley was second, with 1,083,925. Shipments of the Central Railroad of New Jersey were 785,000 and of the Delaware, Lackawanna & Western 782,699 tons.

Financial Notes

Contract between Lehigh Valley Coal Co. and Lehigh Valley Coal Sales Co. provides for purchase of the coal on usual 65% basis, i.e., at 65% of its market value determined by New York tidewater price.

The Chicago, Indianapolis & Louisville has sold to Redmond & Co. and the Equitable Trust Co., both of New York, $2,500,000 first mortgage sinking fund 5 per cent. bonds of the Monon Coal Co. The bonds are being offered at 94 and interest.

A letter has been addressed to bond and stock holders of the Sheffield Coal & Iron Co. requesting them to deposit their holdings with the Bankers' Trust Co., pending the submission of a plan of reorganization by a protective committee consisting of James Gayley, Alfred Clifford, August Heckscher, Randall Morgan and W. R. Walker.

The committee for the reorganization of the Pennsylvania Coal & Coke Co. has given notice that, pursuant to the plan and agreement for the reorganization, depositors of certificates who have complied with said plan, are entitled under the terms thereof to receive certificates of stock in the reorganized company known as the Pennsylvania Coal & Coke Corporation.

The Herbert Collieries Corporation, which has its principal offices at 17 Battery Place, New York, and is engaged in mining coal on leased lands in Fayette and Raleigh Counties, W. Va., filed a voluntary petition in bankruptcy giving liabilities of $224,085 and assets of $169,898. According to the petition, the company owes the Guaranty Trust Co., of New York, $75,000, fully secured by leasehold mortgage 6 per cent. 10-year sinking fund gold bonds, H. L. Herbert, New York, $122,233 and Earle & Russell, New York, $15,000 for legal services. The assets, the petition states, include leases of mines in West Virginia valued at $150,000; stock in a mine store at Herberton, W. Va., worth $10,000 and debts due aggregating $6598.

The Belleville Savings Bank, as holder, it is stated, of $14,000 bonds, brought suit in the Circuit Court at Belleville, Ill., to foreclose the mortgage of 1905, under which $1,100,000 bonds were issued to the Southern Coal & Mining Co., of East St. Louis, Ill. It is alleged that the interest and sinking fund payments are in default and that the business is improvidently handled. An official states that the suit will be opposed on the ground, among others, that the terms of the mortgage require a majority of the bondholders to join in a foreclosure suit, that the company has been unable to meet its interest payments for about a year and a half, but if it were left alone now it would soon be on its feet again, as it has been earning about $10,000 a month since September, 1911.

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COAL AGE

Devoted to Coal Mining and Coke Manufacture

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Issued Every Saturday.
Hill Publishing Company.

NEW YORK, MARCH 23, 1912

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A Modern Underground Hospital

In the Brisbane Colliery of the Delaware, Lackawanna and Western Company, hewn out of the solid coal and rock. The walls are covered with whitewashed concrete; the room is heated by steam and lighted by electricity. The electric wires are carried in conduits, and a steel stand is provided on which a stretcher may be laid. The patient in the illustration has one leg in splints and the attendant is bandaging his fractured skull.

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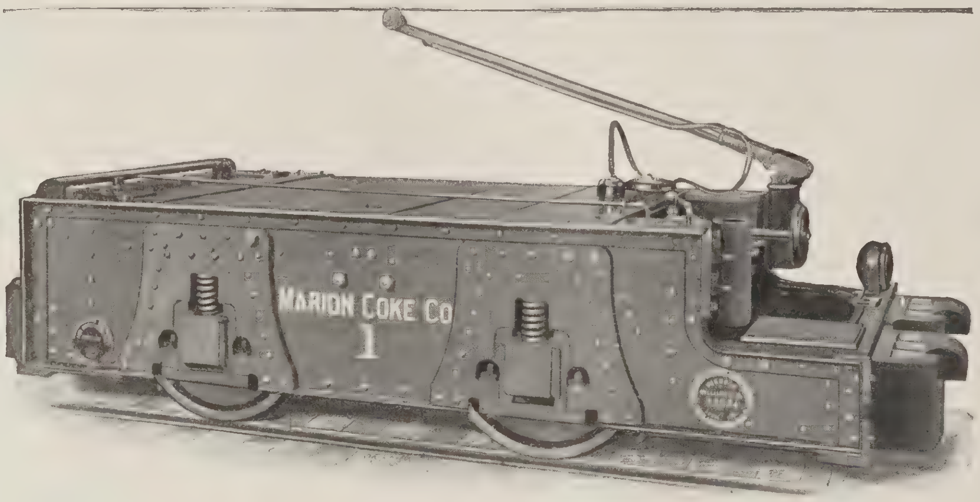

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COAL AGE

Vol. 1 NEW YORK, MARCH 23, 1912 No. 24

To onlookers, and in fact to most people who are not active participants in the controversy, a "strike is a strike"—nothing more, nothing less. Labor wants a larger share of capital's profits. Production is curtailed, money and muscle measure strength, and after a temporary suspension, there is victory for one or a compromise for both.

Do we exhibit sufficient individual intelligence when we reason in this elementary way, and when we look forward to a strike with the same complacence as we do to a periodical change in season? Through the purchase of an overcoat we are able to repel the sting of winter, but the erection of a fence topped with barbed wire won't check the advance of present-day thought, even though it may prove a satisfactory barrier to the forcible trespass of dissatisfied employees. Labor unrest and its recurrent outbursts, are a phase of social evolution, a type of development that never goes backward.

However, if present labor leaders and the operators who now sit in authority were to exchange places in life, these identical fences would be built; the fights would occur with equal frequency and the same increasing severity. Not a letter in the principles of the combatants would be changed. With no less certain growth, the idea would prevail that "the laboring man will never be stronger than the government—he *will be* the government." The change will be effected by evolution, not revolution or socialism.

And getting to the bottom of some matters made prominent in present labor controversies, is a delicate operation. The men want more money because of the higher cost of living; however, we see some similarity in this problem and the question as to whether "the Bowery is tough because bad men live there, or whether the men are tough because the Bowery is bad."

It's the same old story of cause and effect, and frequently we have a way of construing effect for cause. It's a game where the sky is the limit and a few players hold all the good cards. Before long, clerks in stores will ask us how much money we have in our pocket before telling us the price of an article.

It's also interesting to note the effect of strikes on an industry. To begin with, let us lay down one general rule: The injury resulting from a suspension is in inverse ratio to the size and importance of the business affected. When the trouble is local and but few people are concerned, the fight is generally bitter and both parties to the conflict oftentimes are ruined. But in a branch of productive activity as great as coal mining, where the securities of the corporations are widely distributed and the product of the companies is a common necessity, too much is at stake; too many people are disturbed, and the contending parties are obliged to settle their differences or have their noses rubbed together by a power greater than they.

In the meantime, strange to relate, the effect of such trouble is quite contrary to what we generally anticipate or suppose. For months previous to the probable strike, business is stimulated; the men make better than average money and the operators enjoy a good market at higher prices. The suspension occurs and tired bodies and overworked machinery are given a rest.

During the period of idleness, engineering departments and mine officials turn their thoughts to the rehabilitation of exhausted plants, and accept the situation as an opportunity to install new equipment and inaugurate improved methods.

Everyone is aware the deadlock will end and the wheels turn again. It may be a few weeks, or several months, but when a settlement does come, the lost ground will be recovered, and a period of activity with good prices will again prevail. Already, on the eve of trouble, we can record that coal men, especially bituminous, for the first time in years have had a prosperous season, and many operators who recently haven't been on speaking terms with Uncle Sam's currency, are smiling and bowing just as though no estrangement had occurred.

And from the standpoint of better engineering practice and all-round progress, there's a resulting advance not to be ignored. The tendency of the mine owner is to supplant men with machinery—for the first time he is impressed with the enormous appetites of mules as compared with motors; he discovers that machines do the work of many miners, and such facts cause him to slip the band from off his wallet when no other arguments could avail.

The year before the recent Illinois strike, the increase in the number of mining machines was 3.5 per cent.; in 1910, the year of suspension, the increase in machines was 8.1 per cent. So let us view the matter in a sensible way and recognize the benefits as well as the evils. The chief sorrows of life are our worries about troubles that never come to pass.

The Cambria Coal Field in Wyoming

A coal mine with a romantic history is rather out of the ordinary in so humdrum an industry as the mining of this commodity usually presents. But in Wyoming there is a coal mine that has a romance attached—a romance not of love or intrigue, but a romance of commercialism, railroad building, and empire constructing.

By Jesse Simmons*

A description of one of the earliest coal operations in the West. Compressed air is used for both haulage and mining; the peculiarly irregular character of the bottom has made the adoption of the puncher type machine imperative. A long tail-rope haulage system is in use.

Historical

In the year 1889 the Burlington & Missouri River R.R., now a part and parcel of the Chicago, Burlington & Quincy system, had built as far as Alliance, Neb., but the powers that were hesitated to continue farther until a coal supply could be assured. At that time the nearest coal operation was in Iowa, and this was too great a distance to haul fuel for operating engines through a section of country that was but sparsely settled.

Kilpatrick Brothers & Collins were contractors who had built a large portion of the line to Alliance, and they were told that there would be no further Westward extension unless coal could be secured. This big contracting firm immediately put scouts in the field and after a diligent search the Jumbo mine, near Newcastle, Wyo., was discovered. Tests proved the coal to be a splendid grade of engine fuel, developments disclosed a large body, and the work of continuing the railroad Westward was resumed. When the rails were laid to the coal camp, which had meanwhile been named Cambria, the mine was ready to commence shipping, and from that date until the present time the mines have been operated continuously, producing in the interim 8,600,000 tons of coal.

During this period the Jumbo mine has been worked out—the last pillars being drawn last fall—and operations are confined to the four workings known as Antelope Nos. 1, 2, 3 and 4. A company was organized under the name of the Cambria Fuel Co., controlled by Messrs. Kilpatrick Brothers & Collins, which operated the mines until January, 1910, when a new corporation under the name of The Cambria Fuel Co., financed by New York and Pennsylvania people, purchased the property and holdings of the original company.

The coal is classed as bituminous and is one of the few mines in the state of Wyoming producing this grade of fuel. For a number of years a battery of beehive ovens were operated, the coke being sold to smelters in the Black Hills district of South Dakota. The suspension of these smelters curtailed the market for coke and none has been made for a number of years.

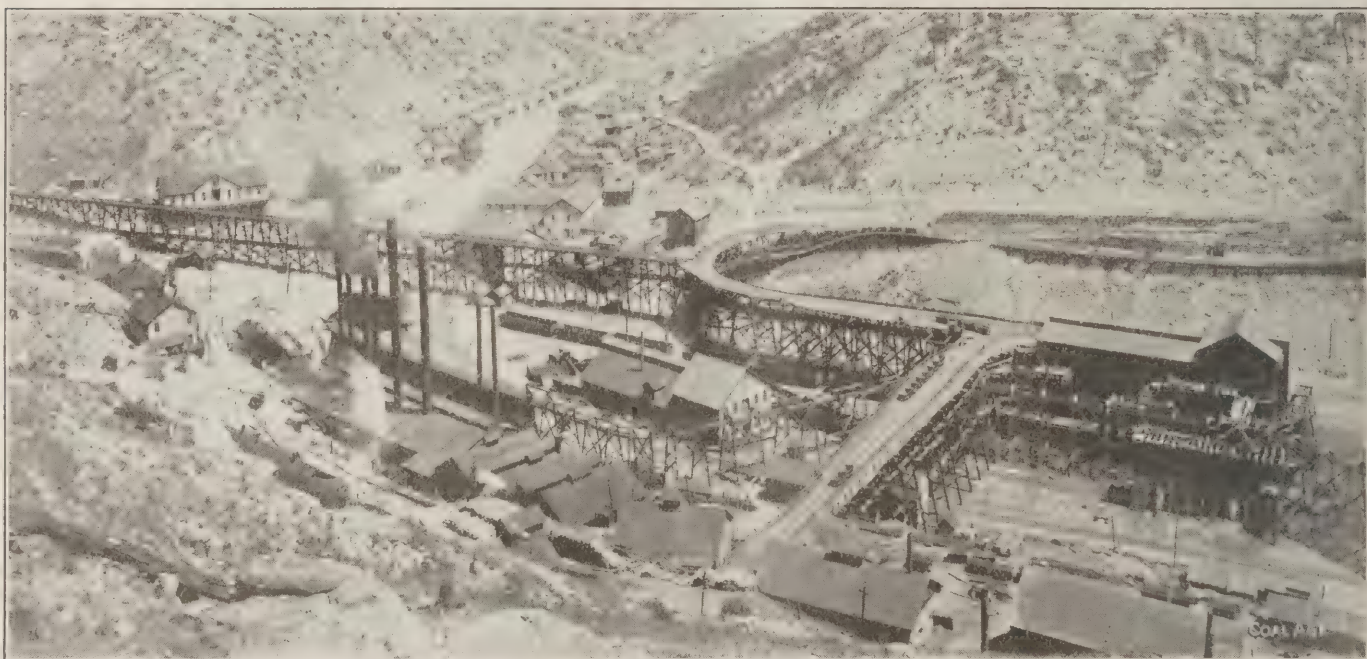
A peculiar feature in connection with the coke was the fact that it carried gold. The coal itself, upon repeated tests, is shown to contain some gold, many assays giving returns as high as $2 per ton, but the content is naturally higher in the coke. Assays made on 31 railroad cars showed the coke to have an average gold content of $2.74 per ton, some of the assays showing as high as $5.60 per ton.

Cambria is on the southwesterly edge of the Black Hills uplift, and gold is almost universally distributed throughout that section. This geological fact probably has a bearing upon the occurrence of gold in this coal.

Geological Formation

The coal of this district occurs in the lower Cretaceous formation, near the bottom of the Lakota sandstone. N. H. Darton, in a description of the Newcastle quadrangle, Folio No. 107 of the Geologic Atlas of the United States, says of the Lakota formation:

> The Lakota formation is one of the most prominent members brought to the surface by the Black Hills uplift. It is mainly a mass of sandstone of considerable hardness, which, together with the overlying Dakota sandstone, gives rise to the prominent hogback rim of the hills. Its prominence is enhanced by the softness of the underlying shales, above which it rises in high cliffs. Its thickness usually varies from 150 to 200 ft., but locally the amount may be somewhat greater. The sandstones are coarse grained, cross-bedded and massive, with partings of shale or thin bedded sandstone of no great thickness. The color varies from light gray, or even white, to buff, the last named being most frequent.



General Surface Arrangement at Cambria Fuel Co.'s Mines

*Deadwood, S. D.

At or near the base there is a coal horizon, in which coal of excellent quality attains the thickness of from 5 to 7 ft., in an area of moderate extent about Cambria. This coal appears not to occur east and south of the gap in which the range is crossed by Stockade Beaver Creek. . . .

The coal in this area varies greatly in thickness and purity, but, as shown on the map, there is a large area in which it is 5 ft. thick or more, and in places it reaches a thickness of over 7 ft. . . . The principal bed of purer, thicker coal trends Northeast and Southwest, its center passing through Cambria.

The Principal Mines

The seam has a sandstone floor and roof, which are quite irregular. Apparently the formation in this locality was affected by the geological action which brought the Black Hills to the surface. This territory is on the southwest edge of the Black Hills uplift.

In the vicinity of Cambria the principal topographic feature is a plateau cut by cañons from 300 to 400 ft. in depth, and their numerous shallower gulches and tributaries. The main opening on the vein lies near the bottom of Cambria Cañon. Running westerly this entry, in following the coal, crosses Camp Cañon on a trestle and passes underground on the westerly side of the bridge.

A large portion of the best coal area has been found under the plateau lying between Camp Cañon and East Plum Creek. At this point are located the mines known as Antelope Nos. 2 and 3. These mines extend toward the west. Antelope Nos. 1 and 4 mines extend parallel with Cambria Cañon, to the north. Workings advanced northerly in Nos. 1 and 4 have made necessary a long, roundabout haul to reach the tipple, and work is now under way upon an entry northwesterly from the tipple to give a more direct haulage route from these mines. The Jumbo mine, which lies east of Cambria Cañon, has now been entirely worked out.

Forty drill holes have been put down at various points on the property, the average depth being 252 ft. to the bottom of the coal. The deepest hole was 308 ft. to the bottom of the coal. The discrepancy in the depth is accounted for both by the contours of the surface and the dip and rise of the vein.

System of Working

Main entries are driven 12 ft. wide in the clear, and cross entries the same width. The cross entries are turned off from the main entry at intervals of 600 ft., and from these, rooms 20 ft. in width are driven at intervals of 40 ft., thus leaving 20 ft. pillars. In this way rooms are about 300 ft. in length. As fast as the rooms are worked to their extreme length, the pillars are drawn, and the old workings are stopped up as fast as completed.

Cross entries to the west have a uniform dip and those to the east a uniform rise. In some cases the rise in cross entries is as high as 10 per cent. In the main entry, which, it will be borne in mind, has a north and south course, the floor dips and rises at various points—in some places the grade being as high as 5 per cent., which is the maximum for the main entry.

View of Miners' Houses at Cambria, Wyo.

However, the rise and fall of the seam averages about level, as is shown by the following figures: From the mouth of the pit, to the face of the main haulage entry, a distance of 1¾ miles, the floor of the seam rises and falls a number of times, but the end of the entry and the pit mouth are on absolutely the same level, as are also the three west cross entries farthest developed.

The mine has been worked for approximately 20 years and experience has shown that the seam will average in the neighborhood of 6 ft. in thickness. At points it pinches down to 3 ft., but it has been found economical and advisable to mine this thickness in order to follow up the body to points where it will open up larger.

Machine Mining and Ventilation

Ingersoll punchers are used for undercutting, as experience has proven that the coal is too hard, and the floor too uncertain to make chain machines practicable. The floor will often dip or rise sufficiently in the length of a cut to either leave coal at the bottom of a cut made by a chain machine, or else the cut will enter the floor. The cut made by the puncher machine is 4 ft. 6 in. or 5 ft. in depth, and an average machine man can take care of 6 or 7 rooms during his shift. The coal is then drilled with breast drills, the holes being 3 ft. 6 in. to 4 ft. in depth and 1¼ in. in diameter. Three of these holes are sufficient to break the face of a room. Black powder, fired by squibs, is used in blasting and each miner does his own loading and firing.

The low pressure air line, which serves the punchers, is 8-in. common pipe for the full length of the main entry. The cross entries are piped with 3-, 4- and 5-in., and every room is supplied with 1½-in. pipe.

The mines are remarkably free from explosive gases, due no doubt to their proximity to the surface, and fact that the coal is overlaid by a coarse-grained porous sandstone. The freedom from gas makes ventilation a simple problem and eliminates the necessity of the many safeguards ordinarily necessary in coal mining. During the time that this mine has been in operation there have been no explosions, nor any fires of consequence.

Six Capell exhaust fans are used for the three operating mines—four of these being driven by compressed air, and two, which are located about 200 ft. from the power house, are driven by steam.

Haulage System

Wooden cars, with loose wheels (which, by the way, are being replaced by Whitney wheels as fast as they are worn out) having a capacity of 3800 lb., average, are drawn by horses from the rooms to the small partings, one and two cars being the average trip for one horse. From these small partings compressed air locomotives take the coal in 10-car trips to the main parting in the main haulageway; the capacity of this parting is 60 loaded cars. Trips of 39 cars are made up on these partings and delivered to the tipple by a tail-rope haulage system 8200 ft. in length.

All tracks are 42-in. gage, and 50-lb. rails are used in the main entry, 40-lb. in the cross entries and in the rooms 16-lb.—these latter being the lightest rails used in the mine.

Underground 36 horses and 7 H. K. Porter, compressed air locomotives are used in handling the coal; three of these are 5-ton, three 7-ton and one 10-ton. They are charged with air at 800 lb. pres-

sure at the charging stations, which are from 1 to 1½ miles from the compressors. At the compressors 1000 lb. pressure is carried, giving about 800 lb. at the charging stations. The charging stations are never more than 3000 ft. apart, and the locomotives will ordinarily run twice this distance on one charge.

The high pressure pipe line is 4 in. inside diameter, and is reduced to 3 in. for the last 1000 or 1500 ft. As fast as the entries are extended, the 3-in. pipe is taken up and replaced by 4-in., so that the maximum amount of the former is about 1500 ft. Extra heavy wrought-iron pipe ($\frac{5}{16}$ in. in thickness) is used.

Surface Plant

There are two frame tipples, almost identical in construction and equipment. After weighing, the coal is dumped and the empty cars returned on a track below the main track to a station at the pit mouth, hooked to the tail-rope system and returned to the mine. As the product of this mine is divided into two classes, viz: slack and 4-in. lump, the latter being used as locomotive fuel, the preparation consists merely of crushing, picking and screening.

The coal as dumped from the mine cars drops into a Jeffrey 30-in., two-cylinder crusher, and is crushed to 4 in. From the crusher the coal is delivered to a sheet-iron picking belt, 4 ft. 6 in. wide and 60 ft. in length. Two men, one on either side of this belt, standing near clutch levers which disengage the power-driven belt, pick the waste material, which is dropped through a chute into a car underneath the tipple and removed to the dump. The coal from the end of the belt drops over a 4-in. grizzly where the slack is separated from the lump.

The boiler house contains 1500-hp. boiler capacity. Of this, 1000 hp. is generated in Heine water-tube boilers, and the balance in return-flue boilers. The boilers are hand fired and the ashes drop to a cellar below the boilers into buggies, and are conveyed to a dump in the cañon.

The power-house equipment includes 7 Norwalk compressors and 2 dynamos. Five of the compressors are 2-stage machines, compressing to 150 lb. pressure, and two are 3-stage machines compressing to 1000 lb. The dynamos are 75 kw. and 35 kw. respectively, generating direct current at 110 volts. The former is used for lights in the camp and mine and the latter for operating the conveyor systems, machine shop, etc. The machine shop is equipped for making all necessary small repairs to cars, puncher machines, etc.

Water Supply

The company owns the town of Cambria also the water-works system, and supplies water to the town of Newcastle and the C. B. & Q. Ry. at that point. Newcastle is an up-to-date town of 2000 inhabitants.

A large portion of the water comes from a well 2345 ft. deep, the casing in which is 8 in. in diameter at the top and 6 in. at the bottom. An air-lift is used to bring this water from the bottom of the well to a tank 100 ft. above the top of the well, on the side of the cañon; air at 800 lb. pressure is used for this work. The pipe line to the bottom of the well ends in two nozzles, one $\frac{3}{32}$-in. and the other $\frac{5}{32}$-in. in diameter, which form the outlet for the air. It has been found that the smaller nozzle gives a solid column of water through a 4-in. pipe into the tank mentioned. The total flow under normal conditions amounts to 325,000 gal. per 24 hours. Additional water is developed in neighboring cañons by means of dams and reservoirs.

The superintendent, Mr. Naysmith, has had experience in the manufacture of plate glass, and is authority for the statement that all the necessary material, ideal in quality, for the manufacture of a high-grade plate glass occurs on the property, and it is quite likely that experiments in the manufacture of glass will shortly be undertaken.

The Cambria Fuel Co.

This company owns 17,000 acres of land, about one-third of which is underlaid with coal, speaking of which Mr. Darton* says:

> A coal bed averaging 6 ft. in thickness contains about 3,000,000 tons of coal per square mile, but there is considerable loss in working. There are now in the Cambria coal fields about 10 square miles underlain by coal that would average 5 ft. or more in thickness, so situated that it is available for working, which on this estimate would yield a total tonnage of 30,000,000 tons.

Following is an average analysis of the coal:

Moisture	5.86
Volatile matter	40.44
Fixed carbon	40.45
Ash	13.25
	100.00
B.t.u.	11,247

The mine is 7 miles from the town of Newcastle, a station on the main transcontinental line of the C. B. & Q. Ry. The product is used almost exclusively for steam coal, the screenings going to steam plants and the lump to the railroad. Exposure to the weather has no appreciable effect on this coal, for the railway has a large quantity which has been in a pile exposed to the weather for years, and it is as good today as it was when so placed. The capacity of the mines would probably average, if pushed, 2000 tons per day, but the output is now from 1550 to 1800 tons per day. In the report of the state mine inspector of Wyoming for the second district, year ending Sept. 30, 1910, the production of the Cambria mines is given at 412,108 tons and the number of employees 484.

*Folio No. 107, Geologic Atlas of the United States.

The seam contains slate bands an inch and upwards in thickness; when it is 10 ft. thick there may be as many as three or four of these bands. Under the terms which are in force between the company and the miners union, the men take care of 2 in. of this waste matter, and receive additional compensation for anything above this amount.

The camp is known as Cambria, and a view of it is reproduced herewith. The cottages are neat and well constructed and the character of the employees is well exemplified in the neat manner in which they keep their homes. The buildings owned by the company include not only the homes of the employees, but a club house, general store, meat market, three churches, school, etc.

The Cambria Fuel Co. has an authorized capital stock of $2,000,000, divided into $1,500,000 common stock and $500,000 preferred stock. There is also a bonded indebtedness, on which the interest is being promptly met, and a sinking fund provided for its retirement. The officers are: B. F. Overholt, Scottsdale, Penn., president; L. T. Wolle, Akron, O., vice-president; Walter Schoonmaker, Cambria, secretary and treasurer and Robert Naysmith, Cambria, superintendent. To the two latter gentlemen, Messrs. Schoonmaker and Naysmith, the writer wishes to acknowledge the many courtesies which have made it possible to present this article.

Briar Hill Coal Co.

The Briar Hill Coal Co. owns 1440 acres of patented land, 14 miles from Cambria, on which 600 ft. of development work has been done, opening up a seam similar to the Cambria coal. The seam is so located that it cannot be opened by drifts, and shafts have been sunk for the purpose of exploiting the beds. The coal is of a quality practically the same as the Cambria, and occurs in the same formation, viz: the bottom of the Lakota sandstone.

The property is 48 miles West of Nahant, a station 19 miles from Deadwood and Lead, S. D., on the C. B. & Q. Ry., and 7 miles from Osage, a station on the transcontinental line of the same road, Northwest of Newcastle. A railroad with a maximum grade of 0.7 per cent. can be built from the mines to Osage at a trifling cost, and 20 miles remains to be built with a road running Westward from Nahant. This would give a connection with the Black Hills, a district that consumes a large amount of coal. This road would have a maximum grade of 2 per cent. The workings show from 7 to 9 ft. of clean coal, with a good roof.

The officers of this company are: W. H. Lyman, Kewanee, Ill., president; Geo. S. Jackson, Deadwood, S. D., vice-president; R. F. McLaughlin, Sheridan, Wyo., secretary and H. W. Trask, Kewanee, Ill., treasurer.

Coal Mine Ventilating Equipment

By W. M. Weigel*

Theory of centrifugal fans. Formulas are here derived which express a number of important relations and determine certain values that are required for calculating the size and proportions of a fan to work under given conditions. Methods and apparatus for the measurement of air pressures. The seventh of a series of articles on mechanical ventilators.

The theory of the centrifugal fan is probably understood less thoroughly than that of any other mechanism which is used to an equally great extent. The basic principles of its operation are, of course, well known but such matters as the effect of different shaped blades and the efficiencies obtainable at various capacities and speeds are determined usually by purely empirical methods or by experiment. A comparison of tests on different fans is rarely a fair way of deciding their relative worth because different methods are employed for determining the pressure and volume of the air and these measurements are frequently made at different points in the circuits. Moreover, published results seldom state whether the pressure given is the static pressure, that due to velocity or the total pressure.

The following demonstration is taken, with some modifications, from Weisbach and Herman's "Mechanics of Air Machinery." Since the pressure generated by mine fans seldom or never exceeds a water gage of 10 in., which is equivalent to less than 6 oz. per sq.in., or a 2½ per cent. increase or decrease in the weight of the air, and since most fans operate at pressures ⅙ to ¼ of this value, it introduces no appreciable error to assume that the weight of air per cubic foot is equal at the inlet and outlet of the fan.

Taking the case of a fan wheel with the blades curved backward from the direction of rotation, as shown in Fig. 1, let r_1 equal the inner, and r_2 the outer, radius of the blades, the form of one of which is shown by AB. Assume that the air, entering the wheel in the direction of the axis C, is deflected radially so that any particle of air will enter the wheel at A with the radial velocity, in feet per second, $AD = v_1$. In order that the air may enter between the rotating blades without impact, the inner circumferential velocity of the wheel, $AE = u_1$, must equal v_1 *cot.* α, where α is the angle FAL between a tangent to the inner end of the blade and a tangent to the circumference at this point. Under this condition the velocity, $c_1 = AF$, with which the particle of air begins its travel along the vane, is given by the equation:

$$c_1^2 = v_1^2 + u_1^2 \qquad (I)$$

Velocity of Efflux

The fan wheel now exerts an accelerating action on the air until it leaves at the outer circumference. Let it be assumed that the particle of air under consideration leaves the wheel at the instant at which the outer tip of the vane, B, has reached the position B'; then this particle has described an absolute path which we will assume is represented by the curve AB', tangent to the radial velocity of entrance v_1.

The air leaves the wheel with an absolute velocity equal to v_2, tangent to the absolute path AB', and this velocity must be regarded as the resultant of the outer peripheral velocity $u_2 = B'H' = BH$ and the velocity relative to the wheel, $c_2 = B'J', = BJ$, with which the air moves along the last element of the vane.

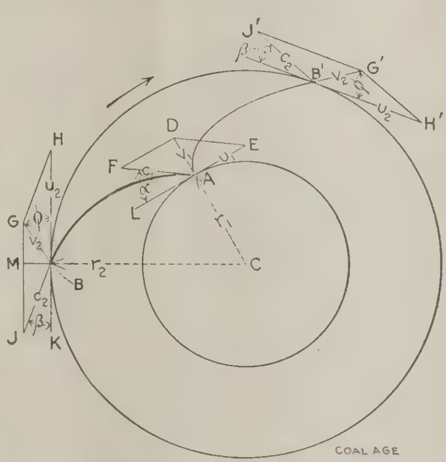


Fig. 1. Velocity Diagram

Then from the figure, if ϕ is the angle, $G'B'H' = GBH$, at which the air leaves the circumference of the wheel, we have:

$$c_2^2 = v_2^2 + u_2^2 - 2\ v_2\ u_2\ cos.\ \phi \quad (II)$$

The entrance velocity v_1, is in all fans generated by the pressure of the atmosphere. Let f = coefficient of resistance to entrance of the air into the wheel. Then $h_o = (1 + f)\ \frac{v_1^2}{2g}$ where h_o equals the head of air necessary to generate the velocity v_1, and consequently the absolute pressure at A is less than that in the fan drift by the above amount. With a blowing fan, the air is taken freely from the atmosphere and the absolute pressure outside the inlet is equal to the atmospheric pressure. For an exhaust fan, this pressure outside the inlet is smaller than the atmospheric pressure by a certain amount, depending on the resistance of the mine.

Let h_1 = static pressure above the atmospheric existing in the fan drift just outside of the inlet, expressed in feet of air column. For exhaust fans h_1 is negative and for blowing fans $h_1 = 0$. Let x = total absolute pressure of the air at A, expressed in feet of air column and, b = atmospheric pressure in feet of air column. Then

$$x = b + h_1 - z_1 - \frac{v_1^2}{2g} \qquad (III)$$

where

$$z_1 = f\frac{v_1^2}{2g}$$

which is the head corresponding to the resistance to entrance.

Again, let h_2 = the static head of air, above the atmosphere, at the end of the outlet; that is, at the end of the discharge opening, and let w = the velocity with which the air leaves the outlet to enter the atmosphere or the fan drift as the case may be; also let z_2 = head corresponding to the resistance of the outlet. The air leaving the wheel at B', with the absolute velocity v_2 possesses a certain absolute static pressure which we will call y, and must be able to overcome not only the resistance, $b + h_2$, at the orifice of the outlet, but also the resistance z_2 and, moreover, must retain a velocity, w. Under the assumption that the weight of air per cubic foot is the same at the inlet and outlet, we then have the equation:

$$y + \frac{v_2^2}{2g} = b + h_2 + z_2 + \frac{w^2}{2g} \qquad (IV)$$

With blowing fans h_2 is a positive quantity, and with exhaust fans $h_2 = 0$.

Acceleration of Air Passing through Fan

The preceding equations, I to IV, relate to the entrance and exit of the air with regard to the fan. The following equation, V, expresses the accelerating influence of the vanes.

The increase in energy imparted to the air in flowing from A to B', is equivalent to the difference in the heads due to the peripheral velocities at these points, or we can write:

$$y + \frac{c_2^2}{2g} - \left(x + \frac{c_1^2}{2g}\right) + z_r = \frac{u_2^2 - u_1^2}{2g} \qquad (V)$$

in which z_r is the head of air necessary to overcome the resistance to the passage of air through the blades.

Substituting in V the values of c_1, c_2, x and y as obtained from equations I to IV, we have after reduction:

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$$h_2 - h_1 + z_1 + z_2 + z_r + \frac{w^2}{2g} = \frac{2\, v_2 u_2 \cos.\, \phi}{2\, g}$$

Let

$$(h_2 - h_1) = h$$

and

$$(z_1 + z_2 + z_r) = z$$

and the equation reduces to:

$$g\,(h + z) + \frac{w^2}{2} = v_2 u_2 \cos.\, \phi \qquad \text{(VI)}$$

From Fig. 25 we also have:

$$v_2 = u_2 \frac{\sin.\, \beta}{\sin.\, (\beta + \phi)} \qquad \text{(VII)}$$

Substituting this value of v_2 in VI and solving for u_2 gives:

$$u_2 = \sqrt{\left[g\,(h + z) + \frac{w^2}{2}\right] \frac{\sin.\, (\beta + \phi)}{\sin.\, \beta \cos.\, \phi}} \qquad \text{(VIII)}$$

This equation gives the peripheral velocity when the pressure, and discharge velocity and angles β and ϕ are known. Now, if the vanes end radially, $\beta = 90°$ and equation VIII reduces to

$$u_2 = \sqrt{g\,(h + z) + \frac{w^2}{2}} \qquad \text{(IX)}$$

Axial Depth of Fan

From the Fig. 1, it is seen that the radial velocity with which the air leaves the wheel is: $BM = v_2 \sin.\, \phi$ and for substitution in this equation, the value of v_2 may be taken from VI. Let l_1 and l_2 represent the axial widths of the blades at the inner and outer circumferences respectively. Then, since the quantity of air Q entering the wheel is the same as that leaving it we have the relation:

$$Q = 2\,\pi r_2 l_2 v_2 \sin.\, \phi = 2\,\pi r_1 l_1 v_1 \quad \text{(X)}$$

from which

$$v_1 = \frac{r_2 l_2}{r_1 l_1} v_2 \sin.\, \phi$$

In nearly all mine fans $l_1 = l_2$, so that this equation becomes:

$$v_1 = \frac{r_2}{r_1} v_2 \sin.\, \phi \qquad \text{(XI)}$$

From the figure, the angle made by the inner end of the vane with the circumference is obtained, or,

$$Tan.\, \alpha = \frac{v_1}{u_1}$$

If the angle ϕ is not known or assumed beforehand, but some other quantity is given, say the entrance velocity v_1, which can be obtained from equation X, $v_1 = \frac{Q}{2\,\pi r_1 l_1}$, an equation for determining the peripheral velocity may be derived as follows: In equation VI, $v_2 \cos.\, \phi$, represents the tangential component MG of the absolute velocity of efflux. From the figure $MG = BH - MJ = u_2 - v_2 \sin.\, \phi \cot.\, \beta$ and combining this with XI

$$v_2 \cos.\, \phi = u_2 - \frac{r_1}{r_2} v_1 \cot.\, \beta$$

Substituting this value in equation VI

$$g\,(h + z) + \frac{w^2}{2} = u_2 \left(u_2 - \frac{r_1}{r_2} v_1 \cot.\, \beta\right)$$

and solving this for u_2

$$u_2 = \frac{r_1}{2\, r_2} v_1 \cot.\, \beta + \sqrt{\left(\frac{r_1}{2\, r_2} v_1 \cot.\, \beta\right)^2 + g\,(h + z) + \frac{w^2}{2}} \qquad \text{(XII)}$$

This gives us the peripheral speed for a given static pressure h_1 in terms of the radii of the wheel, the angle made by the tips of the blades with the circumference, the inlet velocity, the velocity at the orifice of exit, and the fan resistance.

Effect of Curving Blades Forward

With h and w remaining constant, u_2 decreases as the angle β increases. When

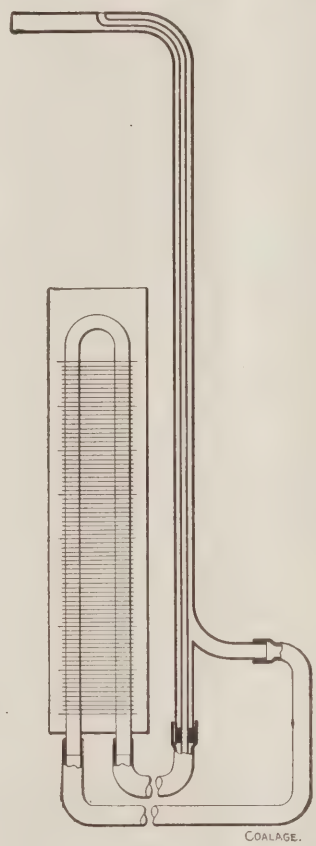


Fig. 2. Pitot Tube

$\beta = 90$ deg., $\cot.\, \beta = 0$, and equation XII reduces to equation IX. If β is greater than 90 deg., then $\cot.\, \beta$ becomes negative and the value of u_2 is still further reduced, the other quantities remaining unchanged. This accounts for the construction of several modern forms of fans, in which the blades curve forward beyond a radial position at the circumference.

The total dynamic pressure of the air is made up of the static pressure h, and that due to the velocity w. This total pressure is, moreover, due entirely to the absolute velocity v_2 of efflux. By referring to Fig. 1, as well as to equation XII, the effect of increasing the angle β is made clear. In the figure, v_2 is the resultant of u_2 and c_2, so that by increasing the angle β, the angle between c_2 and u_2 is decreased with a corresponding increase in the resultant velocity; c_2 being tangent to the last element of the vane at all times.

To obtain the number of revolutions per minute, n, from the peripheral speed we have:

$$60\, u_2 = 2\,\pi\, r_2\, n$$

and

$$n = \frac{60\ u_2}{2\ \pi\ r_2} \qquad \text{(XIII)}$$

Capacity and Pressure

From equation X,

$$Q = 2\,\pi\, r_1\, l_1\, v_1$$

and

$$l_1 = \frac{Q}{2\,\pi\, r_1\, v_1} \qquad \text{(XIV)}$$

If, now, we make the velocity v_0 of the air at the entrance to the fan equal to that at the inner circumference of the wheel;

$$v_1 = v_0$$

and letting

A = The area of the inlet;

$$A = \frac{Q}{v_1}$$

and

$$l_1 = \frac{A}{2\,\pi\, r_1}$$

If the radius of the inlet is the same as the inner radius of the wheel, which is quite common practice, then

$$l_1 = \frac{\pi\, r_1^{\,2}}{2\,\pi\, r_1} = \frac{r_1}{2}$$

In fans so designed, the width is nearly always made greater than the theoretical value, to allow for the slowing of the air caused by resistances at the entrance. Actual values of l_1 vary from $0.6\, r_1$ to $0.8 r_1$, with an average of $l_1 = 0.7\, r_1$.

The pressure or head of air z necessary to overcome the frictional resistances of the fan to the passage of air, depends first upon the volume of air passing, and second upon the mechanical construction. The work expended in overcoming the resistance is lost, and should be reduced to a minimum. This is done by providing ample inlet area, keeping the velocity of the air within reasonable limits by having a fan of proper size, providing a conoidal surface opposite the inlet to deflect the entering air into a radial direction without eddying, and shaping the spiral casing to allow a free outlet.

Theoretical Pressure

In equation IX, the total pressure of the air is divided into three parts, the static head h, the head necessary to overcome the fan resistance z, and that due

to the velocity w. Equation IX may be written:

$$u_2^2 = g\,(h + z) + \frac{w^2}{2}$$

or

$$\frac{u_2^2}{g} = h + z + \frac{w^2}{2g}$$

Now let

$$H = h + z + \frac{w^2}{2g}$$

the total fan pressure, then is

$$H = \frac{u_2^2}{g} \qquad \text{(XV)}$$

which is the equation commonly used to represent the theoretical total pressure developed by a centrifugal fan with spiral casing, in which

H = The total dynamic pressure in feet of air column,

and

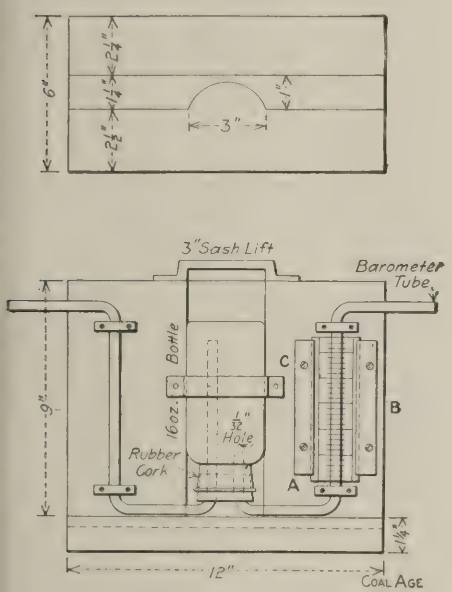


FIG. 3. SPECIAL MANOMETER

u_2 = The peripheral velocity of the tips of the vanes in feet per second.

With an open-type fan, discharging freely into the atmosphere around the entire circumference, the pressure due to the velocity of the air leaving the wheel is lost, and it may be shown that the theoretical pressure due to such a fan is one-half that of one with a spiral casing, or

$$H = \frac{u_2^2}{2g} \qquad \text{(XVI)}$$

From equations IX and X we have the general principles that:

1. Under any given conditions the dynamic pressure produced by any centrifugal fan varies as the square of the speed of rotation.

2. The volume delivered by any centrifugal fan varies directly as the speed of rotation.

Equivalent Orifice

This term, as applied to the ventilation of mines, was proposed by Murgue, and was formerly more used than it is at the present time. Two equivalent orifices were usually stated, that of the mine and that of the fan. The equivalent orifice of the mine was an imaginary opening in a thin plate of such a size that it offered the same resistance to the passage of a given quantity of air as did the mine. That is, it would take the same pressure to pass the same volume through the aperture in the plate as through the mine. The equivalent orifice of a fan is likewise that opening in a thin plate which offers the same resistance to the passage of a given volume of air as does the fan.

Let

a = Equivalent orifice of the mine,

and

o = Equivalent orifice of the fan.

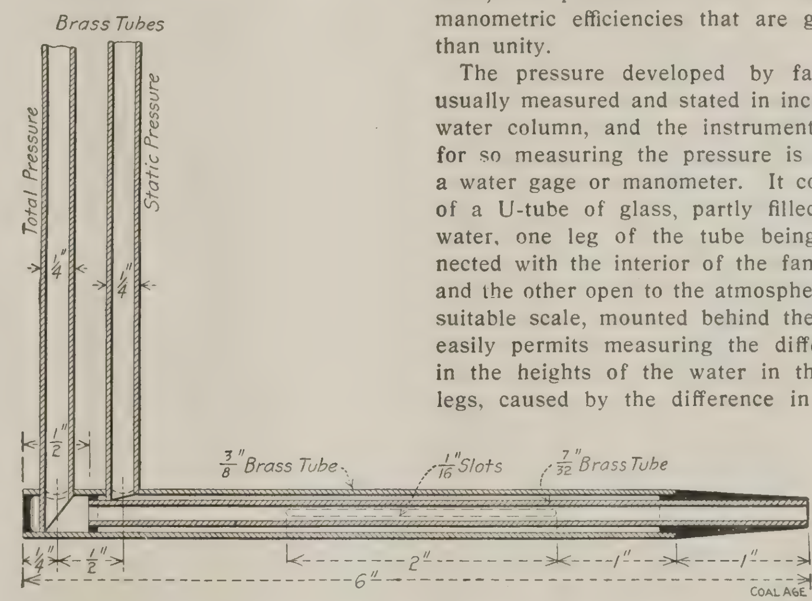


FIG. 4. MANOMETER FOR PRESSURE READINGS

Then from the law of flow of a fluid through an orifice in a thin plate:

$$Q = 0.65\ a\,v;$$

and

$$Q = 0.65\ o\,v';$$

in which

v and v' = Velocities of air passing through a or o, and are also the velocities due to a head of air h or h' feet high;

or

$$v = \sqrt{2\,gh}$$

and

$$v' = \sqrt{2\,gh'}$$

From the above:

$$a = \frac{Q}{0.65\sqrt{2\,gh}}$$

$$o = \frac{Q}{0.65\sqrt{2\,gh'}}$$

About the only value these quantities have is in making a comparison of the resistances of two mines or two fans.

Efficiency of Fans

In discussing the work or operation of a fan, three efficiencies are usually involved, which, while interdependent to a certain extent, vary in their importance. They are:

1. Manometric efficiency.
2. Mechanical efficiency.
3. Volumetric efficiency.

The manometric efficiency of a fan is the ratio of the actual pressure developed by the fan to the theoretical pressure. The theoretical pressure is universally calculated according to the formula $H = \frac{u^2}{g}$. This is the theoretical pressure for a fan with radially ending vanes, and, as some of the modern fans have the tips of the vanes curved forward, it is possible to obtain values for manometric efficiencies that are greater than unity.

The pressure developed by fans is usually measured and stated in inches of water column, and the instrument used for so measuring the pressure is called a water gage or manometer. It consists of a U-tube of glass, partly filled with water, one leg of the tube being connected with the interior of the fan drift, and the other open to the atmosphere. A suitable scale, mounted behind the tube, easily permits measuring the difference in the heights of the water in the two legs, caused by the difference in pressure between the atmosphere and the air in the fan drift.

The correct measurement of the pressure of the air requires considerable skill and proper apparatus. There are two pressures, the *static pressure* and the *velocity pressure*, and the sum of these is equal to the total or dynamic pressure.

To measure the static pressure, the end of the tube inserted into the fan drift must be parallel to the direction of the current, so that there will be no tendency for the air to blow into the end or to blow away from the end. To measure the total pressure, the end of the testing tube must be normal to the air current, so that the air will flow directly against, or into, the opening. The velocity pressure is then the difference between the total pressure and the static pressure. The velocity pressure may be measured directly by connecting the static-pressure

tube to one leg of the manometer and the total-pressure tube to the other; the reading of the manometer then gives directly the pressure due to the velocity.

Shape of Tube Ends

Experiments have shown that the shape of the ends of the testing tubes makes a considerable difference in the readings. Every precaution should be taken to prevent eddying or impact around the ends of the tubes. The best results are obtained by having the end of the velocity tube slightly coned on the outer surface, so that the edge surrounding the opening is practically a knife edge, and offers the least possible resistance to the air. A good form of apparatus combines both tubes in one, as illustrated in Fig. 4, and this is the type adopted by the government engineers for making fan tests. Another form is shown in Fig. 2, and illustrates the method of connection with the manometer.

There is apt to be considerable oscillation of the surface of the water in the two tubes, and this makes accurate readings difficult. To overcome the difficulty, Messrs. O. E. Jager and Geo. C. Westley proposed the manometer illustrated in Fig. 3. [*Engineering and Mining Journal*, Vol. 88, p. 468.]

In this apparatus, the bottle shown is really one leg of the U-tube, but its area is so large, compared to that of the small tube, that the rise and fall of the surface of the water in it may be neglected and the readings are then taken from the zero position of the water in the tube to the side. The end of this tube projecting up into the water in the bottle is drawn out to a fine aperture, which neutralizes the oscillations.

Recording pressure gages may be had which show the pressure developed throughout the 24 hours. They may indicate static pressure only, or total pressure, as desired, and are a valuable accessory of a ventilating plant.

The British Coal Trade Crisis

Special Correspondence

Continuation of diary of events leading up to the present labor crisis in England. The conciliatory attitude of the government and its strenuous endeavors to effect an agreement, are unique features of the present situation.

(*Continued from p.* 604, Coal Age, *Feb.* 17.)

Feb. 12—A special conference of the miners' delegates, from the districts embraced within the English Conciliation Board area, was held to receive a report from their representative, on the Conciliation Board, with reference to negotiations with the coal owners. Power was given their representatives to continue negotiations with the owners on the question of an individual wage, the understanding being that the whole Federation agrees to a settlement thereon.

Feb. 13-14—A special conference of the Miners' Federation of Great Britain resolved:

That we express our regret that the coal owners have refused to accept the principle of an individual minimum wage for all men and boys employed underground, as we know that there can be no settlement of the present dispute unless this principle is agreed to. In view of the fact, however, that we have no desire for a serious rupture in the coal trade of the country, we are willing to meet the coal owners at any time to discuss the matter if the coal owners express a desire to do so.

It was then decided that the conference stand adjourned, to be called together when the officials and the Executive Committee find it advisable.

Feb. 13-16—Miners in the various districts, numbering 400,000, hand in their notice to cease work. Some of them, in Hobbs and Derbyshire, where they have already a partial acceptance of the principle of a minimum wage, do so reluctantly. For instance, at the Mansfield colliery, employing 1941 men, only 914 gave notice on the appointed day.

Conviction strengthened that a national stoppage cannot be avoided, one leader describing the position as "dark as midnight." Panic prices again rule on the coal markets. Figures published by the Registrar of Friendly Societies show that the finances of the various miners' unions, in the federation, in relation to their numbers were, on Dec. 31, 1910, as follows:

		Membership
Dunham	$2,340,930	121,805
Derbyshire	1,623,700	37,428
South Wales	751,150	137,553
Notts	953,275	30,944
Lancashire	447,835	60,461
Northumberland	409,465	37,361
South Derbyshire	71,585	3,622
North Stafford	176,990	8,143
Cannock Chase	80,275	9,400
Pelsall (Staff)	67,145	4,059
Warwickshire	79,880	10,000
Yorkshire	1,763,030	88,271
Cleveland (M. & Q. Asso.)	81,580	9,326
North Wales	41,190	12,043

Feb. 19-20—Negotiations suspended in Scotland, Northumberland and Durham, while in South Wales there is a deadlock. The Conciliation Board for England resumed negotiations, but late in the afternoon of Feb. 20, it was announced that their efforts to secure a settlement had definitely failed. The government took prompt action, and Premier H. H. Asquith at once issued a letter to both sides, inviting the leaders to confer with the cabinet. At the same time the coal owners made public their proposals for a settlement and the conditions on which they are prepared to accept the principle of an individual minimum wage for underground workmen.

Feb. 21—Official statement issued by the miners' leaders as to the conditions on which the demand for a minimum wage is based, and will be accepted, for all underground workers. The statement forms a reply to the terms offered by the owners. A comparison of the terms shows that the differences have practically been narrowed down to the question of the guaranteed individual minimum wage to the coal hewer working on contract in a normal place who fails to earn his wage on tonnage output of coal. The difference now may be briefly stated at 12 or 14c. per day.

Feb. 22—The situation was discussed at meetings held in the Foreign Office between representatives of the government and of the coal owners of Great Britain and the Miners' Federation, respectively. Mr. Asquith and his colleagues met the trade union officials in the morning and again in the evening, having in the meantime consulted with a large and representative body of coal owners. The Prime Minister invited the national conference of miners to meet him on Tuesday, Feb. 27.

Feb. 23—Prime Minister received in audience by King George, who, it is understood, desired to hear from his chief adviser personally the progress of the negotiations. Conference of lord mayors and mayors of England and Wales, convened by the lord mayor of London to consider what action they can take in the interests of conciliation and the public weal in the present coal-trade crisis. Government representatives met the members of the coal owners' committee for the purpose of further consultation, the proceedings being adjourned to Monday, Feb. 26.

Feb. 24—The *London Daily Chronicle* says a definite step forward has been taken. The government is reported to have submitted to both the miners and the coal owners certain proposals which they have been asked to discuss and to answer on Tuesday, Feb. 27. The secret has been so carefully guarded that only the four miners' representatives and the leaders of

the coal owners consulted know the purport of the proposals.

Feb. 24—Conference of 170 mayors convened by the lord mayor of London passed a resolution calling upon the leaders on both sides to "recognize the paramount claims of the community, which outweigh in importance any conceivable difference that may divide them." A committee of five was formed to watch events and take such steps as may seem advisable.

Feb. 26 to *Mar.* 1—Negotiations between the government and representatives of the owners and men separately and jointly proceeded during this period of five days. Prime Minister Asquith submitted the following proposals for a settlement of the dispute:

1. His Majesty's government is satisfied, after careful consideration, that there are cases in which underground employees cannot earn a reasonable minimum wage from causes over which they have no control.
2. They are further satisfied that the power to earn such a wage should be secured by arrangements suitable to the special circumstances of each district, adequate safeguards being provided to protect employers against abuse.
3. His Majesty's government is prepared to confer with the parties as to the best methods of giving practical effect to these conclusions by means of district conferences between the parties, a representative appointed by the government being present.
4. In the event of any of the conferences failing to arrive at a complete settlement within a reasonable time, the representatives appointed by his Majesty's government to decide jointly any outstanding points for the purpose of giving effect in that district to the above principles.

The foregoing proposals were considered by all the parties involved in the dispute, and on Feb. 28 it was announced that "the coal owners of the federated area accept the proposals put forward . . . . the government to make such arrangements as will enable them to look forward with confidence to the due performance of agreements entered into in the future, and to secure that such agreements shall be binding on both sides for some reasonable period." The employers in Durham and Cumberland also accepted the proposals.

Measured on the basis of output, 60 per cent. of the owners thus signified willingness to accept the government terms. Of the remaining owners, those in Scotland adhered to the 1909 agreement, but stated that they were "prepared to meet the employees' representative with a representative of the government to arrange methods to prevent any injustice, and to fix remuneration in abnormal places." In cases of dispute, they are prepared to agree that in the event of such meeting failing to arrive at a settlement, the matter should be referred to the decision of a neutral chairman. The Welsh coal owners passed a resolution adhering strictly to the present agreement, terminating Mar. 31, 1915. The representatives from Northumberland, Forest of Dean, Somerset and Bristol were unable to accept the proposals, but on the following day, Feb. 29, the Northumberland owners reversed their decision.

The conference of the Miners' Federation passed a resolution, in which they "repeat that there can be no settlement of the present dispute unless the principle of an individual minimum wage for all underground workers is agreed to by the coal owners. We are still willing to meet the coal owners at any time they desire to discuss the minimum wages of each district, as passed by special conferences of this federation." A resolution, passed on Feb. 29, made it clear that what the men mean is acceptance of the "schedule rate for each district," as presented on p. 604 of COAL AGE.

Feb. 29—In a speech to the miners' delegates, the Prime Minister announced the government's recognition of the fact that the coal supply is the life blood of the country's industry, and of the consequent fact that reasonable conditions of coal getting lie at the root of the national existence. The government, as a result, had come to the conclusion that a case had been made out for the establishment —with adequate safeguards—of a reasonable minimum wage. As 60 per cent. of the coal owners had also assented, there was a strong presumption that the conclusion was a just and sensible one. They did not intend that the existence of a dwindling minority of employers should indefinitely delay the attainment of the object.

The miners had next to consider the best way to give effect to it. A terrible responsibility would rest upon those who clung to any particular schedule rate and so hindered the negotiations; they must allow a reasonable latitude of discussion in regard to particular rates, and the government must be allowed to discuss with both miners and owners whether each figure was reasonable. Their determination was to establish the principle of a minimum wage in the mining industry—by agreement if possible, by other means if necessary.

Mar. 1—As their notices expired, the men in various parts of the country had "downed tools" during the week, and on this day practically the whole of the kingdom's force of a million colliers came out on strike. There were further meetings between the government mediators and the contesting parties, but under the plea of existing agreements, the Welsh and Scottish owners were obdurate, while notwithstanding the powerful appeal made to the miners by the Premier, their representatives were stubborn in their opposition to the fourth of the government's proposals. In the circumstances, negotiations were suspended over the week end, and Premier Asquith informed the House of Commons that he hoped to make a full statement on Mar. 4.

[*The above diary is published as a matter of record for future reference and not because of its news value. More recent events will be printed in a later issue.*—EDITOR.]

The Colliery Manager in India

According to a correspondent in the *Capital* (India), the mine manager's life there is far from being one continual round of pleasure. The conditions noted are not entirely unknown in this country and a point is raised which should receive the careful consideration of all capitalists interested in coal-mining.

He says:

"I believe I do not overstate the case, when I say that one hears out here of more changes in the managers of collieries in twenty weeks than one does at home in twenty years. Here a manager assumes charge of a place, and in what state, in many cases, does he find it? Machinery with loose motion and neglected, pumps out of order, lots of the lower workings under water, tram lines in bad order or not sufficiently extended, coal worked away where it should not have been, possibly to an extent such as to endanger the mine or a large area of it, ventilation faulty—in fact, a general state of chaos.

The new man has in consequence to set to and put the place in order, and, of course, has to spend money in the process. That puts up his cost per ton. The blue pencil wallah notes this, and presently out the new man goes. Another man comes on, and for a time is able, owing to the work partially done by his predecessor, to show fairly satisfactory results. Naturally such results do not last.

There are so-called 'managers' at some pits in Bengal who are nothing of the sort in the proper sense of the word. They are figure heads, or dummies, merely carrying out orders from Calcutta offices. One cannot, of course, altogether blame the men; they know that non-compliance often means the sack, though at the same time they are doing or following a course which their professional experience tells them is against the interests of the colliery as such. All this is probably unknown to the owners (*i.e.,* shareholders), and if they did know, I am not sure that they would care, so long as a dividend for the time being is forthcoming, and it does not appear to be realized by the gentry who sit in Calcutta offices, under electric punkas, and so effectually wield the before-mentioned blue pencil.

News of the Coal Strike Situation

Special Correspondence

The situation in the anthracite field points to a long suspension, following Apr. 1. The bituminous controversy will probably be settled without any great difficulty. News of foreign strikes.

The demands of the anthracite miners have been formally refused, and the miners have likewise declined to consider the counter proposition made by the operators to renew the existing agreement for a period of three years. No further negotiations are in sight and it is thought that the policy committe of the miners' union, meeting in Cleveland, Mar. 25, will recommend a suspension of work in the hard-coal region, starting Apr. 1. Independent anthracite operators have issued a statement favoring an increase of wages and demanding a decrease in freight rates by the coal-carrying roads. One colliery near Pottsville, Penn., has announced a 10-per cent. advance in wages, effective Apr. 1.

While the situation in the anthracite field must be regarded as serious, and a suspension of at least five or six weeks most probable, the indications are that no great difficulty will be encountered in bringing the bituminous negotiations to a satisfactory conclusion. The joint-scale committee of miners and operators reconvened in Cleveland Mar. 20, but probably nothing decisive will be accomplished prior to the meeting of the miners' policy committee on Mar. 25.

Anthracite Conferences

The meetings of the anthracite operators and miners in New York, Mar. 13 and 15, were decidedly brief and practically confined to the exchange of formal ultimatums, although opportunity was left for a resumption of negotiations. Neither the demands of the miners nor the counter proposition of the operators was discussed.

The statement presented by the operators, takes up each demand of the miners separately and gives reasons for rejecting it. In regard to a recognition of the union, it quotes the award of the 1902 strike commission, to the effect that the United Mine Workers, being largely an organization of bituminous miners and including only a small proportion of anthracite mine workers, is not a desirable party with which to enter into contractual relations.

The proposal for a one-year agreement is rejected as being opposed to the lessons drawn from the strike commission's work and as having proved unsatisfactory when tried in other fields.

The "check-off" system is held to be contrary to a statute of the State of Pennsylvania requiring "the payment to employees by employers of the full amount of wages or earnings in cash." The conciliation board is defended on the ground that for nine years it has "assured a steadiness of work and freedom from wasteful strikes" and that the knowledge of its existence has in itself tended to allay distrust and bitterness. In regard to payment by weight it is stated that the strike commission found this to be impracticable and that the same conditions prevail now as then.

Replying to the demand for a minimum rate and an advance of 20 per cent. in wages, the statement reads:

> We call attention to the fact that in 1900 there was an advance of 10 per cent.; that in 1901 there was an advance of 10 per cent., and a further increase of 4.6 per cent., resulting from the operation of the sliding scale. A comparison of the years 1900 and 1911 shows there has been a total increase of 26.4 per cent.
>
> In addition to these considerable increases, there has been an increase in the opportunity for work, from an average of 165 days in the years from 1897 to 1901, to an average of 210 days for the five years from 1906 to 1910, both inclusive, and a still further increase was had in 1911.

The statement goes on to point out that the contract miner does not average more than 5 to 7 hours a day of actual work and it is submitted that ample opportunity exists for a substantial increase in the earnings of the miners without resorting to an increase in rate.

In conclusion, the miners are urged to accept a renewal of the present agreement for three years.

The position assumed by the operators precluded any discussion of the miners' demands and in their formal reply, delivered Mar. 15, this point is dwelt on as follows:

> Your proposal to renew the present agreement does not appeal to us nor will it to the people we represent. The award of the coal-strike commission was not intended to continue in effect for all time thereafter regardless of how materially industrial and other conditions might change and does not adequately meet changed conditions now in effect, and we submit that conditions have changed since that award was made, notwithstanding your claim to the contrary.
>
> All subjects contained in the mine workers' demands are worthy of the most serious consideration and discussion by both parties in interest, and we had hoped that the answer to them would have been such as to have at least permitted of the fullest and freest discussion of these vital subjects that mean so much to the anthracite-mine industry, but, inasmuch as your proposal to renew the present agreement is final, this renders the hope of arriving at a satisfactory conclusion by reason of such discussion quite impossible, while the position of your committee is continued in this respect.

The fact is emphasized that the cost of living has increased since the award of the commission in 1902, and in support of their demands this contention is set forth:

> The occupation of the anthracite-mine worker is admittedly a most hazardous one, hundreds of them being killed and injured each year. And we know of no good reason mine workers should be obliged to work longer hours in the anthracite coal mines of Pennsylvania than mine workers employed in the bituminous mines of the same state as well as in the chief coal-producing states of the country.

Great Britain

At the close of the third week of the British coal strike, the conferences brought about by the government, between owners and miners having been unsuccessful, a bill has been introduced in the House of Commons with the specific purpose of settling the present difficulty. The proposed enactment will be effective for only three years and will provide for a reasonable minimum wage for the miners with safeguards to protect the owners against deficiency of output. The rates are to be determined by the district boards. Considerable opposition to the measure is in evidence. The Unionist party has decided to oppose the measure, but the government hopes to have the act in force by the coming week.

Germany

The strike in the Westphalian coal fields, which spread last week until about three-fifths of the 350,000 miners were involved, has been attended by considerable violence and a number of conflicts between the police and strikers. Several fatalities were reported. While the number of men on strike in the Westphalian district is now said to be decreasing, the movement has spread to other fields—notably Saxony and Hanover, and some twenty thousand men in these districts have gone out. At a meeting in Bochum, Mar. 19, the leaders of the miners' union decided to end the strike, as they now think it useless. Twenty thousand men have returned to work in the Westphalian region.

France

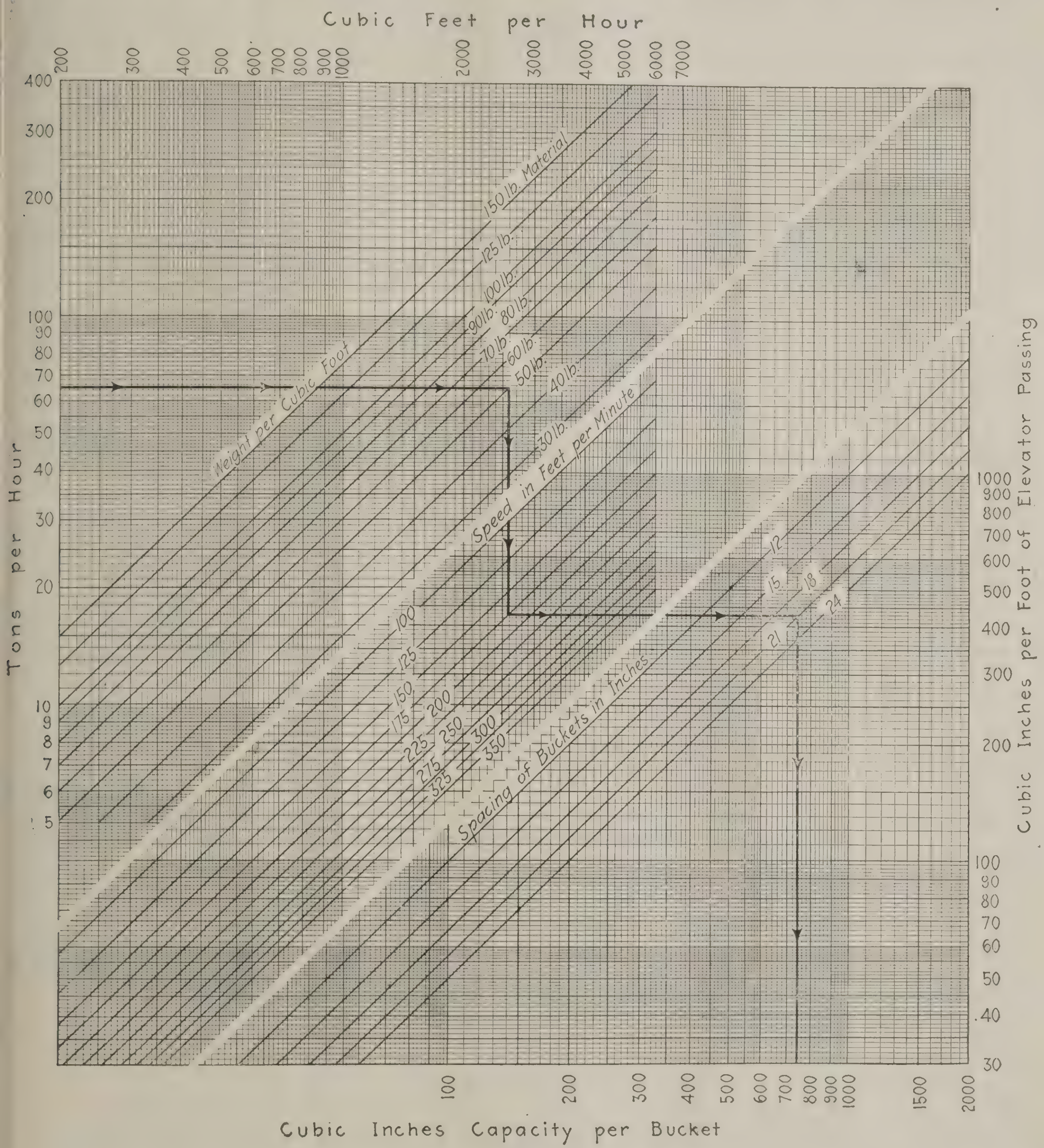
The strike, begun Mar. 18, in the region of Denain, is extending throughout the district and 7000 of the 13,000 miners have quit work. They demand an 8-hour day and a pension of 40c. a day at the conclusion of 25 years of service.

Bucket Elevator Chart

The accompanying chart shows at a glance, practically all the data necessary to determine the speed, capacity and size of bucket elevators, according to the practice of the Robins Conveying Belt Co., of New York. In using the table it should be borne in mind that the required bucket capacity found in the diagram is the working capacity, and somewhat larger buckets should be used, depending on conditions. It is common practice to assume the working capacities of Salem buckets as two-thirds to three-quarters of total capacity when they are operated on a vertical belt.

The heavy line gives the solution for 65 tons of coal per hour, at a speed of 175 ft. per min., and a spacing of 21 in., showing required working capacity of 740 cubic inches.

To find the horsepower required for driving a vertical bucket elevator, multiply tons per hour by lift in feet and divide by 500. This allows for 100% friction.



Capacity and Speed Chart for Bucket Elevators

To find the proper size of a bucket elevator for a given tonnage or volume of material per hour and given weight per cubic foot, enter chart at left with tons per hour and follow across to diagonal line showing weight per cubic foot, thence down the vertical line to diagonal line representing the desired speed of elevator, thence across to the right until the diagonal showing desired spacing of buckets is reached. At the bottom, vertically below this intersection, is found the required capacity of buckets in cubic inches. If the hourly capacity is given in cubic feet, enter at the top of the chart and follow down until the desired speed line is found, thence across to spacing, etc., as before.

Wire Rope Splicing

By F. L. Johnson

Wire rope is susceptible of almost perfect splicing and the operation is so simple that it may be learned in an hour by any mechanic who is at all skillful in the use of ordinary tools. For all kinds of transmission rope the long splice is used and should not be less than 16 ft. in length for ½-in. rope and increasing to 30 ft. for the larger sizes.

Where the splicing must be done in position, rope blocks are used to draw the wire rope taut, as in Fig. 1, care being taken to make fast far enough from the ends to leave plenty of room for the splice and the men who make it. If possible, it is better to hold the rope taut, mark the splice on both ends, by securely winding with No. 20 annealed-iron wire, throw it off the sheaves and make the splice on the floor or staging, as may be most convenient.

The strands of both ends are unlaid, back to the points wound with wire, the hemp core cut off and the ends of the rope brought together with the strands interlaced, as shown in Fig. 2. Any strand, as *a* (Fig 3), is now unlaid and closely followed by the corresponding strand 1 of the other end of the rope which is pressed closely into the groove left by the unlaid strand. The unwinding

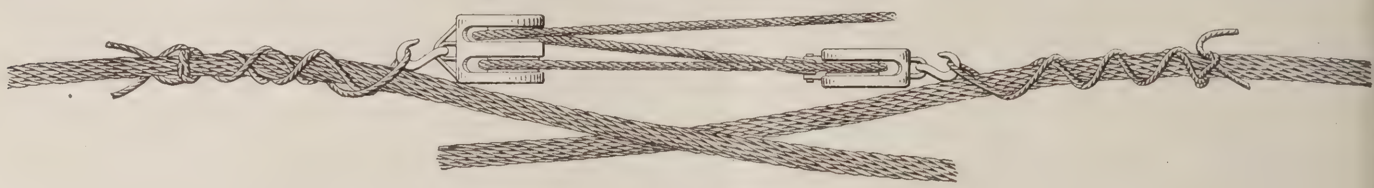


Fig.1.

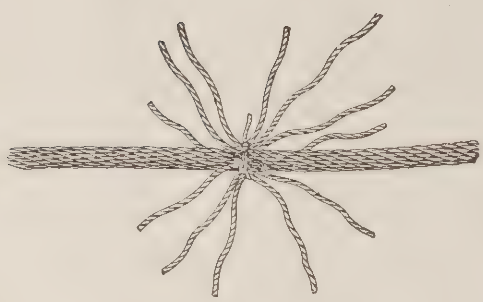


Fig.2.

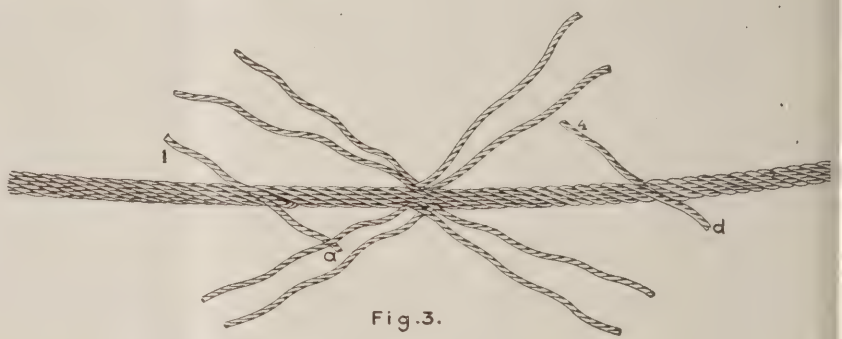


Fig.3.

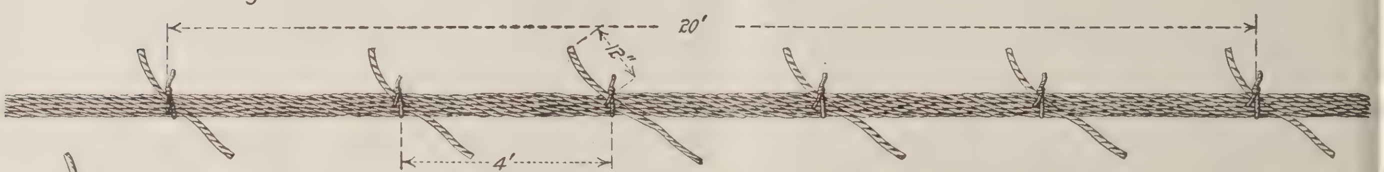


Fig.4.

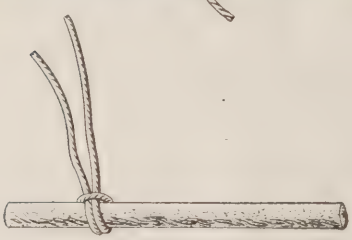


Fig.5

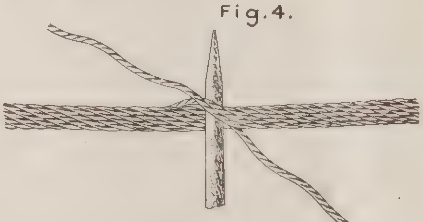


Fig.6.

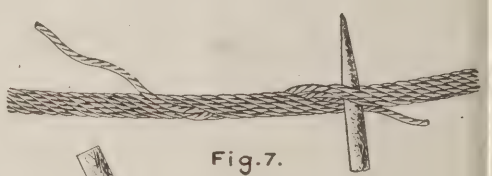


Fig.7.

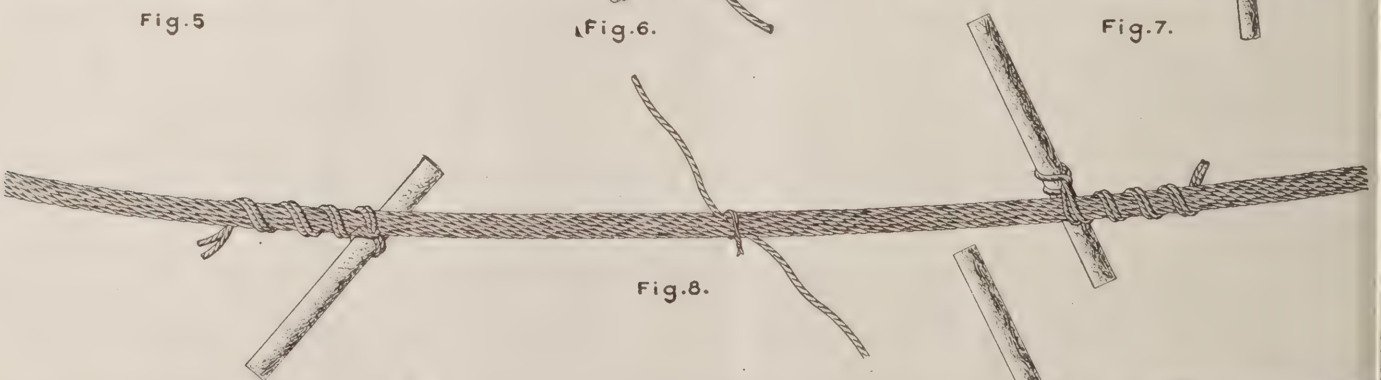


Fig.8.

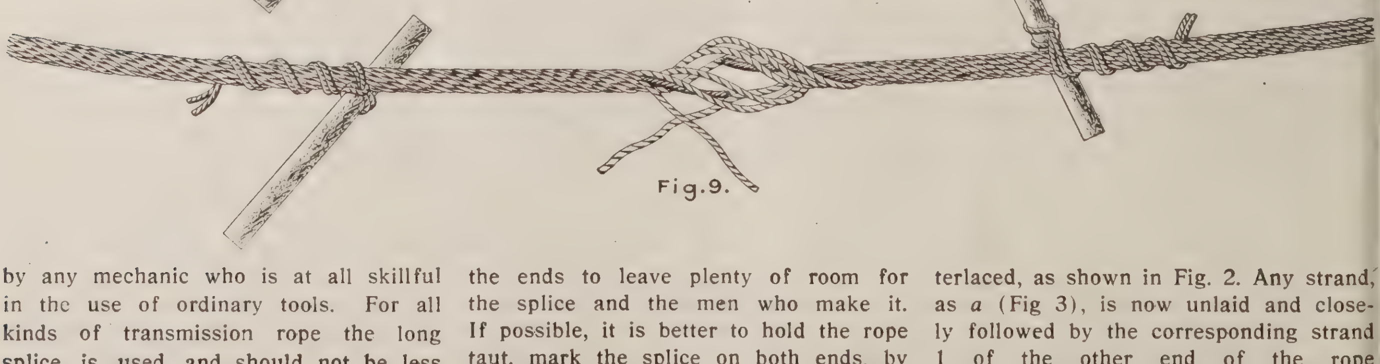


Fig.9.

Note—From "Power," Jan. 30, 1912.

of one strand and the inwinding of the other are continued until all but about 12 in. of strand 1 is laid in, when *a* is cut off at the same length and both strands securely tied with cord. Strands 4 and *d* are next treated in the same way and the process is repeated with each pair of strands until all are laid and cut, the projecting ends being tied to prevent unwinding, as shown in Fig. 4.

When this has been done the splice is bent and worked in all directions until the tension in all the strands is equal and the rope as flexible there as elsewhere. If this is not done and there is more tension in some of the strands than in others when a stress is put on the rope, these strands will pull into the rope, making a bad looking and weak splice.

Next, the open or free ends of the 12 strands are carefully trimmed and wound with fine wire. Two rope-and-stick clamps, Fig. 5, are now secured to the rope, one on each side of an end crossing, as in Fig. 8, for the purpose of untwisting the rope to allow tucking the strand ends into the middle of the rope.

There are two ways of tucking in these ends. They are first straightened with a mallet. The long ends of the rope-clamp handles are twisted in opposite directions, separating the strands and exposing the hemp core, which is cut off and pulled out between the points to where the tucked-in strands will reach and the ends forced into the place formerely occupied by the core.

This is most easily done with the aid of a marlin spike, which is passed over the strand that is to be tucked and under two strands of the rope, Fig. 6, and moved along the rope spirally following the lay and forcing the free end into the core space, Fig. 7.

In the other method the strands are more widely separated by untwisting the rope with the clamps, Fig. 9, slipping the free end in between the strands and correcting slight kinks by the use of a mallet.

The order in which the ends are tucked in is immaterial. Some operators prefer to tuck all the ends pointing in one direction before any of those pointing the opposite way, while others finish each pair of ends in series.

If the foregoing directions are intelligently followed the splice will be uniform with the rest of the rope, of nearly equal strength throughout, and after a few hours' use it will be almost impossible to detect the splice.

A New Type of Mine Humidifier

Special Correspondence

This humidifier raises the temperature of the intake so that the air is able to absorb large quantities of water. Steam is discharged into the air and the condensed water from both steam jets and radiator pipes is forced by a pump to pass in a fine spray into the air current.

The following is a report made by Wm. Nicholson and P. A. Grady, Mine Inspectors of the 11th and 12th districts respectively, to John Laing, Chief of the Department of Mines, W. Va.:—

"Pursuant to your instructions of Jan. 4, 1912, we made an examination of the apparatus for humidifying the air current as installed at the Powhatan Mine, and also a thorough inspection of the workings to determine the effect the humidifier had in rendering the air humid in every part of the area opened up.

Radiator, Atomizer and Vapor Jet Combined

The following is the result of our observations: The humidifier is placed about 700 feet in from the drift mouth and on the intake airway of the mine. It consists of a series of radiation pipes three inches in diameter running about 70 ft. in length. In all there are about 3000 lin. ft. of three-inch pipe running in five vertical rows with ten horizontal pipes to the row. The radiating surface of the whole system measures approximately 2250 sq.ft. The inside ends of the pipes are fitted with small steam cocks so as to permit the escape of some of the steam into the air current. The amount of the vapor thus escaping is based entirely on the amount of moisture needed by the air current of the mine in order that it may be kept at the desired humidity.

The condensed water which is formed within the radiator pipes is drained back into a concrete basin, from which it is picked up by a small pump and forced through German spray nozzles into the air current of the mine. The temperature of this water is from 85 to 90 deg. F. The condensed water from the escaping steam is also led back to this concrete basin and pumped into the air through the spray nozzles. The general result achieved is that the intake air current is raised above the temperature of the mine, thus enabling it to hold much more moisture, and a large quantity of water is deposited over the roof, bottom and sides when this current comes in contact with the cooler surfaces of the mine. Thus is effected a condition somewhat similar to that accompanying the high temperatures of the summer months. A large quantity of moisture is carried by the atmosphere during the summer and when the air enters the mines this moisture is deposited as dew as the heat is progressively abstracted.

Test Records

Before entering the mine, the thermometer reading on the outside showed a temperature of 21 deg. F. with a relative humidity reading of 100 per cent. With this outside reading there was entering the mine only 6.77 lb. or 0.818 gal. of moisture per minute in the air current.

After the air current had passed over the humidifier we obtained a reading of 73 deg. F. with a relative humidity of 65 per cent. The air current from this point on, carried 32.78 lb. of moisture per minute or 3.94 gal. showing that 26.01 lb. of moisture or 3.122 gal. was being injected and absorbed by the air current per minute.

A reading of 56 deg. F., relative humidity 100 per cent. was taken in the return airway near the fan. This showed that the total amount of moisture carried along in the air current at this point was 37.01 lb. per min. or 4.44 gal., indicating that 4.23 lb. or one-half gal. of natural moisture was being taken from the mine surfaces every minute.

The following readings were taken throughout the different sections of the mine, the fifth column recording the distance in feet traversed by the air from the humidifier to the point at which

HUMIDITY OBTAINED

Place where observation is taken	Dry Bulb	Wet Bulb	Humidity Per Cent.	Distance
Pillar work 6½ left entry	58	58	100	2,400
At room 20 on 7 left entry	58	58	100	3,500
Last crosscut 8½ left entry	56	55	94	4,450
Last crosscut 9 and 10 left entry	56	55	94	7,300
Last crosscut 10 to 12 left entry	57	57	100	11,180
Last crosscut 13 and 14 left entry	57	57	100	12,840
"B" Main at 14 right entry	55	54.5	97	13,750
Last crosscut 13 and 14 right entry	55	54.75	97	14,570
Fifth crosscut above 10 right No. 26 room	59	59	100	16,230
7 room off 10 R. at 4th crosscut	59	58.5	97	17,380
"B" Main at 12 right	57	57	100	18,130
5 room off 9 right 350 ft. up	59	58.75	97	18,830
"B" Main 9 right diagonal	57	57	100	19,250
"B" Main 7 and 8 right entry	56.5	56.5	100	20,170
Return near fan	56.5	56.5	100	22,890

BAROMETRIC PRESSURE AT TIME OF READING 28 INCHES

the reading is taken. In every case the coal dust was wet at the point at which observations were made.

The above table illustrates the actual effect produced on the air current where, as in this particular test, practically all the air circulating through the mine was passed over the humidifier and the whole area of the mine ventilated on one air current.

Wherever coal slack was found in the mine, it was always found to be in a moist condition, and when picked up in the hand was found damp and coherent.

Value of Humidifier

This agency for keeping a mine in a damp condition, we believe to be far superior to any of the other agencies in use, such as the water box and mule, the carrying of water to the different sections by means of pipes and hose, or the moistening of the air by means of steam. By keeping this apparatus in operation the superintendent is assured that moisture is being put into every part of his mine where the air current travels. The amount of moisture that is proper and necessary for the safety of the mine can be regulated and he does not have to depend wholly upon the human element. In using the obsolete water box and mule there is no assurance that the dusty section will be made wet and if water is put on dust in high and pitching places in a mine it quickly runs off leaving the section dry and dusty as before.

The severest winter conditions existed at the time our readings were taken, and there was shown to be 37,452 lb. or 4,496 gal. of water taken into the mine every 24 hours. To the practical operator it can be easily seen what the cost would be to put this amount of moisture into the mine with water boxes. The first cost of this apparatus is practically the only thing to be taken into consideration. The cost of maintaining and running it afterwards is a very small item. Only 52 boiler hp. was required in the operation of the apparatus at the time the examination was made.

Roof Should Be Kept Evenly Humid

The complaint is sometimes heard that heating the intake air of a mine by radiation or steam causes the roof to fall; this idea is erroneous for it is the varying difference in temperature of the air that causes the roof to contract and expand, thus making it fall.

In installing an apparatus of this kind to insure safe conditions within a mine from dust explosions, an operator can compute the boiler horsepower and the number of square feet of radiator pipe necessary, basing it on the amount of air entering the mine. A safety factor may be provided by assuming the lowest temperature and humidity conditions that may exist at any time during the year.

We think that Col. L. E. Tierney, of the Powhatan Coal & Coke Co. should be given due credit for the research he has made along this particular line.

A Remarkable Borehole

An interesting feat in horizontal boring has been carried out at the Middletown Colliery near Leeds, England, in drilling a hole 702 ft. long in a 4 ft. 6 in. seam of coal, which dips about one inch in five yards and has a 4-in. band of slate 22 in. from the top. The bore hole was driven 8 in. above the band, and throughout its whole length has been kept between the band and the top.

This can justly be considered a most remarkable accomplishment, and Fig. 1 shows the apparatus that was used to effect this result. The device is a safety hydraulic boring machine, made by George Burnside, of Shiney Row, Fence Houses, in the County of Durham, England, and probably offers the most expeditious method yet discovered for safely boring long holes in the vicinity of old mine workings in which dangerous gases and water have accumulated.

As may be seen from the illustration, the device is fitted with a stuffing-box and several valves or cocks. The tubular boring rods are made with flush joints and passed through the packed stuffing-box *L*, which maintains a water-tight joint during operation. When either water or gas is tapped, the full length of boring rods and drill is withdrawn through the stuffing-box until past the cock *S*. This valve *S* is then shut off and the drill point removed by unscrewing the cap of the stuffing-box. Thus, means are afforded for withdrawing the drill with perfect safety to the workmen and without chance of water or gas escaping.

After the boring rods are withdrawn, the water or gas may either be run off from the apparatus, or piped to some convenient point. A pressure gage mounted on the casing serves to indicate the pressure of the body of water or gas which has been tapped. It is, of course, necessary to keep the inside of the rods from becoming choked, and also to avoid any escape of water from the rods after holing is made; to this end the drill points are furnished with a spring valve.

The apparatus is made in four sizes, ranging from one to four inches in diameter of bore, and the record pressure that has so far been tapped successfully is 287 lb. per square inch.

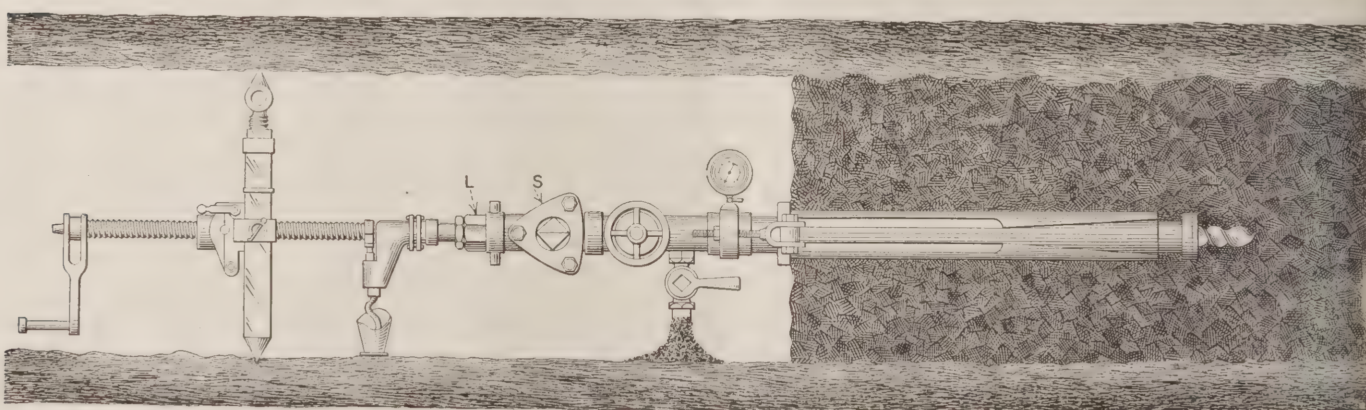


Fig. 1. Safety Hydraulic Boring Machine

Justification is found for the practice of storing coal in the open and spraying it in dry weather, in the conclusions reached by M. Mahler, who states that moist air has less effect upon coal than dry air. He found that under the influence of dry air at 25 to 30 deg. C., 150 grams of coal gave rise in 30 hours to 1 cu.cm. of carbon dioxide and 2.88 cu.cm. of carbon monoxide. At 100 deg. C. the gas produced was nine times as great and carbon dioxide predominated.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Safety Catch for Cages

A South African exchange (Diamond Fields Advertiser) reports that the De Beers Consolidated Mines, Ltd., are interesting themselves in a safety catch, which was exhibited before the recent Safety Catch Commission, in Johannesburg, the members of which were so impressed with its simplicity and utility that they urged early tests under mining conditions.

The object of the invention is to provide an arrangement whereby in the event of breakage of the hoisting rope or wire the cage may be adjusted to stop within 12 to 60 ft. and be effectively supported. The apparatus is disposed at the upper end of the cage and comprises a rectangular frame, the side members of which are slotted to receive bearings in which are journaled two parallel shafts disposed on opposite sides of the wooden or metal guides and to each of which is keyed or fitted a pair of toothed wheels adapted to engage a face of the corresponding guide. Each pair of wheels is normally held, against the action of an adjustable spring, out of engagement with the corresponding guide by means of a wire, each wire being led round a pulley on a transverse of the frame and secured at one end to the corresponding shaft, the other wire being secured to the hoisting rope.

It is explained that the arrangement is such that when the hoisting rope is under tension the wheels are held clear of the guides, but in case the rope breaks with consequent slackening, the wires will also sag and permit the springs to press the shafts in the direction of the guides, so that the wheels engaging the guides are caused to rotate and to rotate the shafts. Each shaft has screw-threaded portions engaged by nuts, one incline face of each of which engages a wedge-shaped block, the blocks being fixed to the transverse members of the frame work. Thus by rotation of the shafts, the nuts are caused to mount the wedge-shaped blocks, and to force the shafts in the direction of the guides, causing the wheels to bite into them. The extent of rotation of the shafts is limited, according to the distance which the nuts may travel, so that when the cage has fallen slightly the shafts and the wheels will be gradually stopped by the jamming of the nuts, resulting finally in the suspension of the cage from the wheels.

Roof Action in Longwall Workings

Special Correspondence

The bending of the roof does not commence at the face line, but continues back over the coal. This is the reason why the coal breaks down along the mining face under the localized pressure. Chocks should not be set vertical but should be placed so as to lean two inches to the foot with their tops toward the working face.

In a paper entitled the "Action and Control of Differently Constituted Coal Roofs," read before the Midland Counties Institution of Mining Engineers, Mine Inspector W. H. Hepplewhite remarked that, with the statutory establishment of systematic timbering at all coal mines, it was thought by many that a remedy had at last been discovered, involving a great reduction in the number of accidents at the coal face. As a matter of fact, however, the expected diminution has not been attained, the death rate per 1000 workers by falls being 75 in 1910, as against 74 in each of the two preceding years. Probably, he added, when the workers become thoroughly disciplined into the necessity of strictly carrying out the timbering rules, better results may be obtained.

How Rock Breaks

A regular stratified shale of good vertical thickness directly overlying a coal bed, provides the condition favorable for the extraction of the coal and the safety of the workers engaged in the operation, for, if the line of longwall face is in a continuous straight line, the weight breaks will be found parallel to the coal face, or else the roof will bend back in the waste without any perceptible break.

If a true sandstone rock, which has no semblance of stratification or lamination, is many feet thick, the chances of extensive falls under normal conditions are rare. The weight breaks generally have a heavy back hade of about 45 deg., and the stone to guard against is in the form of wedge-shaped pieces from out of the open break.

In the event of the roof consisting partly of sandstone rock and partly of hard shale, without apparent stratification, it is apt to break at each successive web (or working face) along the line of the longwall workings. The break may be only faintly observable, or the roof may have bent a few inches below the seam of coal, this being most observable if the seam is of a hard texture and requires holing. Parallel breaks often occur a short distance apart and in between the regular face breaks. Where the holed coal, when taken down, extends over the solid for a short distance, the roof between the sets of bars is often a source of danger to the loaders of the coal, and should be timbered in advance of them.

An Independent Roof Unit

The form of roof known as "non-stratified clod" occurs usually where a thin seam lies above the one worked, and the thicker the clod is, the less difficulty is experienced in safely supporting it. The thin seam rarely gives any adhesiveness to the clod, which falls away without any warning, such as other forms of roof often give.

A bed of shale, of the weakness of clod, overlying a seam, is another specially dangerous form, and when once the roof has broken there is no knowing where the cleavage will end.

Mr. Hepplewhite says that irregular bedding most often occurs where the roof proper overlying the coal bed is a tenacious rock stratum a few feet thick, and adds. The "intrusive shale" (if we may be permitted to use such a term for rock older than the stratum which covers it), from whichever side it is approached by the longwall face, begins with a thin edge immediately over the coal. It gradually grows thicker, until it has attained several yards in thickness, and as the coal face advances it gradually runs out exactly as it began. When it is considered that the "intrusion" has a diameter of several hundred yards, it will be obvious that a long time must elapse in order to work a face of longwall work across it. It is when working under the thin edges that the greatest danger exists from detached pieces of stone. The

loose roof is shaped like a cantilever and does not have sufficient strength to be self-sustaining; moreover, any little irregularity in thickness makes the cross-section inadequate.

Bad Roof and Care Copulate

The inspector says it is commonly supposed that accidents occur most frequently where the roof is worst, because detached pieces are liable to fall, but such is certainly not the case. The fact that the workmen are fully aware of the bad condition of the roof makes them exercise every care in using plenty of supports. Accidents are more likely to occur and usually happen, where the roof is comparatively hard. Risks are therefore run, and when an accident results the usual exclamation is: "Who would have thought it?" It is a well established fact that the greatest number of accidents occur from local detached pieces of roof stone. The fatalities from large falls are only of rare occurrence at the coal face. If accidents are scarce where a bad condition of roof prevails, surely by the same analogy they ought to be scarcer with comparatively good roofs. It seems to Mr. Hepplewhite that if the same precautions were exercised with regard to the method of timbering in good and bad roofs alike, discipline among the workers and sweet reasonableness all round ought to reduce the number of accidents to a minimum.

Regularity of Jointing

Discussing the line of cleavage, it is pointed out that it never varies. When once the working face has been started at whatever angle to the cleavage, that angle between working face and cleavage may be depended on never to alter. Proceeding, Mr. Hepplewhite says the worker knows by advancing the mining face directly parallel to the cleavage (face on) that he has little labor to exert in extracting the coal. The roof action is continuous along a line of face, and for several feet it rides over the coal. The line of least resistance is on the coal itself, which pushes off and prevents fractures from occurring in the roof. It will bend back toward the waste with a depression of about 2 in. to the yard. The pressure may occasionally defeat itself, and instead of always advancing over the solid coal there may be an extra weight sufficient to cause the roof to fracture along the face line. The consequence is that the coal has been relieved of its pressure and becomes set and tough. The coal will have to be advanced several yards before there is sufficient weight on it to enable it to regain its normal condition. The fracture produced by the extra weight is usually semi-arched, with a smooth surface, as the result of friction. As regards roof depression, it is of little importance at what angle of the cleavage the coal is worked, because the support has been removed, and the same amount of subsidence will be the result; but the control of it has a material effect.

Mr. Hepplewhite says the chief function of the roof supports in longwall working is to prevent the roof stratum, especially local detached pieces, from causing injuries to the workmen. No method of roof supports ever yet introduced could sustain the roof stratum in its rigid condition. When once the coal support is taken away subsidence is bound to follow in due course. The subsidence under normal conditions is slow in action, and imperceptible to the workman. He is only aware of the roof settling from the fact of each line of fracture becoming more open, the roof depressed, and a renewal of broken timbers being required. The complete settling of the roof stratum up to the surface depends on the depths and the tenacity of some of the upper measures.

Packwalls Should Be Battered

On the question of packwalls the inspector says it is a mistake to build them vertically, because it is obvious that the lateral pressure has a great tendency to push them inward before the vertical pressure has tightened its hold. A good principle is to build the packwalls with a batter of about 6 in. in the yard. A 4½-ft. bed should be packed on a batter of 9 in. and a 6-ft. bed on a batter of 1 ft. It would be found with the pressures acting conjointly that the packwalls would assume the solidifying state without bulging.

An ideal way to construct a packwall would be to build the first half, no matter how thick the seam, with a batter of 9 in. and the remainder vertical. As the lateral pressure proceeds, the packs would all be pushed to the vertical line and remain to take the top weight.

Workmen are generally instructed to commence building packs on the bare floor at the sides of the roadways, but Mr. Hepplewhite says he has come to the conclusion that both for safety and economic purposes it is a big mistake to build them in that manner.

Electric Hoisting in Upper Silesia

Special Correspondence

Electric hoisting plants, particularly those of the Ilgner system, are being largely adopted in this region. One unique installation has the hoisting motor directly connected to a turbogenerator.

Note—From paper read at meeting of the North of England Institute of Mining and Mechanical Engineers, by Henry M. Hudspeth.

Electric hoisting for main shafts is being largely adopted in Upper Silesia, and the Ilgner system appears to be mostly favored. Electric winding is particularly well adapted to working inclined seams where, owing to the continually increasing depths, it is often a considerable time before the output from a fixed level reaches its maximum. The electric hoist easily lends itself to enlargement, for the Koepe pulley or drum can be coupled to one motor, and provision made for the subsequent addition of a second motor; the Ilgner system especially lends itself to development in this direction, as the flywheel-converter plan can be arranged to suit varying demands.

In certain instances it has been necessary to erect the winding machine on the headgear, as at the Deutschland mine, where there was no room for the hoisting-engine house on the ground level. At that mine the Ilgner system was adopted, the main particulars of the plan being as follows:

The motor-generator takes three-phase alternating current at 3000 volts, and when running at 470 r.p.m. gives 444 h.p., the weight of the flywheel being about 17¾ tons. The winding motor, which takes direct current at 600 volts, has a maximum capacity of about 620 h.p., when running at a maximum speed, or 63 r.p.m. The Koepe pulley is 14¾ ft. in diameter, the depth of wind 780 ft., and the maximum winding velocity 35 ft. per second. The weight of coal per wind is 2½ tons and the amount drawn per 10-hour day is 690 tons.

Economic Advantage of Electric Hoist

The greatest economical advantage of the electric hoist is its low steam consumption per shaft-horsepower-hour, which moreover is the only real basis of comparison that can be made between electric and steam winders. The cost per ton hoisted is certainly a most important item, but it forms no basis of comparison unless two plants happen to be identical, which is rarely the case. Again, the steam consumption of an electric winder is a predetermined and practically unalterable quantity. In the case of steam winders the steam consumption depends to some extent upon the operator. Electric hoisting engines are considered safer than steam hoists, as evidenced by the fact that in Upper Silesia a

speed of 33 ft. per sec. is allowed for hoisting men with an electric machine, as against 20 ft. with a steam machine, an important consideration, especially in the case of deep mines.

At Castellengo colliery the two winding engines are constructed on the Siemens-'Ilgner system. The main particulars are:

Depth of shaft in feet	853
Useful load in tons	2.26
Cage, number of decks	2
Cage, cars per deck	2
Cage, weight in tons	3.25
Velocity of hoist, in feet per second	41
Diameter of winding rope in inches	1.49

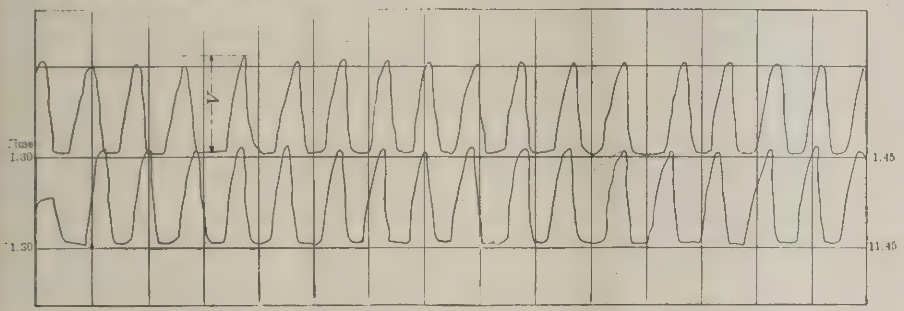


Diagram Shows How Quickly Full Speed Is Reached

The speed curves of the winding motor for part of an ordinary day's work are shown in the accompanying diagram. Mr. Hudspeth explains that the load on the winder changes over from —74 to +790 h.p.; for balancing the same the flywheel is 13¾ tons in weight and when running without load it has a peripheral velocity of nearly 325 ft. per sec. The balancing of the load by the flywheel is brought about as follows: If the load on the winder exceeds the normal, the excess must be taken from the flywheel, this being accomplished by inserting a resistance in the rotor circuit of the three-phase motor, the revolutions thereby being decreased and energy taken out of the flywheel. On the other hand, should the load be less than the normal, the resistance is cut out and the motor winding motor to be run only at a decreased velocity. The flywheel may thus be again run up to full speed when the interruption of the steering lever is cut out.

Winder Made 82 Hoists per Hour

Under test the winder made nearly 82 hoists in an hour, corresponding to 44 sec. per hoist, distributed approximately as follows: Period of acceleration, 12 sec.; period of maximum velocity, 10 sec.; period of retardation, 14 sec.; period of dumping, 8 sec., total time, 44 seconds.

So far as Mr. Hudspeth is aware, the electric-hoisting plant at the Heinitz mine is the only one in existence in which the winding motor is directly connected up to a turbo-generator. He gives the following brief description of the plant:

A Brown-Boveri-Parsons high-pressure turbine is directly coupled to a direct-current generator and an alternating-current generator. The three-phase alternating-current machine supplies electricity for the general working of the mine and the braking of the hoisting motor is made to furnish electric energy. The direct-current generator is connected up to the winding motor by means of the Ward-Leonard control.

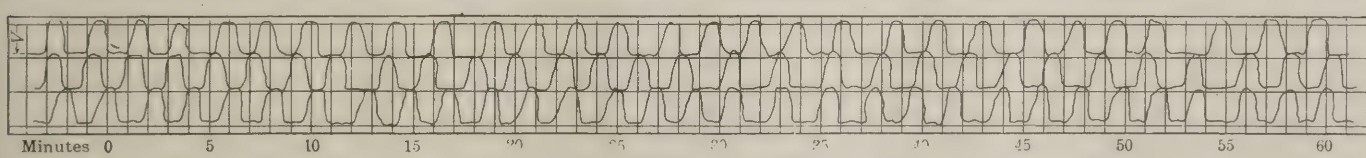
turbine is of special interest, inasmuch as it is the means by which the turbine is enabled to take the heavy starting load of the winder. The valve operates in the following way: Under normal load the steam is throttled at the turbine inlet, so that the pressure behind the admission valve is the same as that before it, the automatic overload valve then steps into operation, and live steam is admitted to the second expansion step of the turbine, thereby increasing the capacity of the turbine considerably.

Advantages of the Overload Valve

The percentage of vacuum in the condensing plant affects to a certain extent the working of the overload valve. If the condensing plant is heavily loaded, the starting of the hoist brings the overload valve into operation sooner than usual; on the other hand, when the vacuum is good the overload valve is at times not opened. A further advantage of the automatic valve lies in the fact that if the boiler pressure sinks, the valve comes sooner into operation and so keeps the turbine up to its required capacity.

The speed of the turbine is altered by starting the hoist, but not to a dangerous extent. The revolutions per minute undergo an alteration of less than 2 per cent. (from 1490 to 1505) when the load due to the winding motor changes over from the greatest positive to the greatest negative value. This alteration is so small that it is not sufficient to bring the three-phase generator out of step.

The author explains that the hoisting apparatus proper consists of a direct-current motor coupled direct to a Koepe pulley, provision having been made for the addition of a second similar motor. The machine has the usual retarding and safety devices, the safety brake being put into operation and the main switch opened when, (1) the exciting current for the motor fails, (2) the existing current



Hoisting Diagram Showing Time Consumed in Hoisting

runs the flywheel up to its full speed. The actuation of the resistances follows automatically. The over or under loading of the converter necessitates a stronger or weaker current from the three-phase mains, which increase or decrease of the current, sets into operation a small motor in a direction corresponding to over or underload.

If the energy of the flywheel is drawn upon to such an extent that there is not enough resistance to balance, which may happen if both winding engines commence together, the steering lever is automatically prevented from being set out as far as usual, and this allows the

Following are the main particulars of the hoisting plant when finally completed:

Depth of shaft in feet	2526
Coal per hoist in tons	7
Velocity of hoist in feet per second	32.8
Tons per hour	226.4
Diameter of Koepe pulley in feet	26.25
Cage, number of decks	4
Cage, number of cars per deck	3
Diameter of winding rope in inches	2 9/16

Mr. Hudspeth proceeds to say that the turbine, which has a maximum output of 1740 kw., takes steam at 140 lb. per sq.in. (superheated to 527 deg. F.), and is connected to the central condensing plant at the colliery, which shows on an average a vacuum of 92 per cent. The patent automatic overload valve fitted to the

increases to 15 per cent. above the normal; that is, by the inadmissible increasing of the turbine revolutions, or (3) by the rotor current increasing above a fixed maximum through an excessive load on the motor. The motor is built for a continuous output of 557 h.p. at a speed of 24 r.p.m. per min.; its maximum output, however, is 1346 h.p. The field excitation is at 110 volts and the armature receives current at 490 volts.

The figures herewith reproduced from sketches submitted with the paper show the speed curves for the winders at the Castellengo colliery and Heinitz mine respectively.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

The present controversy between coal operators and miners is filled with uncertainties, but none are of greater consequence than the doubt concerning the character and caliber of John P. White, president of the United Mine Workers of America.

This man, born at Coal Valley, Ill., in 1870, started life as a trapper boy in the mines when only 13 years of age. After working 16 years underground, part of the time driving mules and the remainder of the time mining coal, his associates in Iowa (where he had afterward settled) chose him to be secretary and treasurer of the miners' organization in that state.

It didn't take young White long to prove that he had executive ability as well as a likable manner, for when he took hold of the union finances in Iowa, there was just $600 in the treasury. After serving the miners six years, "John P." left them with $500,000 in the bank.

In the politics of the national organization, Mr. White does not lack experience. He was called from the presidency of the Iowa miners to act as vice-president of the main organization. After serving in that capacity a year, he was again returned to the presidency of the union in Iowa, filling the position for another two years. This work was followed by his election to the highest office in the national union, succeeding Tom Lewis as president.

Coal people, and to some extent, the public, have now fixed their attention on John White. This is his first big fight and the vantage points on the field of battle are occupied largely by the artillery of the enemy. It is also a fact that general industrial conditions are somewhat adverse to his cause.

At a critical time like this, however, labor forces become fairly united and recent months have witnessed the addition of many names to the United Mine Workers' roll of membership. Furthermore, for each union miner who ceases work, it is safe to figure that one other man not a member, but only a follower and sympathizer, will lay down his tools. It's this condition that makes it possible to call out 80 per cent. of the men when only 40 per cent. may be members in good standing.

There is no doubt but that John White has a preponderance of that essential quality, caution. It is also true that his frankness and evident simplicity will prove the one surprise and perhaps the

John P. White

undoing of many opponents. He fully understands that "the surest way to convey misinformation is to tell the strict truth," and you are likely to leave him, after a conversation, believing he has laid his whole hand on the table, when some of his best cards are in his shoe or up his sleeve—always handy, but quite invisible.

Two of the clubs that "John P." has grasped and will wield with maximum effect are, first, the general fuel deficiency that exists, and which, because of labor troubles abroad, is international in scope; second, the effect of a general suspension of mining on the political situation in a presidential year.

When I suggested to Mr. White that the railroads of the country have been buying and storing thousands of tons of coal, he replied with positiveness that such was not the case, and pointed to certain roads (all Western) where no surplus had been laid by. I mentioned that, although the big anthracite companies did not have their storage yards filled to capacity, they had a normal supply on hand, and that one condition prevailed now that was not the case when the last big strike occurred in 1902: Today the people, remembering conditions that existed during the trouble 10 years ago, have filled their cellars and a great amount of coal has thus been stored. The increase of nearly a million tons in the February output of anthracite was absorbed in this way.

One thing is sure, John White believes he has not underrated the strength of his opposition. A remark I made caused him to lean forward and say, "I know they're strong and I fully realize that the anthracite operators are better fortified today, financially and otherwise, than ever before, but we also are in much better shape than most people believe." The seriousness with which this statement was delivered convinced me that the union leader is fully aware of the great responsibilities resting on him, and that, if he enters a conflict, the dire possibilities to his followers will have been carefully weighed.

White's head is broad, his jaws square and every feature indicates determination. He is not the aggressive type of man however, and it's probable his fights will be conducted without any flare of trumpets, and with an absence of red fire. It's this quiet inherent strength of the man, coupled with his serious view and intelligent understanding of the far-reaching effect of his decisions, that makes him a puzzle as well as a danger to his opponents.

His views on vital questions affecting the mine workers are positive and clear. He does not believe that it is necessary for a union to be incorporated, so that both parties to a labor contract are equally liable. As to the anthracite conciliation board, Mr. White is ready to acknowledge that this commission has accomplished some good, but says there is such a long delay before a man can get action that the value and efficiency of the board are destroyed. I also inferred that he is of the opinion that men are reluctant to carry a dispute to the conciliation court, because of the bad light the man is placed in in the eyes of his employers.

When I spoke of the "check off" system the miners are demanding of the anthracite operators, Mr. White indicated plainly that he considers this demand, not only fair, but absolutely essential to the successful growth of the union in the Pennsylvania field. He may have been bluffing, but his expressed ideas on the matter and his evident determination to back up his opinions, seemed real. If this should prove true, then we are facing a storm in the anthracite field that will make the strike of 1912 appear like a summer zephyr.

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CIRCULATION STATEMENT

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Anthracite Operators Stand Pat

After a session lasting only 23 min., the third, and, for the present, the final joint conference of the anthracite miners and operators adjourned *sine die*. President White, of the miners, read their formal acknowledgement of the operators' refusal to grant their demands and concluded with a few remarks, expressing regret that their plea was disregarded. The chairman of the meeting, Mr. Baer, then declared a motion to adjourn was in order. This motion was made and carried.

Those familiar with the mechanism of "fixing a scale" will doubtless welcome the end of these usual (and useless) preliminaries. The customary ultimatums have been made by each side, the usual recriminations, charges and countercharges exchanged, and the public may now rightfully expect the contending principals to get down to business.

An analysis of the issues involved in the present controversy discloses no new features. The miners' initial demands for wage increases, amounting to 40 cents on the ton, above the present scale and aggregating 28 million dollars annually, or approximately one-sixth the total value of the anthracite production are, of course, absurd. On the other hand, their plea for an advance on the grounds of the increased cost of living appears to be well taken. In compensation for this the operators quote the bonus accruing to the miners through the workings of the sliding scale, which averages three million dollars per annum, and show further that the average working time of the miner has increased 28 per cent.

Of other points in contention, probably the most serious is the "check-off." The operators regard this with uncompromising disfavor, and will fight to the last ditch before conceding such a principle. On the other hand, the miners appreciate that the very life of their organization is dependent upon it and will, accordingly, demand its adoption just as vigorously. If, as the operators claim, the statutes of Pennsylvania prohibit the check-off, the miners should show some satisfactory method of overcoming this or exclude the measure from their demands.

Dustless Mines

The experiments at Bruceton and Pittsburg have probably produced a benumbing sense that dust removal cannot be made sufficiently complete to produce immunity from coal-dust explosions. Small bodies of dust, smaller perhaps than are contained per foot run of gangway and room in any operating mine, have produced most severe effects, actually lifting the surface material at Bruceton by which the mine was covered. It is convincing, but by no means consoling, to remember that these effects of small quantities of dust could be and had been forecasted from a knowledge of chemistry. So it is clear that theory and practice both require *absolute* dustlessness in a mine if from dust removal any good results are to be expected.

Some years ago a mine in West Virginia had a severe explosion. It was thought that the disaster was caused by dust. The dust was removed, but soon after another explosion occurred, and some were of the opinion that this recurrence of the event, after the alleged cause was removed, showed that the original diagnosis was entirely mistaken.

But was it? A body of men, as Mr. Blackett has shown, in an address before the North of England branch of the British Association of Colliery Managers, enters a mine with shovels and brooms. They fill carload after carload with dust, and it is drawn out of the mine. The workings then appear safe, but the finer and probably the newer dust flies away in the air current and finds new resting places; moreover, the fuel content becomes exactly equal to the needs of the oxygen present in the air. Such conditions favor the most complete and violent dust ignition.

The result is easy to imagine. The dangerous coal particles are still present

in a proportion most favorable to aid an explosion. The less dangerous particles alone have been taken away and what little stone dust is naturally to be found in the mine is removed. The more we consider dust removal, the more forcibly it is borne home that mere dust collection is not a panacea for colliery explosions, especially if the method adopted is not one in which suction takes a leading part. A vacuum cleaner may remove just that part of the dust from which most is to be feared, but the brush-and-shovel gang do but make conditions worse rather than better, and, in fact, it would seem that the operation of dust collection as at present conducted is fraught with much danger to those engaged in it.

It is considerations such as these which lead us to emphasize the importance of humidification, schistification and other cures. They do not demand the impossible. A mine *can* be made so damp that all the coal dust will be moistened whether resting or flying. The air can be made so humid that several calories of the heat of combustion can be absorbed by the water vapor it carries. A sufficient body of flue dust or ground-rock dust can be put in the mine to dampen the heat of an explosion. Taffanel barriers can be erected, which will make the extension of an explosion well nigh impossible. Watteyne's external tamping can be used to deaden the escaping flames from blown-out shots. Permissive explosives can be used to reduce the possibility of a primary ignition.

But no man who has experience in mining will advocate the keeping of an absolutely clean mine. The funds of no coal company are large enough to prevent an explodable amount of coal dust being in almost every room and entry from the pit bottom to the remotest recesses of the workings. It is not, however, too severe a requirement to demand three things: Firstly, that the deposit of dust from coal of *recent* mining shall not be large; secondly, that none of the dust, recent or aged, shall be dry, and thirdly, that side by side with all the coal dust shall be a foreign dust or powdered material capable of withdrawing heat from what dust may burn, extinguishing it thereby, as the enveloping gauze of a safety-lamp restrains the flame from entering the surrounding air.

With all our experimentation we are yet without much needed information. We do not know the relative explosibility of old and new dusts; we do not know what are the requisite qualifications of a schistifying powder. It has not been proved but rather assumed that the coal dust just formed is more dangerous than the old, and it has not been shown just how far the dehydration and decarbonization of dusts intensify their power of controlling an explosion.

Powder in the Mines

The dangers arising from the presence of powder in the mines have been generally thought to result from its careless handling, but it should be remembered that one of the principal dangers to be apprehended is that of detonation during storage. The laws of some states limit the amount of powder which may be carried into the mine by an individual miner. As a rule, in such states not more than five pounds or not more than is sufficient for one day's work may be taken by the miner to his working face. Probably those who incorporated the provision in our state laws overlooked one important merit in this requirement.

Prior to the enactments, the miners left large quantities of explosives in the mines at night. Often for safety they would hide these in the gob. If a fall of rock took place over the miner's powder chest or over the place where he had hidden his powder, a widespread explosion might result for the small burst of violence from the contents of the keg might be augmented by the added force of exploding gas or dust. It must, however, be here remarked that this could not have frequently occurred, for we do not remember in a long course of years a case where a powder keg was found detonated by a rock fall. Some explosions may have had that origin and not been charged to the right causes. The two explosions at Adrian have been ascribed to rock falling on powder; perhaps those at Bellevue in Canada may have had such a source and in Wales the Maindy and Pentre explosions may have had a similar origin.

A provision regarding the carrying of all powder out of the mines on quitting work should be made and strictly enforced and the requirement that only sufficient powder should be taken into the mine for one day's work should be unfalteringly observed, among other reasons for the purpose of backing up the provision just proposed. For, if a miner carries but little powder into the mine, he will almost inevitably carry out his canister at the end of the day for replenishment.

Despite all that has been rumored, it will be seen from the report of the Bureau of Mines that all permissibles are capable of detonation. Under favorable conditions almost any mine explosive can be made to explode by means of a blow. It is well known that a rapid glancing blow from a broomstick will ignite powder and for a long time this primitive test was used to prove the relative safety of explosives.

Detonable bodies should always be stored under good roof and the ground around should be freed from fine coal dust. They should not be left where gas is likely to be found in unsafe percentage, and Dr. Thornton has shown that even when the gas is in itself not sufficient to constitute a menace, dust and gas may combine to cause an explosion with greater facility than dust alone.

Government Ownership of Coal Lands

The acquisition of the brown-coal lands of the Leipzig district, Germany, is said by Vice-Consul W. W. Brunswick, of Chemnitz, to be a step in the gradual move of the government to own and operate all coal lands in the kingdom of Saxony. This is an important economic measure, as the plan of the German government to keep such lands in reserve will insure the preservation of a large coal territory for future generations and assure the working of the fields in a regular and systematic manner. The acquisition of an extensive area at Kieritzsch will be considered by the Saxon parliament at its next session.

The mine laws of New South Wales state that no person will be allowed to act as a mine electrician or as an assistant electrician, unless he shall be the holder of a certificate of competency, issued by the Department of Mines, authorizing him to act in either of these capacities. Mine engineers also are examined by the government and only the holders of certificates may be employed where life is at stake. It would be well if mine laws in the United States made like provision.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Electric Pump in Mine

On page 685 of COAL AGE, Mar. 2, T. E. Richards states he has an electric pump located 1200 ft. from the water in a mine and discharging 2000 ft. to the surface, using 2-in. suction and column pipes. Mr. Richards asks if it would be wise to use a 3-in. pipe line instead of the 2-in. now installed, and to set the pump nearer the water.

I would say that with a long suction pipe, or one with bends and valves, the resistance to the flow of water to the pump will be considerable. In any case, with such a long suction pipe an air chamber should be used, in order to maintain a continuous flow of water to the pump and avoid the necessity of stopping this flow at each stroke of the pump. The resistance caused by the long suction pipe may be so great that the atmospheric pressure acting on the water may not be sufficient to force it to the pump, especially if the vertical height or lift is considerable. When the pump is set right over the water basin, the pump will work better, generally, if the lift does not exceed 18 ft. A pump always works better when located near the source of the water supply; but when the pump is located at a distance from the water and the suction pipe has a long horizontal run the pipe line should be one or two sizes larger than is required where the pump is located near the water. When there is no air chamber on the suction pipe, the water flowing through the pump comes to rest at each stroke of the pump; and when the suction pipe is long and the resistance great the water often does not flow to the pump as rapidly as the piston moves. This causes an imperfect action of the pump and produces a severe blow called "water-hammer" or "pounding" when the piston again meets the inflowing water.

In determining the size of pipe to be used in pumping it is customary to assume a velocity of 400 ft. per minute in the discharge pipe, and half this velocity or 200 ft. per minute in the suction pipe.

Now assuming the 2-in. column pipe is used, as at present installed, and calculating the volume of water discharged in feet per minute, for a pipe 2 in. in diameter and a velocity of 400 ft. per minute, or 6.6 ft. per second, the volume of water discharged (G) will be

$$G = 2.448\ d^2\ v$$

$$G = 2.448 \times 2^2 \times 6.6 = 64.62, \text{ say } 65$$

gal. per min.

The formulas for calculating the diameters of the suction and discharge pipes, when the flow of water is given in gallons per minute (G), are as follows:

Discharge pipe,

$$d = 0.25 \sqrt{G} = 0.25 \sqrt{65} = 2.1, \text{ say } 2\ in.$$

Suction pipe,

$$d = 0.35 \sqrt{G} = 0.35 \sqrt{65} = 2.8, \text{ say } 3\ in.$$

I would place this pump nearer the source of water supply, say moving it down about 1000 ft. This will give the pump 200 ft. of a suction line and 3000 ft. of a discharge line.

ARTHUR DUKES,
Mine Foreman.

Marsteller, Penn.

Thawing Frozen Pipe Line by Electricity

I have been much interested in the question asked by "C. B." and answered in COAL AGE, Feb. 10, p. 586. The question asks how can electric power be used to thaw out 100 ft. of a frozen 2-in. iron pipe line; and what arrangements are necessary in order to accomplish this. The question states that ample electrical power is at hand, but does not say whether the current is alternating current or direct current.

If direct current is being used, which is generally the case in mining practice, a motor-generator is necessary in order to reduce the voltage of the current to, say 30 or 40 volts, and obtain a current of from 300 to 400 amp. On the other hand, if alternating current is being used, the arrangements that are necessary to transform the current are entirely different. A special transformer would then be required to regulate the voltage to the desired amount, and to give the proper amperage. Either of these methods is probably an economical one to employ, if the power consumption is the chief factor to be considered.

I would like to ask, however, if a water resistance could not be used with direct current, where there was a pressure of, say 250 volts and a current of 1500 amp. Would it not be possible, by the use of a water resistance, to reduce this current to the proper voltage and amperage for thawing the pipe line?

Suppose, for example, that it required 300 amp. at 50 volts pressure to thaw out the pipe line, what would be the effect on the pipe if there was 150 volts pressure, and 300 amp. flowing through the pipe? Would this additional pressure or voltage have any effect on the heating capacity of the current? I appreciate the fact that this would be a wasteful method if it could be employed. I wish that some of our readers who have had experience in thawing pipe lines by means of electricity, and who understand the use of the different electrical currents, would give us their experience and advice.

THOMAS BRENNAN.

Herminie, Penn.

[The water resistance suggested by our correspondent is a very convenient form of rheostat and can be employed to step down the voltage the desired amount. What pressure will be required to give the current necessary to heat the pipe will depend on the resistance, which can only be determined by trial or test. The heating effect is determined by (I^2R) the square of the current times the resistance. If the resistance of this pipe is such as to allow a current of only 300 amp. to pass under a pressure of 50 volts, the remaining 100 volts will be lost in the rheostat and wasted.—EDITOR.]

The Proper Size of Pipe

Replying to the question of T. E. Richards, in COAL AGE, Vol. 1, page 685, regarding the proper location for a pump and the best size of pipe to use, I note that he leaves out two important factors: The capacity of his pump and the amount of water to be discharged in a given time. These would determine definitely the advantages to be gained by making a change. Since he says nothing about pumping against a head, I am assuming that the suction and discharge are practically level.

As is well known, the practical lift of the ordinary pump will not exceed 24 ft. Referring, then, to a table giving the loss of head in pipes for each 100 ft. in length, we find that a flow of 3½ cu.ft. per min. through a 2-in. pipe will cause a loss of head, due to friction, of practically 2 ft. per 100 ft. of pipe. The suction in this case is 1200 ft. in length, so that the loss of head due to friction would be 24 ft., or the maximum limit of suction.

Assuming that this pump is large enough to handle twice this amount of water in the same time, a change to 3-in. pipe on the suction would reduce the loss of head due to friction in the pipe to 1 ft. per 100 ft. of pipe. Under these conditions the loss of head in the suction pipe, due to friction, would be equal to

12 ft. when handling a flow of 7 cu.ft. per min. This allows him to pump the same amount of water in 12 hr. that now takes 24, and the work required at the suction end of the pump would be only half as great.

For the discharge end we find by reference to the tables, that by doubling the rate of flow as stated, there is a loss of head, due to friction, of a trifle over 7 ft. per 100 ft. when using 2-in. pipe. This amounts to a total of 140 ft., which is about the limit of the ordinary low-pressure pump. I would recommend for use in this case a 2½-in. pipe which would give a friction head of about 46 ft. It is generally a good rule in all pump installations to make the suction at least 50 per cent. larger than the discharge.

W. D. GRIFFITH,
Civil and Mining Engineer.
Pikeville, Ky.

Mine Pump Problem

In reply to Mr. Richard's mine-pump problem contained in your issue of Mar. 2, I would recommend him to lay the 3-in. line, which he has on hand, and to move the pump, providing there is lodgment enough for water. I would also have a 4-in. suction and a 3-in. discharge. I think 12 hours or less would suffice to remove the water if the pumps were located nearer the sump. It makes it easier for the pump to continue primed, and also easier to start the water after it has been stopped. By this arrangement you can pump 2⅛ times as much water as before, with a consequent reduction of attendance and of power used; moreover a saving of wear and tear in the line will be effected.

Marion, Ill. DAVID FULTON.

[Mr. Fulton's suggestions are good, but he overlooks the fact that Mr. Richards gave no data relative to the suction and force lifts of the water. These lifts may be such, as will account for the slowness with which the water is pumped out and the friction losses may not be the important difficulty.

Taking the view that the lift is *nil*, a 3-in. pipe will carry under the same pressure about 2.75 times as much water as a 2-in. pipe, the comparative carrying capacities being given roughly by the ratio $\left(\frac{3}{2}\right)^{\frac{5}{2}}$, so Mr. Fulton's claim for the new arrangement, with a 4-in. suction to reduce intake losses, is quite conservative, assuming that the pipe friction is the only resistance to be met.—EDITOR.]

Best Method of Timbering A Mine Parting

I would like to see in COAL AGE the expression of the opinions of readers as to the best method of timbering a lie or mine parting, under the following conditions: The mine roof is tender and the two tracks are so close together as to make it impossible to set a post between the main track and the side track.

This question is suggested for discussion by readers and I hope it will receive a generous response.

NOAH BURTON.
Anglin, Ky.

Summary of the Mine Fire Letters

By John T. Fuller*

A tabulated recapitulation of the recent mine-fire discussion. The opinions advanced were surprisingly contradictory, but Mr. Fuller believes that the evidence shows the return should be closed off first.

*Consulting engineer, Honesdale, Penn.

Reviewing the discussion recently carried on in the columns of COAL AGE, one is tempted to ask, what answer is to be given to the original question.

The question was, "Disregarding local conditions, that modify any specific rule, is it not possible to prescribe in general whether a fire at the face of a pair of entries should be sealed off first on the intake or first on the return side of the fire?" It was also left as an inference that gas (firedamp) might be present.

Trying to place myself in the same mental attitude as the original questioner and approach the subject with a free mind open to conviction either way, I carefully reread the whole discussion and made a table in which I have tabulated the result of the vote and a digest of the reasons. A careful analysis of this table reveals the following:

Total letters written	32
Number of contributors to the discussion	32
Number advocating first stopping in intake	16
Number advocating first stopping in return	10
Number advocating both simultaneously	6
Number advocating either stopping first	1
Number who do not state which	2
	*35

Analysing now carefully the reasons given, I find that the chief reasons given by the intake advocates are:

(1) Because it is the coolest, easiest and most direct point of attack.

(2) Because it is then possible to work in pure air.

(3) Because the air supply can be cut off immediately.

(4) Possibility of an explosion is not sufficiently evident to offset the danger, inconvenience and delay incidental to working in a bad atmosphere.

(5) Because in most cases it would be impossible to put the first stopping in the return.

The "return" advocates on the other hand offer the following:

(1) Because by placing the first stopping on the intake there is danger of a gas explosion.

(2) By placing the first stopping on the return such an explosion would be avoided, owing to the fact that the mixture of smoke and gases of combustion would be forced back over the fire, aiding in extinguishing same, and by their expansion due to the heat of the fire, force back the air from the intake, thus preventing the formation of an explosive mixture at the seat of the fire.

Considering, for the sake of argument, that the reasons pro and con above noted are the indirect evidence in the case, let us turn to the "direct evidence" of examples in the actual experience of the writers.

Intake Advocates—Have always closed off mine fires that way; nothing at all alarming has ever happened by so doing, and therefore this is most emphatically the correct thing to do.

Return Advocates—Have tried placing the first stopping in the intake with disastrous results in the way of gas explosions, while on the other hand have had no explosions when first stopping has been placed on return.

While my personal experience with mine fires has been confined to but three, none of which were of the nature of the fire in question, nevertheless, having in mind several explosions which to my knowledge had occurred in the anthracite coal region of Pennsylvania due to closing the intake first, I was one of those who recommended closing the return first, if possible.

Any fair-minded man will, I think, if he reads over and carefully analyzes this discussion along the lines I have indicated, come to the conclusion that, in spite of the majority of the intake advocates, the preponderance of evidence, backed by the proof of actual experience, is in favor of the "return advocates."

Therefore, considering myself as the original questioner, I would take my question to be answered as follows:

There is no general rule possible, but if gas is present or liable to be present, make every possible effort to place the first stopping on the return.

*The fact that some writers recommend two courses, such as "intake first or both simultaneously," acounts for the apparent discrepancy in this total with the number of letters received.

CONDENSED SUMMARY OF THE RECENT DISCUSSION ON MINE FIRES

Letter No.	Close Intake First	Close Return First	Both Simultaneously	Either	Not Stated	Reasons Given	Remarks
1	1		1			Closing the intake first is recommended, as otherwise the smoke is forced into the intake and fills it so completely that it is impossible to get so close to the fire on that side	Proper bratticing and short-circuiting of the air, with or without helmets, should remove this difficulty
2	1					Because the coolest and easiest place to work and in most cases it would be quite impossible to put in the return stopping first	Proper bratticing and short-circuiting of the air, with or without helmets, should remove this difficulty
3		1				No reasons given	
4	1					Because it would then be possible to work in fresh air	Proper bratticing and short-circuiting of the air, with or without helmets, should remove this difficulty
5		1				Because, by so doing, an explosion would be avoided, owing to the fact that the mixture of smoke and gasses of combustion would be forced back, over the fire and no chance given for an explosive mixture of gas and air to form near it	This conclusion is supported by cases in the actual experience of others
6			1			Because, when the air current is cut off from the fire, completely, there is no unnecessary delay and the danger from any accumulation and consequent explosion of firedamp is reduced to a minimum	Even in this case it is possible under certain conditions for sufficient air to be sealed in to cause an explosion at least strong enough to blow down the stoppings
7			1			No reason given	
8	1					Impossible to reach the fire in any other way	Proper bratticing and short-circuiting of the air, with or without helmets, should remove this difficulty
9	1					Because it cuts off the supply of oxygen promptly	So does placing the stopping in the return
10		1				Because it is safer and more effective in shutting off any fire to close the draft first and the air supply afterwards	
11				1		No reason given	
12		1	1			Because it prevents the smoke and fumes from traveling to other places in the mine	True, but the ventilating current is just as effectively stopped by placing the first stopping in the intake
13	1					No reason given	
14	1		1			No reason given	
15	1					No reason given	
16	1	1				If gas is not present the intake should be closed first in order to reduce the products of combustion in return, thus giving a better opportunity for building the second stopping. If gas is present or liable to be present would build first in return to minimize the danger of accumulations of gas with resulting explosions at seat of fire	Also recommends reversing the fan under certain conditions NOTE: As in this discussion it is assumed that gas is present or liable to be present this letter is assumed to be in favor of sealing the return
17		1				To avoid gas accumulation with consequent explosion and to force products of combustion back over fire to aid in extinguishing it	
18	1					In order to cut the air off immediately	Letter states that writer would try to prevent an explosive mixture forming, but fails to state how. Writer states that he has always sealed off fires this way
19		1				To confine products of combustion to fire area and so aid in extinguishing same. These confined gases of combustion expand by heat and push back fresh air that would enter at intake. If intake is closed first there is danger of explosive mixture forming	All these reasons have been supported and their truth sustained by actual experience
20	1					Working on fresh air. Is very emphatic that this is the best and only method	Writer strongly condemns reversing fan
21	1					Working on fresh air	
22	1					To work on fresh air. Does not consider the possible danger of an explosion to be sufficient to offset the danger and inconvenience of working in a bad atmosphere	Written by a man of long coal mining experience. Cites examples in his experience when such explosion occurred.
23 & 27	1					Very emphatic that this is the correct and only way. Strongest reason is the working in fresh air	Has always done it this way
24	1					To work on fresh air	
25		1				Because, in addition to stopping the flow of fresh air, past the fire it confines the products of combustion to the area of the fire which aids in extinguishing same and renders gas that may be present inexplosive. Avoids the ever-present danger of explosion when intake is closed first	
26					1		
28		1				To isolate the fire from the accumulated volume of gases in the return	This is rather ambiguous, as one of the reasons for placing the first stopping in the return is to confine the accumulated gases and products of combustion to the fire area
29	1					Reasons not definitely stated	Several good suggestions made
30	1					To work on pure air	States that fire is beyond control. Strictly speaking, is a mine fire beyond control until the mine must be either abandoned or flooded?
31					1		
32		1				Because of the danger of explosion of gas. A man of experience will hesitate long before placing first stopping in the intake	Written by a man of long coal mining experience. Cites examples in his experience when such explosion occurred
	16	10	6	1	2		

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions Asked at Fireboss Examination, Held at Cumberland, Wyo., Jan. 29-31, 1912

(*Continued from March* 16)

Ques.—What precautions are necessary in order to maintain a good current of air throughout the entire workings of a mine?

Ans.—To maintain a good air current in any mine it is necessary to build substantial, air-tight stoppings and to make all doors, brattices, air bridges, etc., airtight. The mine should be divided into separate ventilating districts and the air proportioned to the requirements in each district. It is necessary to so conduct the air as to cause the current to sweep the face, in each heading or working place. Wherever necessary to accomplish this, a temporary brattice should be constructed. Double doors should be used at all important points on main roads; so as to avoid the short-circuiting of the air at such points when cars or men are passing. All mine doors should be so hung as to close with the air and should be given a proper fall in order that the door may close with the current and not stand open. Trappers should attend all doors through which much coal is hauled on main roads. Finally, a reliable form of ventilator should be installed and kept running constantly, night and day.

Ques.—What is the least mixture of marsh gas and air (firedamp) that can be detected, and what is the greatest explosive mixture? What is the lower and what the higher explosive limit?

Ans.—The least percentage of marsh gas in air that can be detected will depend upon the means employed. Using the ordinary Davy lamp, burning common sperm oil, some observers can detect as low as 2 per cent. of gas, but ordinarily not less than 3 per cent. can be detected with this lamp. Lamps burning a volatile oil will often detect as low as 1 per cent. of gas, but owing to the heating of the lamp when burning a volatile oil, the indications are not uniformly correct. By the use of an indicator in a Davy lamp as low as one-half of one per cent. of gas is accurately shown.

The mixture of marsh gas and air reaches its maximum explosive point when the proportion of gas to air is 1 : 9.57; that is to say, the volume of air is about 9½ times the volume of gas. The lower explosive limit is reached when the proportion of gas to air is 1 : 13, or the volume of air is 13 times the volume of the gas. The higher explosive limit is reached when the proportion of gas to air is 1 : 5, or the volume of air is 5 times the volume of the gas.

Ques.—Why do you sometimes find a cap on the flame of a safety lamp when testing for gas, and again the gas will explode in the lamp without a cap having been observed?

Ans.—As explained in a previous answer, the presence of marsh gas in the mine air produces a plainly visible cap; but when olefiant gas is present associated with the marsh gas, the gas will often explode in the lamp before a flame cap has been observed.

Ques.—What are the dangers attending the use of the safety lamp?

Ans.—The chief dangers arise from the improper use of the safety lamp, due either to the ignorance or carelessness of the user. Such are exposure to a strong air current; exposure to gas for too long a period; making a quick or excited movement when the lamp flames; swinging the lamp or allowing it to fall; carrying too high a flame; neglecting to properly clean the lamp and put the parts together, or to properly inspect the gauze to detect any defect, or to properly test the lamp to ascertain its condition. A safety lamp is never safe when improperly handled, or in the hands of an incompetent person, or when the same is defective or improperly cleaned and put together.

Ques.—Explain just how you would carry your lamp when going to examine a known dangerous place containing gas.

Ans.—Hold the lamp erect and do not swing; screen the lamp from any strong air current, or concussion of air, or blast that may force the flame through the gauze. Approach the place cautiously and do not walk carelessly into the gas without making sufficient tests for the same. Raise the lamp carefully and slowly toward the roof, observing the flame for the first appearance of a cap when so doing. When a flame cap is first observed, lower the lamp promptly but slowly, and withdraw quietly from the place.

Ques.—Could a safe shot that did its work immediately succeeding a windy shot, produce a disastrous explosion; if so, why?

Ans.—The flame of the second shot, in this case, would be projected into an atmosphere of combustible gases produced by the first shot and the ignition of these gases would cause a local explosion, which would be intensified by the dust thrown into the air by the force of the blast. The extent of such an explosion would depend on the quantity of dust thrown into the air, its combustibility and the size of the openings. Under favorable conditions a very disastrous explosion would result.

Ques.—In a mine where mining machines are used to undercut the coal, which is blasted down with powder or other explosives, what precautions would you take and what is liable to occur even though no gas is known to exist?

Ans.—Owing to the large amount of fine cuttings and dust produced by the machines there is liable to occur a small local dust explosion at the working face if these cuttings are allowed to accumulate. A good circulation of air must be maintained at the working face and strict regulations must be made and enforced to prevent the occurrence of windy or blownout shots. A thorough system of inspection, charging and firing all shots should be adopted. Shotfirers should be appointed and authorized to refuse to fire any and all shots that may in their opinion be unsafe. Special attention must be given to see that every working place is thoroughly ventilated by an air current traveling at a moderate velocity.

Ques.—In an old mine generating explosive gases, what dangers arise that are not found in new mines generating such gases, and how would you overcome such dangers?

Ans.—An old mine contains many abandoned places, cavities in the roof due to falls, and other void places where gas can collect. Accumulation of gas in these void places renders the mine more dangerous, since the gas may be ignited by the lamp of a miner, or a roof fall may throw much gas out onto the entries. The same result will often occur from a fall of barometer, owing to the expansion of the gases that accumulate in the abandoned places. To overcome these dangers, in an old mine, the abandoned places should be thoroughly ventilated or closed tight and sealed. The air current in such mines should be made to sweep all void places and cavities where gas may collect. A more thorough inspection of the mine is necessary and a larger volume of air required to be kept in circulation.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Problems of the Y. M. C. A. Mining Institute

By Charles L. Fay*

During the past year the Y. M. C. A. Mining Institute movement has more than doubled its membership in the anthracite coal fields of Pennsylvania. Seven district institutes now have a paid membership of over 5000 men.

A few branches in the bituminous region of Pennsylvania are doing good work. Institutes are conducted at Cabin Creek, W. Va., and the State Y. M. C. A., of Kentucky, is introducing special work for miners at Rim and Jenkins.

Teaching the Foreign Element

The institutes have thus far confined their work mainly to monthly meetings for the reading and discussion of papers on mining subjects. A few, however, have conducted successful mining schools and also schools in which to give the foreign miners a working knowledge of English, using studies in elementary mining for the instruction papers. In this connection it is interesting to note the development of instruction papers for use in the foreigners' schools.

M. S. Smith, a former secretary of the State Y. M. C. A. Bituminous Committee, Pennsylvania, first introduced the plan of teaching the foreigners by charts. Mr. Smith prepared the charts himself, using "store" paper and a marking crayon. Sentences were arranged that had to do with the miners' everyday work and experiences.

This crude plan was soon superseded by the "Roberts Method" (Peter Roberts, Ph.D., International Y. M. C. A. Committee, New York City), consisting of printed charts and lesson leaflets. Later, Col. R. A. Phillips, general manager of the Delaware, Lackawanna & Western R.R. coal department, conceived the idea of teaching foreign miners by the use of pictures, and recently the Delaware, Lackawanna & Western R.R. Co., on suggestion and by the initiative of Col. Phillips, at large expense and with great care, prepared a book entitled, "Mine Accidents and Their Prevention," which is so complete and comprehensive that it must be seen to be fully appreciated.

Plans of the Institute

Some of the methods and problems worthy of consideration may be indicated as follows:

A—Discussion of practical mining questions by members, at the monthly meetings, rather than the presentation of technical papers by experts. This is not to the complete exclusion of occasional technical papers or addresses.

B—More emphasis on the social and musical features of programs.

C—Every institute to operate a well conducted mining school.

D—Schools and occasional lectures (illustrated) at all mining towns.

E—The development of plans to meet the moral, educational and social needs of the thousands of boys in the mining communities. (One institute is now planning for experimental work in the way of special institute meetings for foreign boys.)

F—A study of the liquor evil and the promotion of campaigns of education and for legislation to minimize and overcome this greatest foe of the miner and the miner's home. (In one coal-producing county, estimates based on conservative data show that about $8,257,000 was spent during one year for liquor, or $24 to every man, woman and child in the county.)

G—The promotion of Thrift clubs for the study of domestic economy and the betterment of living conditions.

H—The Y. M. C. A. Mining Institute movement should be extended to every mining district in the United States.

The movement is no longer an experiment. It has proved its timeliness and its value to miners, operators and society. A meeting of representative mining men, from all parts of the country, to devise ways and means for a wide and aggressive campaign of development and extension, would result in great good. It seems to be the next logical step.

*Mining secretary, State Y. M. C. A. of Pennsylvania.

Electrical Burns

C. A. Lauffer, in the *Electrical Journal*, makes the following observations on flash burns from electric currents:

"Flash burns of the skin are usually burns of the second degree. That is to say, while destroying the outer layer of skin (the epithelium) they do not injure the inner layer (the corium) nor the deeper tissues. At first these burns may present a mere congestion; the skin is red, as from exposure to the sun, and they have the appearance of merely a first-degree burn, and scarcely appear to need dressing and bandaging. But there is pain and some redness. By the second day huge blebs or blisters may have formed. Usually the hair is scorched; often the outer skin is blown off, and the surface looks ragged. Under proper treatment of these cases there is seldom any formation of pus, and they will heal up, usually without leaving a scar. I have treated many such burns with the happiest results. I have ministered to men whose features were so altered by burns and whose eyes were so badly swollen, that their own mothers would not have known them. To the uninitiated it seemed they were scarred for life, yet within two weeks they were able to resume work, and within two months no trace of their burns was discernible.

Treatment of Flash Burns of the Skin

"In treating flash burns the first requisite is to obtain the highest degree of surgical cleanliness by use of ethereal soap applied with numerous cotton sponges (using sterilized absorbent cotton, such as is sold for medical uses) and the application of sterile gauze dressing, well covered with unguentine. I find this ointment uniformly reliable; it soothes the pain and promotes recovery. A loose gauze bandage is applied and the part permitted to rest.

"The subsequent treatment consists of daily redressings. When the blebs are large, we scissor them open freely, but allow the outer skin to remain for some days, as it is in itself a splendid protective covering.

"Such burns must be washed clean. With this precaution there is little liability to infection with its accompanying pain, the formation of pus, and a resulting long term of disability. But should they become infected with formation of pus, I would at once trim away the skin débris, so as to allow no pockets for the retention of infection. When the burn is not infected; that is, when the pus-producing bacteria do not invade the wound, the dead skin is removed within a few days, as soon, in fact, as the inner sensitive layer of the skin has had a chance to harden somewhat, and to lose its excessive sensitiveness. When the healing has progressed I sometimes apply 10 per cent. ichthyol in petrolatum, to facilitate the formation of normal skin. After recovery, in most cases, the skin remains red and sensitive for some weeks. I instruct the patient to wear canvas gloves and otherwise protect the new skin from grime and weather, as it is prone to eczema.

"The dry, open method of treating such burns, namely, that of freely dusting on the wounds powdered stereate of zinc and exposing the injury unbandaged to the air, is more or less successful in hospital practice, but not adapted to patients who are moving around, especially those who may live in the streets and in dirty houses, and who may return to work before complete recovery."

Apparatus for Artificial Respiration

There are three forms by which artificial respiration can be administered;—Sylvester's, Shaffer's and Marshall Hall's. The first two are those most in use. The Sylvester method is used by the most prominent instructors in this country, because they believe it the most efficacious. However, there are many people who hold firmly to the Shaffer method, mainly because in that system of procedure the tongue does not have to be controlled. The patient lies prone and his tongue naturally remains in the correct position.

The Sylvester Method

The Sylvester method primarily consists in rhythmically moving the arms to an extended position above the head and then pushing them back into a doubled position over the lower vest pockets, wiping them forcibly down the flanks so as to produce extended compression and a binding tension across the stomach. The pull on the arms enlarges the chest, the air enters and fills the lungs. When the arms are lowered and pressure applied the chest is thereby deflated and the air leaves. This treatment has received other developments. It has been recognized that deflation is not satisfactorily attained by a mere movement of the arms. In proper treatment, the elbows of the patient are thrust with some violence into his sides, and in order to make the deflation complete, it is generally recognized that it is well to have a second man ready to put pressure on the lower part of the chest at the same time as the lungs are being deflated by the side compression of the arms. But the use of two men is not without advantage, because the deflator as we may call him, seeing that he does nothing else but deflate, may be over-zealous and compress the lungs when the inflator is trying to inflate them.

A Mechanism Following Sylvester Methods

There is a great deal to be gained by synchronous work, and this is secured by the Fries apparatus, which is being sold under the name of the "Synchron" appliance. It has just been introduced into America, and we believe so far has not been recognized by those who have knowledge of artificial respiration, but from outward appearances it would seem to meet with all requirements. There is little that is more tiring than taking part in resuscitation work. There is but little encouragement for those who are engaged in performing it. Few indeed can be induced to remain at the work for perhaps five long weary hours, when all evidence seems to favor the notion that the patient is dead beyond all recovery. The Sylvester operator must kneel at the patient's head, must lower his own body forward three or four feet, must press the elbows firmly, and then draw back beyond the perpendicular. This is no easy task, especially when many times repeated, and the men who have been working at it without response for an hour or two soon convince themselves that the man is dead beyond recall. With this new machine the patient is fixed to the apparatus, and thus one man can do the work with less labor than two would otherwise expend. The band over the chest operates automatically. It goes completely over the stomach, so that a large deflation is assured, and this occurs at the instant desired, hence the word "Synchron" is well earned.

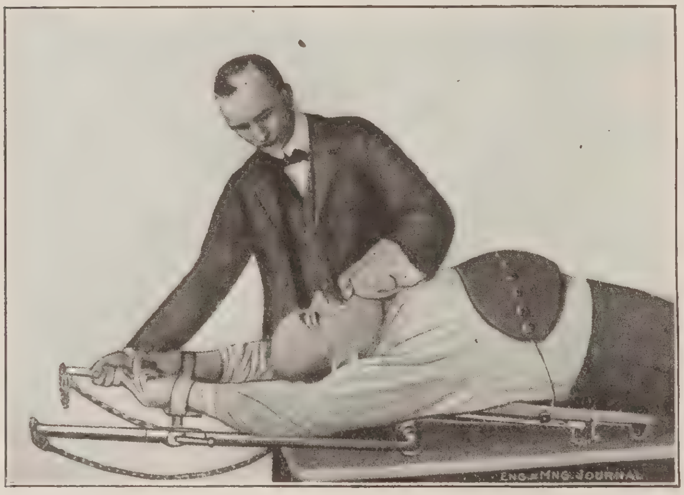
The Air Passages

The patentees recommend the extension of the tongue by hand and show that this can be done by the man who works the appliance, but it would be better to hold the tongue in place by bandaging, as is the general practice in the United States.

The shape of the apparatus is such that the patient's head is naturally thrown back in an abnormal position. like that of one whose neck is resting on a rolled up coat. This position is that recommended by physicians because it makes a direct passage for the air from the nose and mouth to the lungs.

Dr. Fries, a Swedish physician is the inventor. Prof. J. E. Johannson has made several severe practical tests of the contrivance in the Physiological Department of the Karolinska Institute at Stockholm. Also at the Serafimerlasarett, the Royal Hospital of Stockholm, it has been well tested and is now installed for general practice. The appliance has also been adopted by the Life Saving Society and approved by the directors of the Association of Swedish Physicians. At the royal hospital at Stockholm this apparatus proved successful in several cases of asphyxia after manual treatment had been abandoned as hopeless. A. E. Sylven of 29 Broadway, New York City, is the representative in the United States for the sale of this apparatus.

It must be remembered that while the first duty is not to get the apparatus but to attend to the patient, another can be sent for it. As artificial respiration must usually be conducted for a long time, there will be plenty of opportunity for the apparatus to arrive and do good work, at least in all cases where the resuscitation of the patient is difficult.



The Synchron Respiration Apparatus in Operation

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Representative Lee of Pennsylvania has offered a bill to provide for compulsory arbitration in coal-mining controversies. The bill has been referred to the Committee on Interstate Commerce, discussed, and referred to a subcommittee. It provides that in case a controversy arises between a carrier and its employees or between the owner of a coal mine and the employees of such owner or owners, "seriously interrupting or threatening to interrupt the business of said carrier, owner or owners, the chairman of the Interstate Commerce Commission and the Commissioner of Labor shall, upon the request of either party to the controversy, with all practicable expedition, put themselves in communication with the parties to such controversy and shall use their best efforts, by mediation and conciliation, to amicably settle the same; and if such efforts shall be unsuccessful, shall at once endeavor to bring about an arbitration of said controversy in accordance with the provisions of this Act."

The bill goes on to provide for the submission of the controversy to the arbitration of a board of three persons in case it cannot be settled by the mediation and conciliation referred to above.

Representative Lee comes from the heart of the anthracite region in Pennsylvania. As a Democrat he has interested Speaker Clark, Representative Oscar W. Underwood, the majority leader, and Representative William B. Wilson, of Pennsylvania, chairman of the labor committee, in his plan, and he thinks he has their support. He hopes to have the bill made a party measure.

Mr. Lee says: "I am perfectly willing that my bill should be amended in any way that will enable it to get through Congress more quickly, so long as it is effective. The time to pass such a measure is now, and not after a strike has come upon us."

Decision in the Pittsburg-Lake Erie Rate Case

The Interstate Commerce Commission has just handed down its decision in the long drawn-out controversy between John W. Boileau and the Pittsburg & Lake Erie R.R. Co. *et al.*, with the result that the rate of 88c. per ton "for the transportation of bituminous coal in carloads from the Pittsburg, Penn., district to Ashtabula Harbor, Ohio, when for trans-shipment by vessel on the great lakes to points beyond" is found to be unreasonable and the rate of 78c. is prescribed for the future.

After a lengthy review of the situation, the commission offers the following interesting remarks on the conditions affected by the rate under complaint:

Viewed in the light of all the evidence and our own inquiries, the 88c. rate looks high. Complainants assert that there exists no power anywhere to let a shipper into a market by advancing the rate to another shipper. If the rate which the other shipper is paying is unduly low, we doubt whether this contention is tenable, and to this extent the general principle appealed to does not appear to us to be sound. But even though counsel have stated their contention somewhat too broadly, as applied to the situation in the Pittsburg district, it appears to point to the truth in this case. We think it only a fair inference from this record that the Pittsburg rate was raised step by step, not to bring it up to a level which the carriers might have regarded and defended as reasonable, but in order to let certain competing coal fields into the lake trade. And the record is conclusive that it is not a competitive rate.

Defendants argue that the lack of prosperity among the Pittsburg operators is due to excessive competition among the operators in the different districts. Granting that this be so, does that justify the imposition of an excessive rate upon the traffic from one of the competing fields? The Pittsburg field is entitled to a reasonable rate whether it brings the expected relief or not and irrespective of the specific channels into which the amount of the reduction in the rate will flow.

Rate Not Determined by Cost Alone

From the point of view of the specific cost of doing this particular business this rate is still too high; but, as we have said before, cost is only one of the elements entering into a rate. When we consider the coal rates from all the fields which will be affected by this change in the Pittsburg rate, the disturbance in established differentials, the possible deflection of the currents of coal trade and its effect upon operators elsewhere, the effect upon the carriers directly involved and the indirect effect upon other carriers, and all the other valid considerations, we are forced to the conclusion that a rate lower than this would not be just and reasonable under the conditions disclosed by this record.

In view of all the matters herein set forth it is our opinion, and we therefore find, that the present rate of 88c. is unjust and unreasonable, and that the defendants shall maintain for a period of two years from the date hereof a rate not to exceed 78c. from the mines in the Pittsburg district to Ashtabula Harbor, Ohio.

Alabama

Birmingham—The Maryland Coal Co., which is preparing to develop coal lands along the Frisco line in Winston County, is pushing preliminary work and expects to have an output from the Black Creek seam with 30 days. This new concern is headed by Henry F. De Bardeleben.

Sheffield—It was recently announced that a plan for reorganizing the Sheffield Coal & Iron Co. will shortly be submitted to the bond and stockholders. This concern is a New York corporation, organized in 1909 with a capital of $3,250,000, owning mines and collieries at this point and at Wise, Va.

Colorado

Boulder—Although the agreement effected recently between the American Fuel Co. and the members of district No. 15, United Mine Workers of America, has given employment to about 750 men who have been on strike for almost two years, the industrial war in the northern coal fields is still a long way from settlement. The Rocky Mountain Fuel Co., the National Fuel, the Frederick, the Brooks-Harrison and the Consolidated Coal and Coke companies have all joined in a notice to their nonunion employees in which they give assurance that they will not enter into any agreement with the union and will not under any circumstances discharge the nonunion miners without warning. The mines which have signed an agreement, represent 9.46 per cent. of the total production, and those which are still employing nonunion men, represent 91.54 per cent.

Illinois

Edwardsville—Twenty-five deeds of trust were filed here recently by residents of Leef Township, transferring coal rights on their property to Thomas Williamson, trustee. The deal involves about 2500 acres at $20 an acre, or a total of $50,000. The land is just east of Livingston and Williamson and the center of the tract is at the intersection of the Illinois Central and Big Four railroads. Mr. Williamson states that he represents Eastern capital, and that a mine will probably be opened on the property.

Hillsboro—The coal properties, recently purchased by the Chicago and Eastern Illinois R.R., include the two mines at Witt, and the Kortkamp mine at Hills-

boro; the Montgomery County mine, at Taylor Springs, and the Peabody mine at Nakomis. The Taylor Springs mine and the No. 2 mine at Witt, have an average capacity of 2500 tons a day, while the No. 24 mine at Witt and the Kortkamp mine have an average of 1750 tons daily, and the Peabody mine, at Nakomis, produces an average of 1000 tons a day. This gives a total production of about 10,000 tons a day for the five mines. The purchase, it is thought, will have a tendency to make work even better than heretofore, and will also tend to create a business boom in the towns where the mines are located. No change will be made in the operation of the mines at the present time.

Tilden—Two miners were perhaps fatally injured, and three others severely hurt, the latter part of last week, when the hoisting cage at the Tilden mine dropped 100 ft. to the bottom of the shaft. The accident was due to the engineer losing control of his engine.

Chicago—The Interstate Commerce Commission has recently made an examination into the alleged disciminatory rates formerly in force on coal handled from the Saline County field by the Big Four railroad. A differential, favoring the field to the extent of 3c. a ton, has been removed and the full rate demanded. In consequence, the O'Gara Coal Co. and five other operators in this field have brought complaint against the railroad. The O'Gara company does about 90 per cent. of the business in the territory, and its loss in consequence of the altered rate is said to amount to $240,000 a year. The other operators who are fighting the Big Four are the Big Creek Colliery Co., the Saline County Coal Co., the Wasson Coal Co., the Harrisburg Southern Coal Co., and the El Dorado Coal Company.

Indiana

Linton—The Vandalia mine No. 4 was flooded recently and had to be abandoned. The inflow of water came from old workings, nearby, and the men had not even enough warning to allow them to remove their tools. The loss is estimated at more than $10,000.

Indianapolis—A famine of anthracite coal is being experienced in many towns and cities throughout Indiana. This condition has prevailed for more than a week, although it is reported that thousands of cars are standing on sidings and in yards of the various railroads.

The pay of miners in the Indiana coal field for the half month ending Mar. 11, broke all previous records. Every mine in all the principal districts worked full time during the two weeks.

Terre Haute—The annual convention of District No. 11, United Mine Workers, which comprises all the Indiana field, except Clay County, was held here, Mar. 12 and 13, with 150 delegates in attendance. The scale committee made a report in favor of the demands made at the interstate joint conference at Indianapolis, but did not go into the details of the state contract, since the joint conference will reconvene at Cleveland, Mar. 20.

Kansas

Pittsburg—Another shotfirer was killed recently at Radley; this time in the Hamilton No 7 mine. One week previous, two shotfirers were killed in a mine near Radley, and a week before that another two shotfirers were killed in a Radley mine.

Kentucky

Frankfort—Articles of incorporation of the Long Fork R.R. have been filed with the railroad commission. The new road will be 20 miles long and will extend from a point in Floyd County, through a part of Pike County to the Knott County line. It will open up valuable coal and timber lands in Floyd and Pike Counties and develop mines that have not been operated heretofore on account of lack of transportation. The project is backed by West Virginia capitalists, who own land along the route of the railroad.

Louisville—Sweeping charges of rate discrimination, embracing an allegation that the Stearns Coal & Lumber Co. owns and operates the Kentucky & Tennessee Ry. Co. or *vice versa*, and that rebates are paid the coal and lumber company named, are made in a complaint against the Kentucky & Tennessee Ry., the Cincinnati, New Orleans & Texas Pacific Ry., and the Southern Ry. Co., filed before the Interstate Commerce Commission recently by the Tennessee Coal Co. The charges involve an alleged discrimination of 10c. per ton in rates from Freeman to Chattanooga and Atlanta as compared with the rates in force from Jellico to the same points.

Maryland

Cumberland—Preparations are being made to resume operations at the Potomac mine, at Barton, after an idleness covering nearly five years. This mine was once the backbone of the little-vein region about Barton, and when at its best employed about 200 men. The suspension at the mine was a great blow to Barton and Pekin as the miners had to seek work elsewhere.

Ohio

Cleveland—The amount of coal afloat at Ohio ports is not any larger than it has been in former years. The leading shippers say that there will be less than 500,000 tons in store in vessels at this end of the route on Apr. 1. Owing to the heavy local demand there is little lake coal coming forward and the chances are that some of the boats that have been lined up to load before the contracts with the miners expire will not be able to get cargoes. There is more coal afloat at Cleveland than at any other port. Vessels are holding about 150,000 tons of coal here, and most of it is consigned to the Canadian head of the lakes.

Coshocton—The entry which is being made into the side of the mine of the Columbus Coal & Mining Co., near Coshocton, is about completed and the mine will soon be placed in operation again. This entry was driven for the purpose of draining the mine which has been flooded for some time.

Columbus—Secretary Nigh, of the Michigan-Ohio-Indiana Coal Association, has brought suit on behalf of that organization against the Hocking Valley R.R. Co., to test the question of responsibility of railroad companies for short-weight cars. The railroad contends that it is not liable to any claims of this character involving shipments made while the old under-billing rule was effective. This practice consisted in billing the coal cargoes at 500 lb. less than actual weight in order to cover all shortages. The matter will be tested thoroughly in the courts.

Oklahoma

Poteau—The property of the Sutter Coal & Mining Co. was sold here recently by the sheriff. E. F. Swinney, of Kansas City, purchased both the mine and the railway owned by the mining company. The mine sold for $25,000 and the railroad for $35,000. The railroad is nine miles long and connects with the Kansas City Southern at Shady Point. The mine will be put into operation at once.

Pennsylvania

Bituminous

Washington—An action involving more than $100,000 worth of coal land in Chartiers Township was begun recently by James G. Morris, of Washington, who obtained a cautionary injunction against the Meadowlands Coal Co. to restrain it from further mining of coal under the Morris farm. The tract comprises 122,235 acres. Morris alleges that the coal company has been taking out coal at the rate of one acre a week and has failed to make the payments called for by the agreement, excepting an original $1000.

McDonald—After being on strike since Mar. 1, about 500 miners employed at the Jumbo mine of the Pittsburg Coal Co. have returned to work. The men went out because of orders received from

the company compelling the machine men to use safety lamps. The agreement is to last until Apr. 1, and, by that time, the district convention will be over and a more definite settlement between the men and the company will likely be made.

Clearfield—The jury in the car discrimination case of the Beulah Coal Co. against the Pennsylvania Railroad Co. recently brought in a verdict for the plaintiff for $338,728.20, which is threefold the amount of damage it was found that the company had suffered by reason of the alleged discrimination. This makes the fourth case of this kind decided against the Pennsylvania Railroad in Clearfield. The awards in the other three cases were as follows: Sonman Coal Co., $145,830; Puritan Coal Mining Co., $72,000, and Walnut Coal Co., $74,000. All the cases will be appealed.

Du Bois—A fire on Mar. 13, did about $15,000 worth of damage to the plant of the Cascade Coal & Coke Co. at Sykesville. The fire originated in a large coal storage bin in the tipple and was confined to this locality.

With all the mines in this section working full time in anticipation of a possible shutdown, Apr. 1, the railroads are kept quite busy and every available man is being used. The Avoine mine at Fuller has been reopened. The mines at Tyler are running full time. The Buffalo & Susquehanna, the Buffalo, Rochester & Pittsburg and the Erie are all getting out as nearly their maximum output as the labor supply will permit.

Connellsville—The coke market in the Connellsville region has taken another leap. A prominent producer said recently that 2000 more men are needed in this district in order to fill orders already booked.

Uniontown—The H. C. Frick Coke Co. has recently ordered into service 462 additional ovens. These ovens are being fired this week and will give the Frick company a total of approximately 18,000 ovens in blast or about 84 per cent. The Frick company has also given orders to have the Filbert coal-loading plant put in shape for operation, and it is expected to begin loading coal there at once. The Fretts plant of the South Fayette Coke Co. is being fired this week and the entire 80 ovens will be put in operation as fast as men can be secured. The Banning Coke Co. is firing the 76 ovens at the Wineland plant, which have been idle for almost a year.

Anthracite

Scranton—Anthracite coal sold at tidewater during February for an average of $4.89 a ton, and as a result the increase to the mine workers under the sliding scale is 7 per cent.

First-aid men in the Diamond colliery of the Delaware, Lackawanna & Western Co. successfully demonstrated their methods on three men overcome by afterdamp following an explosion of gas, in which one man was burned to death. For an hour and a half the first-aid crew worked on Sidney Baker, mine foreman, and two other men, inducing respiration by artificial methods.

Pittston—A coal breaker underground is to be the latest novelty in the mining industry in this city. Hogan & White, who recently acquired possession of the Bowkley tract, have commenced operations. The firm plans to erect a set of coal rolls and screens inside the mine, and to prepare the coal there, after which it will be taken from the mine in assorted sizes. The seam which is being tapped is 20 ft. high, which makes this arrangement an easy possibility.

Wilkes-Barre—The new washery of the Hillside Coal & Iron Co., which has been under construction for several months past, is now completed. The structure is considered one of the most uptodate in the valley. It will take coal from the Butler, Lawrence and Thomas shafts.

According to reports of the mine inspector for the seventh anthracite district, the Prospect colliery, of the Lehigh Valley Coal Co., at Wilkes-Barre, prepared 1,157,667 tons of coal during 1911. This is stated to be a world's record for the greatest amount of coal produced by one colliery in a year.

Tamaqua—Because 18 nonunion men failed to join the ranks and wear union buttons; 700 employees of the Nesquehoning colliery of the Lehigh Coal & Navigation Co., near Mauch Chunk, went on strike, Mar. 11, and declared that they would remain away from work until the nonunionists joined the ranks. Subsequently, the movement spread to the Coaldale colliery, throwing idle about 1600 men altogether.

Pottsville—February was the biggest month for coal production that the Philadelphia & Reading Coal & Iron Co. has had in its history. Coal trains were sent from here every half hour during the month. Reports for the past five months show that 4,069,000 tons of coal were shipped.

Utah

Salt Lake City—Fifty-four owners of coal lands in Emery County, Utah, have formed a company known as the Emery Coal & Coke Co. The incorporators have turned their lands over to the company and taken stock in return. It is believed that the organization of this concern is another step toward the consolidation of the coal interests of that section. J. R. Sharp, a brother of William G. Sharp, president of the United States, Smelting, Refining & Mining Co., is a dominant factor in the new organization. The lands of the company are located near the townsites of Emery and Ferron.

West Virginia

Fairmont—The Consolidated Coal Co., which operates 40 mines in this section, employing upward of 6000 men will, in the early spring, put into full operation all plants owned by the company. Some of the plants have not been running full time for the past year and as soon as men can be secured the mines will start full blast. Fifteen hundred men will be brought to this section to operate these plants within the next few weeks.

Bluefield—The owners of 6000 acres of coal land in Dickenson and Russell counties recently appeared before the senate committee on railroads of the Virginia legislature and argued in favor of a bill requiring railroads to connect with parallel lines. The bill was reported favorably. The proprietors of the coal field told the committee that they had bought the land several years ago, expecting to get railway connection with the Carolina, Clinchfield and Ohio. They had offered to build a line from their mines to the railroad tracks, but the railroad would not let them connect. Even after offering to give their line fee simple to the railroad, they said, a connection was refused them.

Fire broke out at the steel tipple of the Pocahontas Consolidated Collieries Co., in the morning of Mar. 10, causing a loss estimated at about $2000.

Sutton—The holdings of the Cosmopolitan Coal & Coke Co., in Braxton County, were recently sold here at sheriff's sale and bid in by W. H. Martin of Uniontown, Penn., for $49,800. The property, consisting of about 10,000 acres of coal land, was mortgaged for several hundred thousand dollars.

Wheeling—The annual convention of the miners of the fifth and sixth subdistricts of Ohio, which include six counties in eastern Ohio and three counties in northern West Virginia, opened here Mar. 14 with 200 delegates in attendance. The sentiment of the meeting was expressed as in favor of a strike Apr. 1, unless the miners' full demands, are granted.

Canada

Calgary, B. C.—A car shortage which is holding back the work at various coal mines and causing them to curtail their outputs, and a general stagnation which necessarily follows the strike of seven months' duration in the Crow's Nest Pass, last summer, have practically killed business in that section of Alberta and British Columbia.

Russia

St. Petersburg—Forty-five miners were killed as the result of an explosion in the Italianka coal mine, Mar. 16.

Personals

Josiah V. Thompson, coal operator, of Uniontown, Penn., is a candidate for delegate from the twenty-third congressional district to the Republican National Convention.

John H. Jones, president of the Pittsburg-Buffalo Co., was chosen to act as spokesman for the operators at the joint conference of operators and miners in Cleveland, Mar. 20.

Timothy W. Sprague, of Boston, has just returned from a trip to Colorado which he made for the purpose of looking into the production and development of several Colorado coal fields.

John A. Roan, formerly manager of mines for the Sunday Creek Coal Co. of Columbus, Ohio, has resigned as manager of the Log Mountain Coal Co. of Bell County, Ky., and returned to Columbus.

John R. Rittman has resigned his position as superintendent of the Lovington mine, near Decatur, Ill., and will be succeeded by Dan Cameron who has been connected with the company for a number of years.

J. C. Kolsom was elected president of the Indiana Bituminous Coal Operators Association at the regular annual meeting, held in Terre Haute, Mar. 13. Hugh Shirkle was chosen vice-president and Philip Penna, secretary.

J. R. Pill of Birmingham, Ala., well known in industrial circles, has been made general manager of the Corona Coal & Iron Co. properties, recently purchased by Edgar L. Adler, with mines at Corona, Coal Valley and Patten, Alabama.

E. J. Wallace, until recently with the Mississippi Valley Fuel Co., St. Louis, Mo., has been appointed Western sales manager of the Dealers Fuel Co., of Nashville, Tenn. Mr. Wallace will make his headquarters in the Wright Building, St. Louis.

Louis Smith of Chicago has been appointed resident manager of the Spring Valley, Ill., mines of the Spring Valley Coal Co., to succeed the late J. H. Luther. Mr. Smith was formerly connected with the Chicago office and is thoroughly conversant with mine matters and with the business of the company.

Obituary

James Jones, founder of the Pittsburgh-Buffalo Co., and one of the most widely known coal operators in the United States, died in the afternoon of Mar. 17, following a stroke of apoplexy. He is reputed to have left an estate valued between $5,000,000 and $6,000,000, which includes interests in subsidiary companies of the Pittsburgh-Buffalo Co., in Pennsylvania, Ohio, Virginia, West Virginia and Kentucky. Mr. Jones was born in Wales and arrived in this country in 1858. His first stopping place was Mount Savage, Md., but it was only a few years before he moved to Pittsburg. He served through the Civil War with conspicuous bravery. In 1878, Mr. Jones leased the Osceola mines from Judge Thomas Mellon, founder of the Mellon National Bank, and formed the Osceola Coal Co. He later formed a partnership with the late W. L. Scott, of Erie, Penn., for a time, and after successfully organizing and operating the Catsburg Coal Co. and the Rostraver Coal Co., Mr. Jones, in 1896, took his five sons into partnership and formed the company known as James Jones & Sons, at that time the largest shippers of coal in the Pittsburg district. At the formation of the Monongahela River Consolidated Coal & Coke Co., in 1899 an offer for the Jones interests was finally accepted and subsequently Mr. Jones and his sons formed the Pittsburgh-Buffalo Co., with Mr. Jones as chairman of the board of directors. After selling a number of his coal properties to the Monongahela River Coal & Coke Co., Mr. Jones purchased a large tract of land in Hazelwood and diverted a portion of his time from his mining interests to building homes for working people, and at his death was one of the largest small home owners in Pittsburg.

Construction News

Latrobe, Penn.—The H. C. Frick Coke Co. is preparing to sink an air shaft at its Marguerite plant. S. J. Harry has been given the contract.

Pottsville, Penn.—The Lehigh Valley Coal Co. has under consideration the installation of an electric plant and haulage system at the Packer collieries near Shenandoah.

Lawrence, Mass.—The contract for a 10,000-ton reinforced-concrete coal pocket at the new print-works department of the Pacific Mills has been awarded to the Aberthaw Construction Co., Boston.

St. Clairsville, Ohio—The Provident Coal Co., of Cleveland, Ohio, will, next month, begin work on opening and equipping a new mine, at Fairpoint, Belmont County, Ohio. About $300,000 will be spent in developing this property.

Colorado Springs, Colo.—H. McGarry, of this city, and John T. Milliken, of St. Louis, have bought the Pike View mine and 1760 acres of coal land north of here. They will spend $35,000 in improvements to increase the daily output of the plant to 1000 tons.

Baltimore, Md.—It is the intention of New York capitalists to build a large power plant, 40 miles west of Chambersburg, Penn., on the 2500-acre property of the Mt. Equity Coal & Coke Co., to furnish electric power for the entire Cumberland Valley from Carlisle, Penn., to Winchester, Va.

Du Bois, Penn.—The Miller Construction Co., of Lock Haven, Penn., has taken the contract for building the four-mile extension of the Buffalo, Rochester & Pittsburg R.R. to run through Jacksonville and tap the company's new coal field in Indiana County. The work is to be done during the coming summer.

Publications Received

REVIEW OF THE COAL TRADE IN 1911. Edited by Hubert Greenwell. 162 pages, 5½x8½ in. 1s. The Colliery Guardian Co., Ltd., London.

A comprehensive review of the British coal trade during the past year.

ANNUAL REPORT OF THE STATE MINE INSPECTORS OF WYOMING, 1911. By George Blacker and W. E. Jones. 36 pp., 6x9 in.

Separate reports are given from the two inspection districts into which the coal mines of Wyoming are divided. No attempt is made to combine the statistics compiled for each section, in order to present totals for the entire state. The reports are for the fiscal year ending Sept. 30.

MECHANICAL STRESSES IN TRANSMISSION LINES. By A. Guell. Bulletin No. 54 of the Engineering Experiment Station, University of Illinois. 36 pages, 6x9 in., illustrated. Free on request.

Of the stresses to which lines of wire for the transmission of electric current are subjected, this bulletin discusses the following three: (1) dead weight; (2) wind pressure; (3) change of temperature. Approximate and exact formulas are derived for use in the calculation of such stresses. A numerical example given shows that for long spans and great sags the parabola method of calculation, commonly used by engineers, is inadequate. Evidence is presented to show the superior advantage of the catenary method, and also to show that this method is sufficiently simple and accurate to serve the purposes of practice.

Trade Catalogs

Scranton Acetylene Lamp Co., Scranton, Penn. Leaflet. The Scranton Acetylene Mine Lamp. Nine pages, 3x6 in., illustrated.

J. R. Robinson, Pittsburg, Penn. Booklet. "The Turbine Fan and the Ventilation of Mines, Power Houses and Buildings." 20 pages, 5x9 in., illustrated. Five pages of useful information and data in connection with mine ventilation are presented in convenient form for mine foremen and engineers.

Myers-Whaley Co., Inc., Knoxville, Tenn. Catalog of Shoveling Machines for underground and surface work. 20 pages, 8x10 in., illustrated. These machines are built to load coal or rock in seams as little as 50 in. in height; electricity, gasoline, compressed air or steam may be employed for motive power.

Industrial Notes

Roberts & Schaeffer, Chicago, Ill., have recently placed an order with the Robb Engineering Co., Ltd., through their Calgary office, for a 16x16-in. Robb-Armstrong automatic engine, direct-connected to a 185-kv.a. alternating-current generator, and an 11x12-in. engine of the same type direct-connected to a 75-kv.a. alternating-current generator. These engines are to be installed at the plant of the Jasper Park Coal Co., Pocahontas, Alta., Canada, and are to be used for lighting and for motor purposes in connection with the operation of the mines.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

While the urgent demand prevailing in the Eastern market has eased off to a certain extent, the general tone throughout the country is unquestionably panicky. The entire situation hinges on the labor outlook, and should it become evident that there will be a deadlock between the miners and operators, coal prices will undoubtedly experience a spectacular rise.

In the East, at Atlantic Coast points, it is believed that such a rush for coal was never experienced before. While the stocks of the wholesalers continue to diminish, the tonnages being handled are so enormous that it seems certain the consumers must be accumulating a substantial surplus. Embargoes have been declared on some of the Eastern roads and buyers are paying premiums on coal already *en route* in order to insure prompt delivery. Retail prices on anthracite have advanced 50c. a ton at a number of points; the uncertainty in the labor situation and the small shipments being received are causing a widespread anxiety in this trade.

The Ohio mines are reported to be working only 25 to 35 per cent. capacity, because of the car shortage. The difficulty in obtaining sufficient of the Ohio product, in the markets supplied by it, is becoming serious. In West Virginia, bids from foreign markets are carrying prices entirely beyond the control of the local consumers; the first shipments to this trade have now been made and others will follow in rapid succession.

Heavy storing by the railroads in the Middle West continues to be the predominating feature in the trade there. The St. Louis market is particularly short, coal destined for there being diverted to Chicago, which is not receiving its customary shipments of the West Virginia product, because of the influx of foreign orders. Auctioneering methods of selling in St. Louis have been the cause of a sensational advance in prices, but it is believed that they have now reached the maximum.

Boston, Mass.

Stocks of Southern coals in this section are rapidly diminishing; every contract, for use locally as well as for bunkers, is being stretched to the limit and receipts are relatively small. Long detention at Hampton Roads and the near expiration of the contract year are also tending to create a large extra demand on coals that can be shipped all-rail from the mines. A number of large plants at inland points, usually dependent on tide coal, have been forced to make heavy purchases of the Pennsylvanias to tide them over. Panic prices have been paid for coal actually *en route,* in order that buyers might have some assurance of the cars coming through. There is a lively scramble for March delivery in fear of a general tie-up Apr. 1.

The Boston retailers advanced domestic sizes, Mar. 13, 50c. as follows: Broken, \$7.50; egg and stove, \$8; chestnut, \$8.25; pea, \$6.25; Franklin, \$9.25; Shamokin, \$8.25. It was also announced that no fill-up orders could be accepted.

The following is some guide to wholesale prices, although they are extremely hard to follow in a market of this kind:

Clearfield, f.o.b. Philadelphia	\$3.75@4.00
Clearfield, for shipment, f.o.b. mines	2.50@2.75
Clearfield, *en route*, f.o.b. mine basis	2.75@3.50
Pocahontas, New River, f.o.b. Hampton Roads	5.00
Pocahontas, New River, Boston, on cars	5.85@6.25
Pocahontas, New River, Providence, on cars	6.00@6.25

New York

The New York market appears to have steadied up to a certain extent in most branches during the past week. Not that prices have fallen off, but the demand is not so positively urgent and fears of a panic are no longer expressed. There is some hesitancy among consumers to stock further because of the ruling high prices, although stocks on hand among the wholesalers are generally conceded to be far below normal for this period. On the other hand, it is believed in most quarters that the large consumers have succeeded in accumulating some surplus fuel to tide them over a possible suspension at the mines.

Spot bituminous of ordinary grades may be quoted at \$4@4.50 with the better grades out of the market. Water freights continue high, about double that quoted under normal conditions, although plenty of charters are obtainable at these figures. There is a decidedly optimistic feeling among the bituminous dealers generally, regardless of whether the strike takes place or not.

In anthracite the supplies among the wholesalers continue low and none of the companies appear to be accumulating any surplus. The shortage is most noticeable in broken and egg.

We quote wholesale anthracite prices, f.o.b. New York, as follows:

Broken	\$5.50@6.00
Egg	5.50@6.00
Stove	6.50
Chestnut	6.50
Pea	5.00@5.25
Buckwheat No. 1	4.00@4.50

Philadelphia, Penn.

The uncertain condition of the labor situation still continues to spur the trade in this vicinity, and as a consequence, the dealers still complain that they cannot begin to get sufficient coal to fill their orders. Many dealers have absolutely refused to accept orders for pea, claiming that it is impossible for them to get it, or if they can, the wholesale price is such, that they do not feel like paying it, or asking their customers in turn to stand the difference. Under ordinary conditions, the retail price of pea in this vicinity is about \$4.75, but \$5.25 and \$5.50 are practically the ruling prices now, and very little of this size in stock at that.

Every size is moving off, and there is no guarantee given that any size will be delivered promptly. The dealers simply cannot get ahead. Some of them have been successful in laying in a little advance stock of the steam sizes, mostly buckwheat, against possible trouble at the mines, but the dealers as a whole have little or no stocks of coal, and if there is trouble Apr. 1, the anthracite business is likely to be brought to a standstill within a few weeks, at the most.

Pittsburg

Bituminous—Negotiations as to the wage scale have resulted in nothing important, which is precisely what has been expected all along, and the prospects for a suspension remain unchanged. The sharp scarcity in tidewater markets has abated in the past few days, and coal is about 50c. per ton lower in the districts which have advantageous rates there and which were getting fancy prices. Clearfield coal, for instance, stands at \$1.75@2 per gross ton at the present time, though a day may effect an entire change. Early last week Clearfield coal sold up to \$2.50. In the Pittsburg district prices are a trifle higher, if anything, but there is relatively little excitement. Slack has brought \$1.50 and ¾-in. \$1.75, slack being particularly scarce. The mines continue to run up to the limit of car supply, about 80 per cent. of full rated ca-

pacity. We quote: Mine-run and nut, \$1.50@1.60; ¾-in., \$1.65@1.75; 1¼-in., \$1.90@2; slack, \$1.40@1.50, per net ton at mine, Pittsburg district.

Connellsville Coke—The market advanced sharply for both foundry and furnace coke, but the pressure for spot furnace has decreased this week, the consumers who were buying actively last week having apparently gotten all they required for the time being. For several weeks the spot coke market has been very irregular. A fortnight ago there was a sale of a round lot of prompt furnace coke at \$2.50, although on immediately succeeding days there was coke available at \$2 or less. The middle of last week prompt furnace coke was bringing \$2.10 @2.25, but is easier today. Contract coke is not being negotiated to any extent, though two or three contracts expire Apr. 1. We quote: Prompt furnace, \$2@2.10; prompt foundry, \$2.75@3, per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended Mar. 2 at 396,010 tons, an increase of 5000 tons, and shipments at 4521 cars to Pittsburg, 6244 cars to points West and 1125 cars to points East, a total of 11,890 cars, an increase of 150.

Baltimore, Md.

An almost unprecedented demand for coal, and a still further advance in prices on all grades occurred in the Baltimore market during the past week; it is believed the trade never experienced such a rush for fuel before. The offices of the mining companies here have simply been glutted with orders, and, despite the strenuous efforts that have been made to take care of customers, a majority of the companies here are away behind in shipments, owing to the scarcity of cars.

Prices for all grades have advanced over those for the previous week. At the majority of the offices of Baltimore companies it was stated that low-grade coal which, in normal times, brings about 90c. per ton, was now selling at \$2.50 per ton, and in some instances it had been sold as high as \$2.75. The better grades have also advanced, those which ordinarily sold at \$2.50 per ton, now being disposed of at \$3.25, and higher. It is not now a question of price as any operator who has the product can name his own price for it.

Buffalo, N. Y.

The bituminous-coal trade is fast approaching a state of frenzy, with both producer and consumer very much alarmed over the outlook. There are many reports from certain districts that the supply is out or nearly so and almost any price is offered for spot deliveries, with here and there some factories already closed. Northern New York is suffering most, but there is now a fast increasing demand from Michigan.

Even Buffalo is now on the anxious list and dealers are showing confirmations of large orders of bituminous sold as high as \$3.60 delivered, with nothing said as to size or origin. The purchaser is in a panic if the delivery is not prompt, though the seller quite likely recalls the times when the same buyer has canceled orders because the price declined.

One dealer states that he sells all coal as accepted when it leaves the mine and declines to replace if the railroad confiscates it, which has not been done very much yet. Such precaution is made necessary because prices will drop sharply as soon as the English strike is settled, regardless of whether we have a strike or not.

Bituminous quotations are nominal at \$2.60 for Pittsburg three-quarter, \$2.50 for mine-run and \$2.25 for slack, but for spot delivery prices run all the way to \$1.75 higher. Coke is also up, the demand being for 50 to 75c. over the nominal quotation of \$4.25 for best Connellsville foundry.

Cleveland, Ohio

Conditions in the past week in regard to procuring sufficient coal to take care of requirements have become serious, and in consequence prices have advanced on coarse coal from 40 to 60c. per ton, and slack from 75 to 85c. per ton, with a great scarcity at that.

There is still a pronounced shortage of cars and operators are not running more than about 25 to 35 per cent. capacity. West Virginia shipments to this market are out of the question at this time, as that district is busy supplying coal for the European trade. It looks very much at the present time that there will be a coal famine in this district, strike or no strike, as there certainly will be a suspension for at least 30 days or possibly more, and there is little coal on hand.

Columbus, Ohio

As the time for the expiration of the present mining scale approaches, the large consumers are becoming worried and efforts are being made to store up for a suspension, which is now believed to be inevitable. As a result, all steam sizes are in good demand and premiums are readily obtained on these grades. The small sizes have also advanced sharply until nut, pea and slack are quoted at about \$1.10, and coarse slack at an even dollar.

It is estimated that during the past week the production has been only about 55 to 60 per cent. normal, and, in some cases, the percentage was even lower. Operators are making every effort possible to relieve the situation, but the car shortage cannot be overcome. It is impossible for the railroads to get the empties back to the mines, and, as a result, many of the mines were compelled to close down for a portion of the past week.

The strike situation in England is having its effect upon Ohio fields. The demand for bunker is taking much of the West Virginia fuel off the market, and, as a consequence, the Ohio product has a wider market. Much of the West Virginia Pocahontas and Fairmount gas coal is being shipped to the seaboard.

Retail trade has been rather active despite the higher temperatures. Dealers have been busy on small orders. Prices on domestic grades are still ruling firm in every particular.

Prices prevailing in the Ohio fields are as follows:

Hocking Valley	
Domestic lump	\$1.60
¾-in.	1.40
Mine-run	1.20
Nut	1.20
Nut, pea and slack	1.05
Coarse slack	0.95
Pittsburgh No. 8	
¾-in	\$1.35
Mine-run	1.15
Coarse slack	0.95
Pomeroy Bend	
Domestic lump	\$1.75
¾-in	1.50
Mine-run	1.25
Kanawha	
Domestic lump	\$1.40
¾-in	1.30
Mine-run	1.15

Hampton Roads, Va.

The British steamers "Statia" and "Chiverstone," loaded with coal for Rotterdam, Netherlands, and Port Said, Egypt, respectively, sailed from Hampton Roads recently. These two vessels are the first to carry coal from this port to foreign countries, which have been affected by the coal strike in England, and is the beginning of a large number due here during the next few weeks. The "Statia" has on board 4000 tons of coal for Rotterdam, and is the first coal shipment ever made from Norfolk to that port.

Another vessel, the British steamer "Denaby," is in port to load a cargo of coal for Las Palmas, Great Canary Island. Heretofore all the coal in that port has been received from the mines in Wales.

The supply of cars at the mines during the past week has been poor and what coal is loaded is moved to Hampton Roads very slowly. Very little trading in spot coal is going on and it is hard to quote a standard price on spot at the present time. One dealer who was pushed for spot coal earlier in the week paid \$4.25 a ton for 500 tons to accommodate the demand of his customer.

Charleston, W. Va.

That the coal operators are able to accept but about 30 per cent. of the orders offered, fairly illustrates the condition of the West Virginia trade. More orders are not accepted because the mines can only be worked about half time owing to the fact that cars are not available. The demand for coal and the failure to get sufficient cars to supply the demand has sent the price up, and those mines that are not compelled to use the entire output to fill contracts are once again making a good profit. In many instances the operators are now given an opportunity to recoup the losses of the past year or two, to which they are entitled.

With anything like an adequate car supply that would keep the mines of the state in operation, the output will exceed that of any other period in the coal-mining history of the state, while the revenue will likewise top all previous figures.

Louisville, Ky.

Coal prices in the Louisville market will probably begin to tumble in a short time. This may not occur for a few weeks yet, but Louisville consumers are fortunate in that they are always offered an opportunity to lay in coal at summer prices, which helps to tide them over the winter without serious trouble.

The retail dealers of Louisville have educated their customers up to the point where the winter supply is laid in during the summer months to an extent probably equalled in few other cities. It was this precaution which prevented widespread inconvenience, and more suffering, the past winter. River coal is now coming down in goodly quantities, and the harbors in this locality show evidence of the activity in that trade.

Memphis, Tenn.

The mine situation is steadily growing more distressing; in the west Kentucky fields foreign buyers are paying as high as $1.75 per ton for mine-run, which is about 90c. above the normal price. The high-grade coals have been extremely scarce and hard to get for the reason that there has been an unusual demand, as well as a car shortage. The western Kentucky operators are selling coal from day to day, and to the highest bidder.

While the following prices have been quoted for the last few days, it has been impossible to buy at these figures. Cahaba district has announced its minimum price for April, which is $2.25 per ton. However, there will be very little coal supplied to the domestic market at this price during the month of April should a strike go into effect.

The normal or natural markets are suffering for want of coal because there are foreign buyers on the ground and they pay prices that are far beyond the normal.

Prices quoted in west Kentucky are as follows:

No. 1 lump	$1.50
No. 2 lump	1.35
No. 1 nut	1.10
Mine-run	1.00
Screenings	0.75

Chicago

The net result of the expected strike of the miners, Apr. 1, has been an advance in prices to a basis of $1.75@2 per ton at the mines for practically all kinds of Western steam coal.

Smokeless coal has been the center of the greatest interest. Smokeless mine-run has sold at $5 at tidewater, which means $3.60 a gross ton at the mines. All available cars and boats are being brought into requisition to move this coal.

The only coal known of as having been sold spot on the Chicago market went early this week at $1.75 for mine-run. The coke market is strong in sympathy with the rest of the trade. In furnace and foundry coke the consumers want to contract for the third quarter of the year, but producers are backward about doing so.

Prevailing prices at Chicago are as follows:

Sullivan County:	
Domestic lump	$2.87
Egg	2.87
Steam lump	$2.62@2.87
Screenings	2.62@2.87
Springfield:	
Domestic lump	$2.82
Steam lump	$2.57@2.82
Mine-run	2.57@2.82
Screenings	2.57@2.82
Clinton:	
Domestic lump	$2.77
Steam lump	$2.52@2.77
Mine-run	2.52@2.77
Screenings	2.52@2.77
Pocahontas and New River:	
Mine-run	$3.80@4.05
Lump and egg	4.05

Coke—Prices asked for coke are: Connellsville and Wise County, $4.85; byproduct, egg and stove, $4.95; byproduct, nut, $4.75; gas house, $4.90@$5.

Indianapolis

Consumers in all grades are storing heavily here in anticipation of the strike. It is the general belief on all sides that a suspension will take place on Apr. 1 and that there will be a decided shortage of coal.

During the week past heavy tonnages of coal have been shipped into Indianapolis for storage purposes. This coal has been consigned principally to the railroads and large manufacturing interests who have kept the matter so quiet that the fact that storing was being done has not been generally known. The Pennsylvania R.R. appears to be the leader in this movement as they are accumulating an immense surplus of fuel which they are storing on the right-of-way within the city limits; the officials of the company do not deny the fact that they are anticipating trouble at the mines.

Among the dealers the talk varies considerably. Some seem to believe the situation will be acute while others are of the opinion that the outlook is not serious. It is the general impression, however, that the public will not suffer to any great extent, insofar as domestic consumption is concerned, at any rate.

Minneapolis—St. Paul

Should a cold wave strike the Twin Cities and remain any length of time, the fuel situation will be serious and a coal famine will surely be the result. The supply of all grades is limited, both on anthracite and bituminous. Anthracite sizes of nut and pea are not to be had and the dealers' stocks on stove are low. Steam users who have been adverse to laying in stocks in view of the strike troubles are beginning to realize that they have been regarding the situation too lightly.

Dealers, while interested in the progress of the wage-scale conferences, are no more conversant with the real strike situation than the public at large. Practically all the anthracite coal at Duluth, Superior and Ashland is exhausted, and nearly all the bituminous is contracted. Dealers say they have been reasonably busy, although not rushed. A lot of speculation is being made as to whether or not the strike situation will prevent the usual Apr. 1 reduction of 50c. on anthracite. Information in regard to this is generally received from the East about the middle of March, but dock men say they have heard nothing, owing to the labor situation.

St. Louis, Mo.

The last week or ten days has seen the most excitable market condition in coal-trade circles that St. Louis has known in years. The St. Louis market was governed largely by the panicky conditions at Chicago where the auctioneering methods of buying, simply put the market out of sight.

Conditions here are uncertain, but indications are that the market will not get any stronger, but probably break, unless discouraging reports come from the efforts that are being made to settle the different wage scales.

Coal that would usually come to St. Louis to take care of the local consumption is being diverted to Chicago, on account of the supply from West Virginia being diverted from Chicago to the Atlantic Seaboard for export. As long as this continues the local market will be strong.

Prevailing prices in the St. Louis market are as follows:

Franklin County	
Lump and egg	$2.25@2.40
No. 1 nut	2.25@2.35
No. 2 nut	2.00@2.10
No. 3 nut	1.85@1.95
2-in. screenings	1.75@1.85
Carterville	
Lump and egg	$2.15@2.30
No. 1 nut	2.00@2.10
No. 2 nut	2.00@2.10
No. 3 nut	1.85@1.95
Screenings	1.75@1.85
Mine-run	1.85@2.00
Standard	
6-in. lump	$1.90@2.00
2-in. lump	1.85@2.00
No. 1 nut	1.90@2.00
No. 2 nut	1.90@2.00
Screenings	1.35@1.45
Mt. Olive	
3-in. lump	$2.00
No. 1 nut	2.00
No. 2 nut	2.00

Coke is in good demand and hard to get at from $4.75@5, St. Louis. There is a good tonnage of smokeless coming forward that has been bought for some time, and anthracite is moving fairly well in the larger sizes.

There has been a heavy tonnage of Kentucky coal shipped in, with screenings anywhere from 50c. to $1, mine-run $1@1.40, nut $1.35@1.60, 1¼-in. lump $1.50@1.60, and 2½-in. lump $1.75@1.85, all taking a $1 rate to East St. Louis. Part of this is from the union Kentucky field, and these mines will suspend on Apr. 1.

Portland, Ore.

Coal dealers here regard the winter season as over and from now on till next fall the demand will be only the normal average. Stocks carried over are somewhat larger than usual, owing to the mild winter, despite the fact that a couple of Australian cargoes were canceled. It is thought the coal strike in England and Germany will have no effect on prices here as the Australian product is one of the price-governing factors on this coast.

Local prices have shown no decline as yet, and they are not expected to until the beginning of the storage period, a date fixed by the dealers themselves, and depending upon conditions in general. At that time values will be shaded $1 per ton as is always customary.

Production and Transportation Statistics

Car Situation

There is a further decrease of 5902 in the car surplus, the total surplus for the period ending Feb. 28 being 44,984 cars, as against 50,886 on Feb. 14, 1912. The decrease in surplus is reported in all classes of cars, the largest being 2402 box cars, while flat, coal and miscellaneous cars showed decreases of 580, 1225 and 1695 cars, respectively. The total car shortage (37,142) remained practically the same as in the previous period when it was 36,928 cars.

Exports

It is estimated that since the strike began in Great Britain, that country has lost the sale of 190,000 tons of bunker coal to the world's coaling stations. Orders for this amount have been placed in America, and deliveries will be made before the end of the present month. The following is the destination of this coal, in tons:

Gibraltar	17,000
Buenos Ayres	32,800
Naples	10,500
La Plata	24,000
Genoa	11,000
Las Palmas	37,000
Marseilles	14,900
Rio Janeiro	22,950
Port Said	12,300
Algeria	6,000
St. Vincent	5,200

Norfolk & Western Ry.

The following is a statement of commercial and company coal from mines on the Norfolk & Western Ry. for the month of February, in short tons:

Field	Commercial	Company
Pocahontas	1,067,876	99,353
Tug River	140,956	49,030
Thacker	175,786	57,894
Kenova	68,570	9,956
Clinch Valley	107,238	7,642
Total	1,560,426	223,875

The following is a statement of the coal and coke tonnage from mines on the N. & W. Ry., in the state of West Virginia, for the month of February, 1912:

From	Tipple Coal	Total Coal
Pocahontas	20,418	1,122,908
Tug River	3,247	189,986
Thacker	4,744	233,680
Kenova	8,714	78,526
Total	37,123	1,625,100

Note—Total shipments of coke, originating entirely in the Pocahontas field, amounted to 111,524 tons.

Foreign Markets

Africa

The South African coal production for the year 1911 was as follows, in short tons:

Transvaal	4,343,680
Cape	89,023
Orange River Colony	482,690
Natal	2,682,029
Total	7,597,422

Australia

Coal production for the first nine months of 1911 shows an increase of 249,934 tons over that for the same period in 1910. It is probable that the production for 1911 will show a heavy increase over that for 1910.

Great Britain

The following is a summary of the coal production in Great Britain for the year 1911, in tons:

England	193,231,139
Wales	39,845,058
Scotland	41,718,163
Ireland	84,564
Total	271,878,924
Total for 1910	264,417,588

Market Conditions—The miners have suspended work and there is no coal market. Negotiations for a settlement are still proceeding. Quotations on the last day of business were nominally as follows:

Best Welsh steam coal	$5.28@5.52
Seconds	5.04@5.28
Thirds	4.56@4.80
Best dry coals	4.62@4.80
Best Monmouthshire	4.44
Seconds	4.14@4.32
Best Cardiff small coals	3.96
Seconds	3.48

The prices for Cardiff coals are all f.o.b. Cardiff, Penarth, or Barry, while those of Monmouthshire descriptions are f.o.b. Newport, both exclusive of wharfage, and for cash in 30 days, less 2½%.

British Exports—The following is a comparative statement of the British fuel exports for the first two months of 1911-12, in tons:

	1911	1912
Anthracite	430,564	447,199
Steam	7,126,219	7,941,579
Gas	1,548,601	1,730,471
Household	247,708	264,903
Other sorts	489,552	552,007
Coke	169,873	222,040
Patented fuel	284,884	310,183
Bunker coal	3,056,722	3,066,978
Total	13,354,123	14,535,360

Financial Notes

At a regular meeting of the board of directors of the Coal & Iron National Bank (New York), a quarterly dividend of 1½% was declared, payable Apr. 1, to stockholders of record, Mar. 13, 1912.

The annual report of the Pittsburgh Coal Co. for the year ended Dec. 31 shows net earnings of $4,044,504, compared with $4,699,863 in 1911. The deduction of $1,563,775 for reserve, depletion, and depreciation against $1,678,374 in the previous year and of $1,088,790 in bond interest, compared with $1,056,039 in 1910, left a surplus of $1,391,937. The payment of $1,535,590 in dividends on the preferred stock left the surplus for the year at $38,347, against $611,860 in 1910.

The average price of white-ash coal, of sizes above pea, sold at or near New York between Perth Amboy and Edgewater, for February was $4.88 per ton. This compares with an average price of $4.81 in February, 1911. Price this year entitled all miners and mine workers, included in the anthracite strike commission, to an increase of 7% over the rates of wages fixed in said awards. Average monthly increase over such rates for the past nine years has been 4½%, and aggregate bonus paid under the sliding scale has amounted to approximately $35,000,000.

The Sheffield Coal & Iron Co. has no overdue indebtedness to general creditors, owes no money to its banks, and should subsidiary companies continue to earn their way, the properties could be held for a considerable time were it not for the default which occurred on Jan. 1, 1912, in the payment of $63,580 interest on the outstanding first-mortgage bonds, and the further fact that on Apr. 1, 1912, a series of notes, aggregating about $82,000, given by the company at the time of its reorganization, will mature. The above amount of $63,580 includes the coupons on a large number of bonds, the holders of which agreed to defer payment of the same from January, 1910.

Alphabetical Index to Advertisers

Classified Index to Articles Advertised

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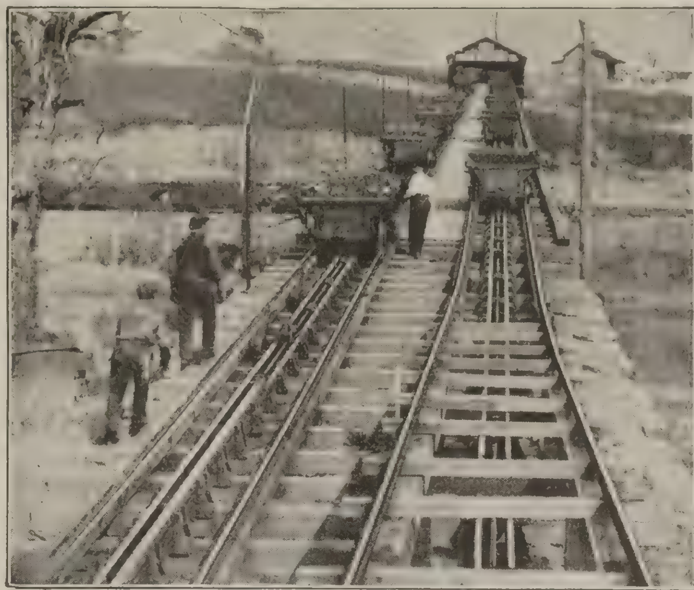

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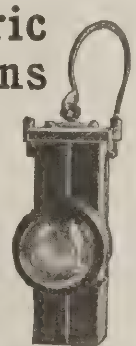
Ideal for MINE Use

For general use about the mine, the officials' and Miners' Hand Lantern here shown is unequalled. It is excellently adapted for work in tunnel headings, for use with rescue apparatus or coal punching machines. Cost of operation is only about half that of any oil lamp. *Write for catalog.*



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A Grade for Every purpose.

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SITUATIONS WANTED

Experienced store manager desires to make a change; has made good record; will furnish best references. Address Box 14, Coal Age. Mar. 23.

Advertisements under this head 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Mine electrician and armature winder desires to make a change; 16 years' experience; married; 35 years old; don't drink. Address Box 20, Coal Age. Mar. 23.

Position as master mechanic by a young man of electrical and mechanical experience; able to handle anything of either line around a modern equipped mine; Sullivan cutting equipment preferred; open for engagement after April 1. Address Box 17, Coal Age. Mar. 30.

Commissary man wants position; if you have an opening for a store manager, write to the National Commissary Managers Association, 801 Manhattan Building, Chicago; good men will be recommended without charge; inquiries treated confidentially if desired. Mar. 23.

Wanted—Change of position by experienced superintendent; have engineering experience; have worked colored and foreign labor, rope and electric haulages, air and electric machines; good record for tonnage and economy; 10 years' experience in charge of mines for some of the largest coal companies in United States. Address Box 18, Coal Age. Apr. 13.

CA

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 25.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, MARCH 30, 1912

Ten Cents per Copy.
U. S. and Mexico, $3 per Year.
Canada, $4; Other Countries, $5.

MINERAL SPRING COLLIERY, Lehigh Valley Coal Co., as seen from the Wilkes-Barre Mountain, and an interior view of the breaker, showing shaking screens and chutes. The building is of steel construction throughout, sheathed with corrugated iron, and has a liberal number of large windows which contribute much to efficiency of operation.

COAL AGE

Vol. 1 NEW YORK, MARCH 30, 1912 No. 25

MOST of us have one viewpoint for mechanical installations and an entirely different one for human equipment. And nowhere is this fault more emphasized than in the individual himself.

A man receives $1500 a year. Viewed in the light of reason, that means but one thing: He has been able to capitalize his ability for $30,000, since $1500 is the annual income at 5 per cent. on that sum.

Now, $30,000 will buy quite a few mine motors, and any one of these machines will pull a much greater load than a two-legged human, but unlike the latter, the locomotives can't think, and are absolutely useless when not directed by intelligent thought.

It's right here the individual has it on the machine. The latter is a known quantity and the company will never get from it any more than a fixed maximum horsepower. The energy of a human varies within a wide range, and the capital value a company places on a man depends largely on the amount of sensible efficient effort he develops.

If we expect the corporation we work for to increase the capitalized value placed on us, it is essential that we treat with care the body on which our mind depends for strength and sanity.

A man can become of greater value to a company as time passes; a mine motor will never be worth a dollar more than it was on the day of its purchase. The whole matter is a purely business proposition. Capitalized ability is more to be desired than capitalized property. The income from honest effort generally creates happiness. The annuities from massed wealth not only breed idleness and discontent, but in the hands of incompetents and degenerates, are most potent of all causes of class hatred.

In one way, however, the motor and the man correspond; each must possess the faculty for staying on the rails. An employee who frequently jumps the track, landing oftentimes in saloons and dives, won't be capitalized at any huge sum.

The fellow who proposes to increase his valuation to $100,000 or $200,000, must think fast and travel straight. He must study, read, observe and labor not a minimum eight, but a maximum 12 or 15 hours a day.

The age for whittling sticks and swapping stories at the corner grocery passed with the kerosene lamp and the stage coach. Sound sense and sold virtue have been essential in all ages; it's the application of ideas that has changed. We might have all the reputed courage of the ancient Romans, but our army would be useless if equipped with bows and arrows.

Also, the man who slows up and complains that nobody is watching his earnest effort, is in a class with the fellow who believes luck carves all careers. Someone higher up is sure to set a real value on our work, and 5 per cent. interest on a true capitalization, based on quantity and quality of results produced, will eventually be paid us.

And speaking of luck, let us realize that such an element doesn't enter into a man's life when measured over a period of years. For a day, a month or a year, maybe Yes, but for a score of years, No.

More good men have been hopelessly ruined by once making a little easy money than were ever incapacitated by inherited inability. Things go not by luck, but law. Winds and waves are on the side of the best navigator.

der, double-drum, first-motion hoisting engine. The drums are 8 ft. in diameter, and each has a capacity of 5000 ft. of 1¼-in. wire rope; the flanges are detachable and will be replaced with higher ones later, as the slope lengthens. The engine is fitted with steam-operated brakes, friction and reverse, and Corliss valves, although the dashpots have been left off, to be added later when length of haul becomes a serious item. Extension piston rods, through the back cylinder head, equipped with crossheads, are provided to take up the weight of the piston. There is 140 lb. steam pressure at the throttle. This engine handles 15-car trips, each car weighing loaded 5000 lb., at a speed of 1500 ft. per minute.

Other units are a 250-kw., 3-phase, 60-cycle, 2300-volt generator, direct connected to an 18x24-in. Corliss engine, having a speed of 120 r.p.m., and a 25-kw., 125-volt, direct-current generator, direct connected to a high-speed 8x7-in. engine, running at 350 r.p.m.; this latter is used as an exciter set and is of sufficient capacity to take care of additional units. There is also a 40-hp. motor-generator set which is used as an exciter set while running, and the engine exciter is used only for starting and as an emergency unit.

The decision to adopt alternating current was due to proposed additional openings to be made later, a mile or more from the present one, and the intention to provide power for both mines from this one plant. The flexibility of the alternating current was also taken into consideration. Then, again, although the first cost of alternating current machinery is slightly in excess of direct-current apparatus, the low maintenance and operating cost of induction motors, as compared with direct-current motors, is so great that in 12 months it would more than pay the difference in first cost.

Boiler House and Steam Lines

The boiler house, 41x51 ft. 3 in., is located 79 ft. below, and 197 ft. horizontally from the power house. In locating this building, advantage was taken of the profile of the ground for fuel- and ash-handling. Coal is drawn from the slack bin into a one-ton side-dump car which is pushed on a track running into the boiler house on top of the furnaces, on a 0.5 per cent. grade in favor of the load. The ashes are drawn from hoppers under the furnaces into a similar car, operating in a concrete tunnel running the length of the building; this car, when loaded, is pushed out on the track supported on a pole trestle along the hill side, and the contents dumped down the bank.

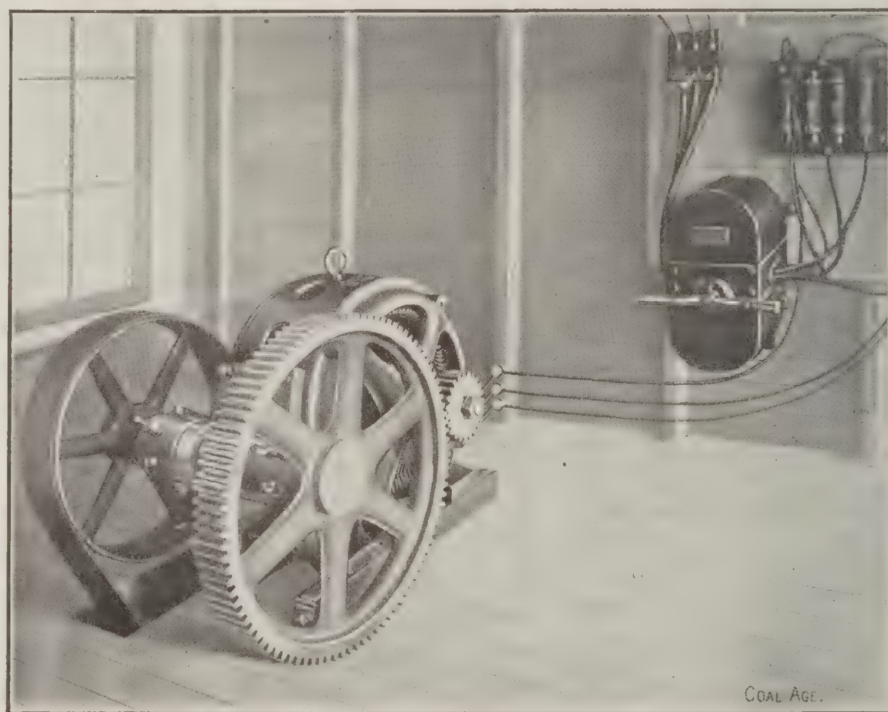
The building is similar in construction to the power house and contains three 300-hp., vertical water-tube boilers, having 150 lb. working pressure, set singly, in steel casings, and equipped with automatic stokers, feed-water regulators and automatic valves. Although at first glance this may appear an unnecessary refinement in equipment for a coal mine, it is justified by the saving in labor, one man handling this entire 900-hp. plant, including the firing and ash removal.

The 12-in. steam main from the boilers to the power house, 168 ft. long, is carried on a suspension bridge over the three side tracks. The span is 99 ft.; difference in elevation of the foundations of the towers is 49.75 ft., and of the tops 27.88 ft. The bridge consists of two ⅞-in., galvanized, steel-wire cables, spaced 48-in. centers, and ⅝-in. suspension rods, with longitudinal spacing of 5 ft. The minimum clearance from the top of rail is 22 ft. The bottom tower is 35 ft. from the track and behind a 6-ft. bank, while the upper tower is on the top side of a cut, 41 ft. above the rail, so it is plain that the danger of damaging either tower by a derailed car is eliminated. The grade of the bridge floor is 15 degrees.

All steam piping is of standard-weight pipe, lapped at the ends, and having rolled-steel flanges, forming a "Van Stone" joint. The connection from the 12-in. main to the boiler header is made with a 12-in. Harter flexible joint, which takes care of all expansions, the main connecting at the upper end to a long-radius, cast-steel L, securely anchored in the basement of the power house, from which distribution is made to the machinery. All valves are Fairbanks, extra heavy.

General Utility Shops

One large building houses the blacksmith, machine and carpenter shops. It is 35x82 ft. and 16 ft. high, of brick and steel construction, tile roof and contains a circular saw, boring machine, lathe and planer in the carpenter shop, and a power hammer, down-draft forge, blower, exhaust fan, pipe-cutting and threading machine, drill press, emery grinder, etc., in the machine shop. All machinery is driven from line shafting, to which is belted, in the carpenter shop, a 10-hp., 220-volt, three-phase induction motor, and, for the other machinery, a 15-hp., 220-volt, three-phase induction motor. A branch from the empty coal track outside leads into and runs the length of the building, ending over a concrete-lined pit in the machine shop for repair of the electric mine locomotives, of which there are at present two in operation, both being 4-ton Westinghouse Baldwin, having wrought-steel frames and fitted with arc headlights.



Conveyer Motor, Showing Potential Starter and Fuses on the Right

The locomotive trolley poles are located to one side of the center, which is necessary in low-roof mines to prevent accidents to employees. In addition to placing the wire to one side of the entry close to the rib, additional safety is provided by a wooden guard on each side of the wire which extends from the roof to 3 or 4 in. below the wire. While only 250 volts is carried on the trolley wire, which would not do material damage to persons coming in contact with it, the extra precaution of the wood guard has reduced danger of accidents of this kind to a minimum. This building, as well as the boiler and power house, is lighted with three 5-light cluster, 40-watt, tungsten lamps.

The Water Supply

Unfortunately, the nearest source of an abundant and pure water supply is over a mile from the town. This, of course, means pumping all the water used both

for domestic and boiler purposes. For the former, a storage supply is provided by a concrete tank of 50,000 gal. capacity, set on a concrete tower, 60 ft. above the ground. For the latter a 500,000-gal. concrete-lined reservoir was built on the crest of a hill beside the power house; from this reservoir, water flows to the feed pumps and later, when condensing apparatus is installed, will supply the condensers also. At present it is necessary to feed cold water to the boilers, but this is only temporary.

The proposition of handling the water from the stream is taken care of by two three-stage centrifugal pumps, direct-connected to three-phase, 2300-volt, 60-cycle induction motors, operating at a speed of 1700 r.p.m. One of these has a capacity of 150 gal. per min., and the other 250 gal. per min.; both operate under a 300-ft. head. The motors are 35 hp. and 60 hp., respectively, and only one pump is operated at a time, the other being held in reserve.

This plant is located in a brick building, 12x16 ft., and about 10 ft. from the bank of the stream. The motors are started and stopped by starters, located over a mile and a half away, in the power house. This use of starting apparatus, with a remote control, is one of the advantages of alternating current, as no extra or increased sizes of wire are necessary. The 4-in. suction from the pump leads into a sump on the outside of the building, which is connected to the stream by a 6-in. pipe provided with necessary strainers, check valves, etc. The building is waterproofed 6 ft. above the ground to prevent damage to machinery through high water.

It might be well to mention here that this source of supply was finally decided upon only after an exhaustive series of analyses of the water at the two extreme seasons of the year. A 6-in. cast-iron pipe carries the water from the pump to the 50,000-gal. tank, and thence to the reservoir in a 4-in. pipe, suitable valves being placed to turn all the flow into the latter without interfering with the domestic supply.

Electric Transmission System

The pole-line construction conforms to the best standards for this work. All poles are either 35 or 45 ft. long, spaced 100 ft. apart, and of good, straight, sound chestnut. Main-street poles, running through the town, carrying circuits of 2300 volts, are 45 ft. in length and placed 5 to 6 ft. in the ground; all corners are substantially guyed. On every fifth pole is placed an arm which extends out to the center of the road, about 20 ft. above the ground, on the end of which is hung a 60-watt tungsten series light, there being 26 of these distributed along the highways, on an independent 2300-volt circuit.

On each pole danger notices are printed in large black letters on a white background, which can be read from a distance. Some of the poles are equipped with steps from the top to within 8 ft. of the ground, and the management found that to protect the public as well as the company, it would have to prevent young boys from ascending these poles and stealing insulators; therefore, in addition to the "Danger" sign, there were placed on these stepped poles a $25 reward notice. Since this, there has been no trouble from that source whatever.

The Ventilating and Direct-current Plants

The ventilating equipment is in a large general building, divided into three compartments. One end contains the fan, 72 in. in diameter, delivering 100,000 cu.ft. of air per min. at a 1½-in. water gage and 300 r.p.m. The fan is belt driven by a 75-hp., 2300-volt, three-phase induction motor and starter. A reinforced-concrete tunnel carries the air from the fan to the two air courses. Concrete is extensively used in the mines for overcasts, etc. The middle compartment is a hospital for rendering first aid.

The third compartment, separated from the rest of the building by a 13-in. brick wall, contains a motor-generator set. Provision is made for three sets, but, at present, a 75-kw., 250-volt, direct-current generator, driven by a three-phase, 2300-volt, 60-cycle, 112-hp. induction motor, and a starter, is all that is necessary. The motor-generator set is mounted on an iron sub-base, and the speed is 650 r.p.m. A skeleton wood switchboard, for the outgoing mine circuits, completes the equipment of this room.

The machinery at present installed in the mine using the direct current supplied by this generator, is: Two locomotives, two small triplex sinking pumps, driven by back-geared, 15-hp. electric motors, two electric air rock drills, one 250-gal. triplex station pump, back geared to a 40-hp. motor, and six 20-hp. electric single-drum hoists. All the power leads run down the lower air course and at intervals branches are tapped off and run where necessary. Little water has been encountered so far in the mines, but a station pump will be installed later. All the motors for the plant were supplied by the Allis-Chalmers Co., Milwaukee.

The mine is being equipped with a complete telephone system, also electric indicators for showing the engineer the location of the trip he is handling. Shotfiring will be done entirely by electricity from the outside of the mine, while a system for checking the men going in and out will be established to prevent accidents happening from firing shots while anyone is in the mine. Electric air drills are being used for drilling the sandrock top in the headings and air courses.

Sociological Conditions

For the use of the miners, a bath house of brick will be built, equipped with 20 showers having both hot and cold water, and a locker for each man. The building will be divided into two compartments, one for the colored and the other for the white miners. A system of steam heating will be installed and an attendant, in charge at all hours, will be responsible for the proper care of the building.

The fire protection at Marvel has been given careful consideration. Fire hydrants are established at regular intervals throughout the camp, and hose carts are placed at convenient points, with plenty of underwriters hose to reach any desired locality. The water pressure from the concrete tank alone is sufficient to throw a stream from a 2-in. nozzle the necessary distance, while the pressure obtained when the pump is in operation and feeding directly into the mains is, in some places, more than 150 lb. per sq.in. Fire companies have been organized to fight any conflagration which might occur.

All the miners' houses are wired and the light is supplied at a flat rate, which is charged in with the rent. All lamp renewals are purchased at the commissary by the consumer. For use in the mines, 220-volt lamps are provided, but 110-volt lamps are used in the houses.

A 10-ton ice plant will be located convenient to the commissary, and a refrigerator will keep all the fresh meats in perfect condition until used. Ice will be supplied to neighboring camps at a minimum charge throughout the summer. An amusement hall, having opera chairs and seating 600 people, provides for moving-picture shows weekly.

Experiments on Explosive Dust at Pittsburg Testing Station

Experiments made at the Pittsburg testing station have shown that a charge of 1¼ lb. of black powder is capable of igniting 60- to 80- or 80- to 100-mesh coal dust and propagating an explosion. Dust larger than 60-mesh was not ignited. A 2½-lb. charge, with 2 lb. of clay tamping, ignited 60- to 80-mesh dust and propagated an explosion. Also 40- to 60-mesh dust mixed with 20- to 40-mesh was ignited, but only a partial explosion took place, although the indications were that a still larger charge of powder, with a correspondingly increased concussion and heat, would produce a complete explosion. Under mine conditions, where there is an abundance of fine dust to sustain the flame, coarser sizes of dust may be able to propagate an explosion if the shot is very large; but until further tests are made 20-mesh dust is the dividing line between fine coal and dust.

Water Purification for Collieries

Special Correspondence

A growing tendency toward the establishment of large central power plants at the coal mines and a universally increasing demand for colliery bathing facilities are both emphasizing the need of water purification at mining plants. The first of a series of articles on water-purifying processes and apparatus.

The water problem in connection with colliery work, includes not only the question of securing the most convenient or economic method of ridding the mines of this element which frequently threatens to submerge the workings and to endanger the lives of the men underground, but, especially in recent years, has come to include the question of treatment both for use in steam boilers and for bathing and cleansing purposes. Modern practice will probably render these latter phases of the subject of greater and greater importance as time goes on because of two tendencies which have become increasingly evident.

The first of these tendencies is connected with the economics of power supply. There is a steadily increasing opinion that the problem of cheap power in areas adjacent to coal mines will be solved, ultimately at least, by the institution of large electric generating stations at the collieries or as near thereto as can be conveniently arranged. The cheaper forms of coal which can not be profitably transported can then be burnt here and the steam so obtained utilized to drive electric generators supplying a distribution system which may spread over hundreds of square miles of country side. This achievement is perhaps nearer actual accomplishment than is generally supposed, and even to-day we have such a system fore-shadowed in more than one large group of collieries where a central electric-generating station supplies all the power necessary for the various operations of the plant both above and below ground and in some cases for the lighting of the adjacent villages. It needs but a simple extension of this system to usher in a new era of electric power supply.

The second tendency which was referred to above, is the growing feeling that provision for the cleanliness of the miners is absolutely necessary. In Germany, France and Belgium, extensive miners' bathing installations have been equipped, and contrast most favorably with the inefficient means formerly adopted in the miners' own cottages in order to secure an occasional bath. The influence on the health and morality of the miners in those areas where such accomodations have been provided, is stated to be considerable, and there is every probability that before long similar installations will be found at most of the collieries throughout the world where the management is of an up-to-date character.

Necessity for Pure Water

For both the purposes mentioned above, water is necessary; and furthermore, it must be of a clean and pure nature. Unfortunately, however, most of the water pumped from underground workings not only contains a large amount of solid matter in suspension, which has been acquired by its passage through the earth, but also frequently becomes impregnated with iron salts and other salts in solution, that render it unfit for direct application to either

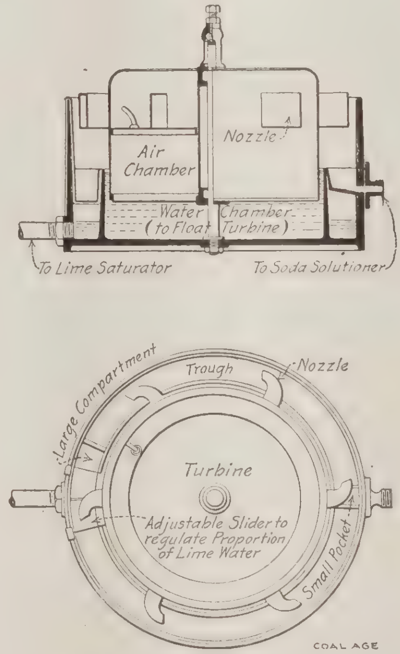


Fig. 1. Water Distributor

steam production or other purposes. It will be seen that the subject of water purification for collieries is, even at the present day, of considerable importance, and this importance will grow as time goes on. It should therefore prove a matter of interest to review briefly some of the types of water-purification apparatus which are available for special adaptation to the needs of colliery work.

It is not proposed to spend much time in this article on the question of the removal of solid matter in suspension in the water pumped from a coal mine. As a rule, such matter can be removed by means of settling tanks, into which the water is allowed to pass and rest before being drawn off for boiler or washing purposes. Where this treatment is not sufficient the water may be passed through beds of gravel or sand, which still further arrest the finer portions of suspended matter. In some cases also, the coagulating properties of aluminates are employed to bind the floating particles together into a more or less gelatinous mass; and this treatment, combined, if necessary, with a suitable filtering process is sufficient to remove the impurities that are mechanically held in the water.

By far the more serious problem, especially in the case of boiler-feed supplies, is that of getting rid of the disolved matter in the water. Fortunately, the impurities contained in solution in the majority of waters are limited to a small number of substances, and, generally speaking, the trouble which is to be most apprehended is that arising from the presence of bicarbonates of lime and magnesia (which produce what is known as temporary hardness) and from the presence of sulphates of lime and magnesia which give rise to permanent hardness, that is to say, hardness which is not removed by boiling the water.

There may also be found air and carbonic acid gas in solution, and, in the case of mine water, free acid, such as sulphurous acid, small traces of chloides and nitrates and sometimes a considerable amount of iron salts such as bicarbonate of iron. Of these the lime and magnesium salts are the most important and are the impurities with which it is most generally necessary to deal. Obviously, in the matter of boiler-feed supplies, it is advisable to get rid of the impurities before the water is allowed to enter the boiler, although the use of compounds, which deposit more or less dubious sediments in the boilers is still prevalent. The methods usually adopted for the preparation of feed water before it enters the boiler may in general be divided into two classes, the hot and the cold treatment.

The Cold Process

In order to get rid of the temporary hardness of a feed water, by chemical treatment without the use of heat, the bicarbonates are precipitated by a lime-water solution and the sulphates are precipitated by soda ash. The cold, or purely chemical treatment, usually involves a certain amount of storage capacity for the water which is being treated and it is necessary to make sure that the chemicals are added in just the proper proportion, since otherwise lime might be passed over into the

boilers, there to be deposited as scale. The cold process is particularly adapted to use where hard water must be softened before it can be used for bathing or washing purposes. It is also no less frequently adopted in connection with steam raising plants.

The alternative method of hot treatment is available where engines are being run, and consists in the employment of exhaust steam to preheat the water before it passes to the boilers.

There are numerous types of hot and cold water softeners at present installed at colliery plants and the mechanical details of some of these will be referred to in this and succeeding articles. Before passing to this, however, a preliminary reference may be made to the removal of iron compounds. In a case to be mentioned later, the mine water was discharged into a brook, and complaints were raised because of the contamination of the brook by the ochre-

water, is the addition of just the precise amount of reagent that is necessary to reduce the hardness to the required degree; and one of the chief aims in the construction of modern water softeners is to effect this admixture with as much ease and certainty as possible. As an illustration, the distributor used in the water softener made by the Harris Patent Feed Water Filter Co., Ltd., of Newcastle-upon-Tyne, may be mentioned.

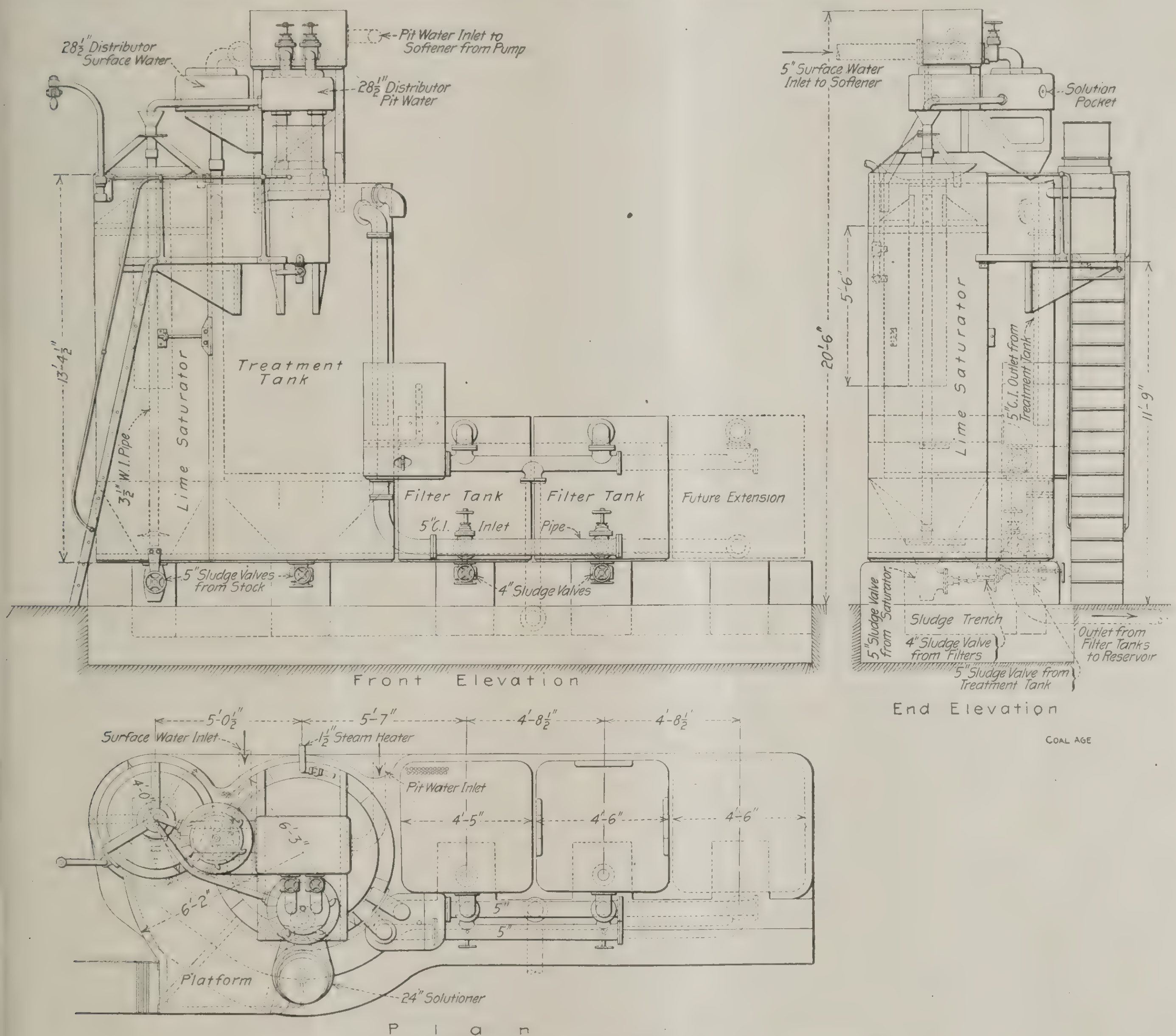


Fig. 2. Harris-Anderson Water Softener. Capacity 5000 Gal. per Hour

This heating often eliminates the necessity for the use of lime, because the temporary hardness is removed by boiling the water, and the permanent hardness is either simultaneously or subsequently treated by means of soda ash. Where exhaust steam is used in this way there is the possibility of oil being brought over from the engine, and therefore, it is not unusual to find an oil eliminating device as a part of the hot, softening process.

colored mine water. It was here necessary to install a self-cleansing filter in order to obtain a clear effluent. Still another phase of the subject is the use of colloidal aluminum, which appears, from recent investigations, to offer some promising results. This matter will be treated in further detail later on.

Harris Distributor

One of the points which demands careful attention in the treatment of

This device, shown in Fig. 1, effects an automatic and accurate separation of fractional portions of the total flow of water, the relative proportions being unaffected by changes in the rate of flow. It consists of a small turbine, floated by the water which flows into it. The water leaves by bent nozzles and thus the turbine is rotated about a vertical axis. The water flows uniformly from the nozzles into an annular trough and this trough is divided into two compart-

ments, one of which is just such a fraction of the whole trough as to correspond to the fractional part of water that it is required to separate from the main flow.

The separated portion of water is led away by a special pipe, and evidently its proportion relative to the whole is not disturbed by the total rate of flow. The water thus diverted is converted into a saturated reagent when taken to the saturator or solutioner. If saturated lime water is to be made, the amount separated is usually about one-tenth of the total flow, variation of the amount being made by the adjustment of a slide; while if caustic soda or some other strong reagent is used the proportion is much smaller, varying from one-fiftieth to one-two-hundredth part of the total. In the latter case separation is effected by means of small knife-edged pockets placed radially in the annular trough.

Where lime is used as a reagent, the water separated from the distributor passes into a conical-bottomed tank, charged with slaked lime. The water enters through the lime, thus agitating it and disolving as much as possible. From the upper part of the tank it passes out, after settling, to the reaction tank where it is mixed with the main water supply by means of baffle plates. A certain amount of sludge is separated in the reaction tank and the water is further cleared by being passed through a mechanical filter bed of wood fibre, placed either internally or externally with respect to the main tank.

Where soda or other readily soluble reagents are used, a solutioner of circular form, containing three concentric cylinders, nested in one another, is provided, as shown in Fig. 3. Successive annular spaces are thus formed. The outer containing cylinder is notched at its upper edge and leads to the delivery spout. The second cylinder is fixed so as to have its upper edge a little way above the top of the third cylinder, which latter may be adjusted vertically by means of a screw nut and is notched at its upper edge. The fourth or innermost cylinder is carried higher than all the others and is fixed. It contains a gauze cage, placed at such a height that the bottom is an inch or two below the level of the notch on the outermost cylinder. In this cage the reagent to be dissolved is placed.

Operation of Solutioner

Now, if the movable cylinder is adjusted so that its notch is slightly above that on the outer cylinder and a pipe is lead from the distributor pocket into the space between the innermost and the next cylinder, the water flowing from the pipe will pass down this annulus and up the outermost space, the water level being that of the outflowing water. The innermost cylinder will also be filled with water and this, coming into contact with the reagent, dissolves it, the resulting solution being of higher specific gravity than the water passing down the inner space to the bottom of the solutioner.

The flowing water then takes up the solution at the bottom of the tank and mixes with it, so that the outer annulus carries a solution of greater density than that in the mixing cylinder. As the overflowing solution becomes stronger the level of the water in the inflow space rises to maintain hydraulic balance and continues to rise until the solution becomes strong enough to bring the level

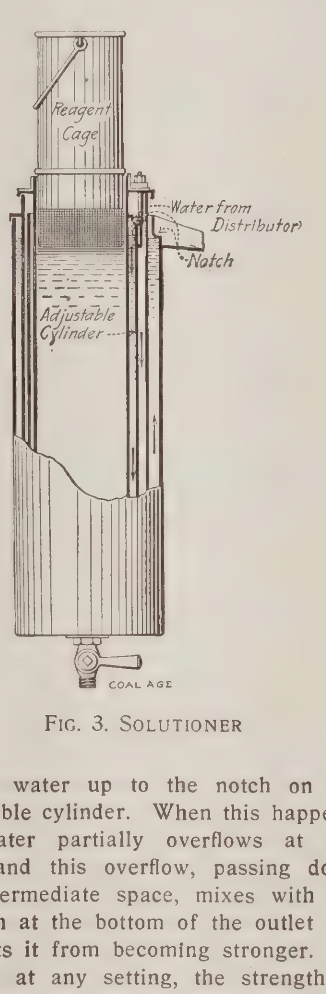


Fig. 3. Solutioner

of the water up to the notch on the adjustable cylinder. When this happens, the water partially overflows at this point and this overflow, passing down the intermediate space, mixes with the solution at the bottom of the outlet and prevents it from becoming stronger.

Thus at any setting, the strength of the outflow solution automatically adjusts itself to a constant value, and by raising the adjustable tube, the strength of the solution is raised, and by lowering it is weakened. Within working limits the strength of the solution is independent of the rate of flow through the solutioner and of the temperature of the water. Moreover, at low loads, or on standing, the increasing density of the innermost column of solution causes the height of this column to diminish and so carries the liquid out of contact with the reagent so long as the outflowing solution is of the proper strength. Waste is thus revented.

A Harris-Anderson water softener of 5000 gal. capacity is shown in Fig. 2. This is dealing successfully with water from two different sources, at a colliery in South Wales. One of the supplies is a surface water and the other is pumped from the mine. As these waters are of different strengths, two different distributors are required; one operating for the surface water and the other for the mine water. Beyond this point, however, the same apparatus deals automatically with either water supplied to it.

(To be continued)

A Combination Coal Mine

A new freak in the geology of the Rocky Mountains has recently been disclosed in the development of a mine producing anthracite, semi-anthracite and bituminous coal in addition to some coke. This rather amazing mine is owned by the Moffat Coal Co., and is located about 18 miles northwest of Steamboat Springs. The president of the company, F. M. Perry, is credited with the following statement relative to the different products of the mine:

The bituminous coal occurs at the top of the series with a semi-anthracite second and the anthracite and coke at the bottom. In common with many portions of Colorado, this district has evidently been the scene of great volcanic activities and numerous intrusive dikes are encountered. It is due to these igneous intrusions that the many different grades of coal were formed.

While these dikes ordinarily take the form of vertical fissures, it is not unusual for them to spread between the intervening strata. Under these conditions, they often have the appearance of the ordinary stratified rock and where found in Colorado are designated as "sill."

The different forms of coal can, no doubt, be easily accounted for by their proximity to these volcanic rocks. The bituminous coal at the top of the series is probably the natural form of occurrence in this region, while the change in the quality of the remainder of the seams has been caused by the different degrees of metamorphism to which they have been subjected, the coked portion representing the maximum metamorphism.

While the year 1910 saw more coke produced in the United States than ever before, the increased value was more than offset by the higher cost of the coal used. The output for 1910 was 41,681,410 short tons, valued at $99,696,267; the output for 1909 was 39,315,065 tons, valued at $89,965,483. While the increase in value was $9,730,784, there was an increase in the cost of the coal used which amounted to $12,604,732.

News of the Coal Strike Situation

Special Correspondence

No progress toward a settlement of wage agreements has been made in either anthracite or bituminous fields.

Great Britain has passed a minimum wage act which is expected to end the strike. Strikes in Germany and France have collapsed.

No definite progress toward reaching agreements between operators and min-miners has been made during the past week in either the anthracite or bituminous fields. While anthracite operators declare they are ready to discuss the miners' demands, at any time, the latter maintain that negotiations having been broken off, the first effort to renew them must come from the operators.

A week has passed since the bituminous operators and miners met in conference at Cleveland, and as yet there has been no progress toward agreement on wage scales for the states of Pennsylvania, Ohio, Indiana and Illinois.

The policy committee of the United Mine Workers met in Cleveland, Mar. 25, but deferred taking action, pending the outcome of the conference of bituminous operators and representatives of the miners. Thirty-two operators and 32 representatives of the miners constituted the full conference at Cleveland, which began Mar. 20. There were eight representatives on each side of the controversy from each of the four competitive states.

The miners presented their demands for a 10 per cent. increase in wages; a reduction in working hours from eight to seven per day, with five hours on Saturdays; provision for an unlimited "check-off"; payment on the run-of-mine basis, and weekly pay days. The operators took the same position as that taken at the first meeting of the joint-scale committee in Indianapolis last January. They contended for a 10 per cent. reduction in wages, an increase in the number of working hours and denied the balance of the miners' demands in general.

For two days, the full conference of 64 members discussed the demands of the miners and the counter proposition of the operators. Failing to agree, the whole question was referred to a subcommittee of eight operators and eight miners, constituting the joint-scale committee which reconvened at the same time that the main conference assembled.

Meeting of Joint Scale Committee

At a meeting of this subcommittee, Mar. 22, the miners again renewed their demands and the operators continued to argue for a 10 per cent. reduction in wages. Eventually, the operators suggested a continuation of the present scale for two years on condition that there would be no suspension of work at the mines under any circumstances. A vote showed the miners unanimous in their rejection of this proposition, and the subcommittee so reported back to the full conference.

Subsequently, all the several compromise offers which were made by the operators were voted down by the entire miners' representation. It being agreed, however, that a suspension of negotiations for an indefinite period would have the same effect on the industry as the declaration of a strike, it was voted to postpone further discussion until Tuesday, Mar. 26. Accordingly, the conference again met on this date, but last reports fail to show that any progress has been made toward reaching an agreement. The miners, throughout the negotiations have firmly held to the letter of their original demands. The operators have offered and withdrawn several compromise measures, without effect.

The following figures show the total number of miners employed in bituminous fields controlled by the miners' union:

Arkansas	6,000
Illinois	73,000
Indiana	22,000
Iowa	17,000
Kansas	13,000
Michigan	4,000
Missouri	10,000
Montana	4,000
Ohio	47,000
Oklahoma	9,000
Pennsylvania	82,000
Texas	4,000
Utah	3,500
Wyoming	8,000
Washington	7,000
Total	309,500

In the nonunion bituminous fields, 50,000 union miners are said to be employed. The total number of mine workers for each state in the nonunion fields is approximately as follows:

Alabama	23,000
Colorado	15,000
Kentucky	21,000
Maryland	6,000
New Mexico	4,000
Tennessee	12,000
Virginia	7,500
West Virginia	69,000
Central Pennsylvania and elsewhere	75,000
Total	232,500

The total number of mine workers in the anthracite field of Pennsylvania is approximately 175,000.

The Anthracite Controversy

In the anthracite region, independent operators, through John C. Haddock, president of the Plymouth Coal Co., have issued a statement, in which it is contended that the individual coal owners should be allowed a better price for their coal, which is taken over by the large coal-carrying companies, than that afforded by the contracts that are based on 65 per cent. of tidewater prices. It is further argued that, "the proper adjustment of this item would permit a reasonable concession to the mine workers." To this statement the larger companies, have replied by pointing out that the willingness of the independents to advance wages is based entirely upon their ability to advance prices.

The so called 65 per cent. contracts, by which the coal of the small owners has been taken over and marketed by the larger companies and coal-carrying roads, have been temporarily suspended, and for the next three months the individual operators will be permitted to dispose of their own coal at such prices as they are able to command. It is argued that this opportunity for making large profits will hold them in line with the general policies of the larger companies.

Government Intervention

Repeated rumors are current regarding the possibilities of federal intervention in an effort to avert a coal strike. While, beyond doubt, Congress and government officials at Washington are making every effort to keep well informed as to the merits and progress of the controversy, it is not likely that definite action will be taken by them prior to a demonstration of the fact that the operators and men will not be able to agree through their own efforts.

Representative Lee, of Pottsville, Penn., has proposed a bill providing for an extension of the Erdman act to apply to the coal-mining industry. The bill is at present under consideration by a committee of the House of Representatives and probably much valuable testimony will be adduced in this connection from the witnesses to be summoned. Serious objections, however, are raised against the provisions of the bill itself, in that its extension to other commodities and industries than coal and coal mining, would seem to be logical and necessary in the event of its becoming a law.

Minimum Wage Bill Passed in England

At the end of the fourth week of the British coal strike a minimum wage bill has been passed and becomes a law. This bill recognizes the principle of the minimum wage, but does not specify the amounts for which the miners have held out so long. It is therefore unlikely that the enacting of this measure will at once to settle the strike, although it will pro-

vide means by which the miners may return to work, knowing that such a minimum wage is assured them as can be agreed on in the various districts.

A week ago this bill had passed the committee stage in the House of Commons but was temporarily abandoned because the leaders of the miners' federation held out for the stipulation in the bill of the definite sums which they demand as a minimum wage; namely, 5s. a day for men and 2s. for boys employed underground. Considerable opposition to the measure had previously been manifested, and the government itself refused to incorporate any such provisions in the bill.

Conferences Were Resumed

Conferences were resumed through the intermediation of the government on Mar. 25, but were unproductive of results. The conference on the twenty-sixth was short-lived, and following it, the Premier immediately went to the House of Commons and announced that the government had put forth its best efforts to secure a settlement between operators and men, and had completely failed. The minimum-wage bill was forthwith passed by a large majority and sent to the House of Lords, which held a special session to receive it.

Some breaks in the ranks of the miners were reported during the week. One thousand men have returned to work at mines in Lanarkshire, Scotland, as well as a number at other places in Scotland and Wales. The situation in many towns is becoming more and more desperate, and it is thought the general government will have to arrange to render aid to the town treasuries in providing food for a great number of the unemployed. So far, the strike has been remarkable in its lack of violence, but it is believed that the point has now been reached where it will be difficult to hold the unemployed and suffering workers in order.

German and French Strikes Ended

Following a conference of the miners' leaders in Bochum, Mar. 19, the coal strike in Germany has come to an end. From last reports, men were returning to work in the Westphalian district at the rate of 15,000 to 20,000 a day. This strike had involved nearly 300,000 men in Westphalia, Saxony, and Lower Silesia, and was marked by disturbances of such a violent nature that troops had to be sent to the mining districts.

The strike of miners in the vicinity of Denain, France, was of short duration; the movement was in direct opposition to the wishes and councils of the miners' federation, and while it was feared for a time that it would spread to considerable proportions, it was settled without difficulty, the men returning to work, Mar. 25.

It is reported that 36,000 coal miners of Austria have demanded a 15 per cent. increase in wages, and, failing to receive this concession, have threatened to strike.

British Coal Trade Crisis

(Continued from last week)

March 8—Conferences with the committee of the Cabinet resumed. Prime Minister issued an invitation to both sides to meet at the foreign office.

March 11—The miners' conference decided that the executive of the Federation should meet in joint conference either the whole of the coal owners of Great Britain or any of the districts which are prepared to concede the principal of a minimum wage.

March 12—The coal owners agreed to accept the Prime Minister's invitation to a joint conference with the miners for a discussion of the dispute, the representatives from Scotland and South Wales doing so "without prejudice."

March 13—The miners' conference passed a resolution in which they explained they were "willing to enter into negotiations at once with the coal owners in the various districts for the purpose of securing a settlement of all points in dispute at the earliest possible moment."

March 14—Further resolutions, passed by the men's representatives, in which they "agree to the proposal of the Prime Minister that some neutral person might tend to help guide the discussion along such lines as would facilitate an agreement." This with other resolutions relieved the position of the men who, having thus conceded the arbitration point, now virtually fell into line with the suggestions made a fortnight earlier by the government.

March 15—The fourth day's sitting of the joint conference of coal owners and miners and government representatives ended disastrously, in so far that all negotiations were broken off. The Prime Minister announced that the government had done all in its power to arrive at a settlement by agreement, and that they had come to the conclusion that such was impossible. Further measures must therefore be taken and the government would ask from Parliament a legislative declaration that a reasonable minimum wage, accompanied by adequate safeguards for the protection of the employer, should be a statutory term of the contract of employment of people who are engaged underground in coal mining. Mr. Asquith indicated that the district minimum should be locally fixed by a joint board in each district consisting of representatives of employers and employees, with a neutral and independent chairman who might be selected by the parties themselves, or if necessary, by the government. In the opinion of the government such a body would afford what they have regarded as all-important — the means of securing finality.

Byproduct Coke Ovens

A list of byproduct coke ovens in the United States has several times been asked for. The following (Circular No. 97, U. S. Dept. of Agriculture) gives the list as of Jan. 1, 1910:

SEMET-SOLVAY OVENS—Solvay Process Co., Syracuse, N. Y.; Semet-Solvay Co., Pennsylvania Steel Co., Steelton, Penn., also Lebanon, Penn.; Semet-Solvay Co., National Tube Co., Benwood, W. Va.; Semet-Solvay Co., Milwaukee Coke & Gas Co., Milwaukee, Wis.; Semet-Solvay Co., Detroit, Mich., also Ensley, Ala.; By-Products Coke Corporation, South Chicago, Ill.; Semet-Solvay Co., Empire Coke Co., Geneva, N. Y.; Semet-Solvay Co., Dunbar Furnace Co., Dunbar, Penn.; Semet-Solvay Co., Central Iron & Coke Co., Tuscaloosa, Ala.; Philadelphia Suburban Gas & Electric Co., Chester, Penn.

OTTO-HOFFMANN OVENS—New England Gas & Coke Co., Everett, Mass.; Lackawanna Steel Co., Lebanon, Penn.; Dominion Tar & Chemical Co., Sydney, Nova Scotia; Hamilton-Otto Coke Co., Hamilton, Ohio. The following use both the Otto-Hoffmann and United Otto: Camden Coke Co., Camden, N. J.; Cambria Steel Co., Johnstown, Penn.

UNITED OTTO—Carnegie Steel Co., South Sharon, Penn.; Maryland Steel Co., Sparrows Point, Md.; Citizens Gas Co., Indianapolis, Ind.; Pittsburgh Gas & Coke Co., United Coke & Gas Co., Glassport, Penn.; Zenith Furnace Co., Duluth, Minn. The Lackawanna Steel Co. at its Buffalo, N. Y., plant uses both the United Otto and the Rothberg ovens.

KOPPERS—Illinois Steel Co., Joliet, Ill., and Indiana Steel Co., Gary, Ind.

Miner's Night at Pottsville, Y. M. C. A.

Over 800 miners spent Saturday night Mar. 16, as the guests of the Pottsville Y. M. C. A. There were superintendents and managers; foremen and laborers; breaker boys and helpers of every kind; men of all nationalities and degrees of learning.

The special attractions of the evening were the games in the gymnasium. These were witnessed by an audience that taxed every part of the large room.

The opening number was a series of games of volley ball between the business men and senior class men from the association. The second attraction was a game of basket ball between teams picked from the best men in the Association league. The last game had great interest for the visitors, as it was played by men from the collieries. It was a game of indoor base ball, one side captained by Potts, with men from Supt. Kaercher's district; and the other side captained by Mader, with men from Supt. Hadesty's district. It was a fast game and the men, although new to it, showed great proficiency. Potts' team won by a score of 15 to 9.

The Problem of Mine Timbering

By R. B. Woodworth*

The use of steel in the mines is discussed with regard to the proper commercial forms for certain classes of work, general methods of design and the cost of manufacture and installation. This is the fourth of a series of articles on mine timbering.

*Engineer with the Carnegie Steel Co., Pittsburg, Penn.

Note—Paper read before the Kentucky Mining Institute, Lexington, Ky., Dec. 11, 1911.

From a theoretical point of view, structural steel is the best all around material for use in mine timbering. However, the steel mills roll this material in a mulptiplicity of shapes and experience has to tell us which shapes may be used most economically, as well as whether or not the use of these shapes has solved the timbering problem to the satisfaction of the principles of scientific management.

For obvious reasons, rails were the first form of steel to be used in the mines for roof supports; and they were so used in the mines of Commentry, France, as far back as 1878. They have often been used in the mines of this country as plain bars; and I have seen them fabricated into gangway supports in the Chapin mine of the Oliver Iron Mining Co., at Iron Mountain, Mich. They have been used also as stuttles between the steel ring sets of rectagular shafts in the iron-mining districts of Minnesota and Michigan. Rails are of small depth and consequent low efficency pound for pound of material used. Owing to high carbon content, they also break easily. In the Commentry Mines they were displaced by rectangular iron bars 3.15 in. deep by 1.18 in. thick and 12 ft. long. These had the requisite vertical strength, were easily straightened, and in 1889 some of them had been re-used 200 times. Bars, however, are weak transversely and fail by sidewise deflection under compressive stress in the top fibers long before the real strength of the material is fully developed.

Long experience indicates that where cross bending stresses have to be resited, as in roof supports or in the collar of the three-piece gangway set, no form of section is more economical than the standard I-beam, which combines a high degree of resistance to bending and sufficient resistance to lateral deflection, with a minimum weight of metal. The I-beam is not, however, the best section to use for props, the legs of gangway supports, buntons and compartment dividers in shaft framing, wall plates in rectangular shaft sets or for any member that has to take pure compression or combined compression and cross bending, because the beams least radius of gyration is low and there is here required a shape that is equally strong about both axes of symmetry.

Hollow tubes possess the quality of equal strength in all directions in a theoretically ideal manner but suffer from the disadvantages of their relatively high cost of manufacture and the practical difficulties attendant upon fabrication. While hollow tubes, therefore may economically be used for props, as they have been, especially in the collapsible form, they are not adapted to the other more varied uses in frames.

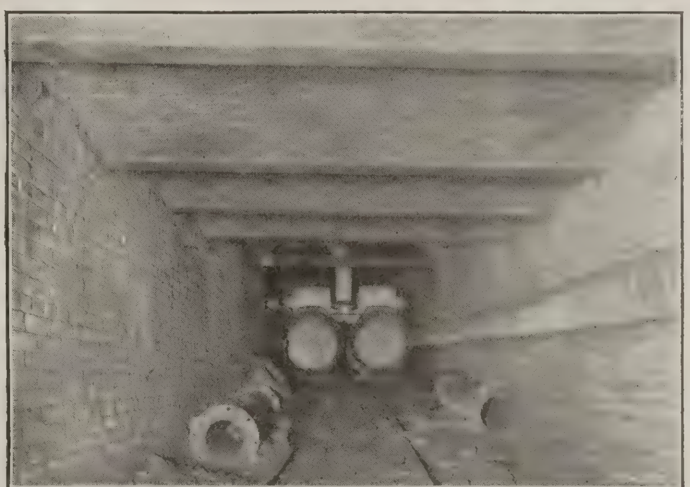
Properties of the H Section

The ideal section of sufficient strength for most mine-timber framing conditions is the H-beam. This form of rolled shape possesses a large radius of gyration and, in comparison with its weight, the most economical distribution of material to resist pure compression or combined stresses. A distinct advance in the use of metal for mine timbering in England, was inaugurated by the rolling of an H section in 1885 by the Darlington Iron and Steel Co. A like impetus to the use of steel in the mines of the United States was given in 1907 when, after careful investigation of the mine timber situation, the Carnegie Steel Co. began to roll 4, 5, 6 and 8 in. H-beams with especial reference to the needs of the mines.

As early as April 7th, 1894, the Carnegie Company had called attention to the theoretical economic advantages that would follow the application of steel to mine timbering. The timber situation, however, was not then so critical as now and neither had it been shown that the use of wood in many cases entails large economic wastes. The favor with which these sections have since been received and the success which has attended their use has demonstrated their peculiar fitness for this work. Industrial progress often waits upon the proper solution of its problems and the exact satisfaction of its fundamental needs.

The H-beam is, therefore, the proper shape to use for the legs of the three-piece gangway supports, the wall plates of rectangular shaft sets, for buntons in all types of shaft framing, whether circular, elliptical or rectangular, for

Interior View of Mine, Moshannon Coal Co., Oceola Mills, Penn.



Steel Roof Supports and Brick Arches, Leggitt's Creek Colliery, Scranton, Penn.

mine props and for mud sills under gangway supports in swelling ground. It has also been used for cage guides both with and without cast steel safety racks. In rectangular shaft framing its broad bearing surfaces render wedging simple and secure.

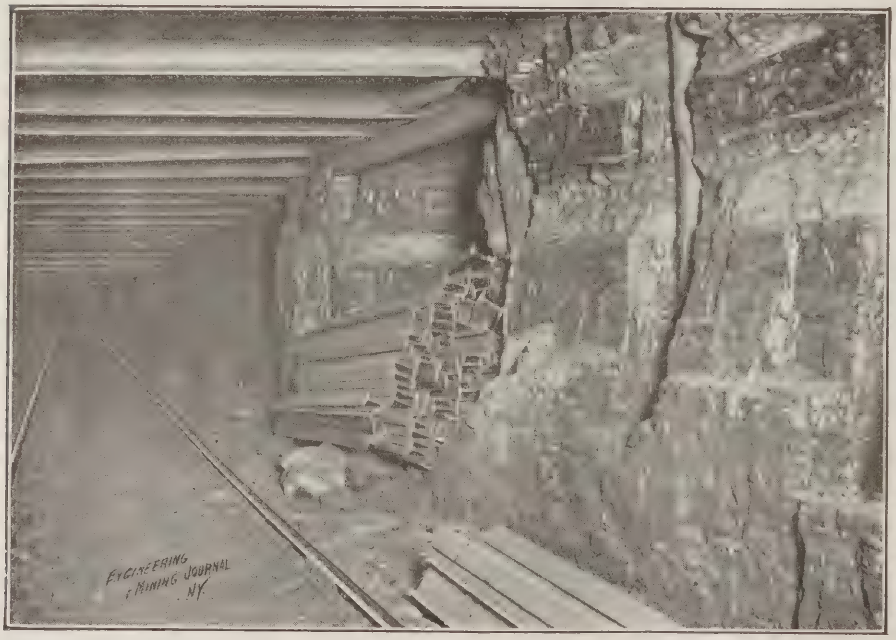
The rolled steel angle makes an ideal stuttle, calculated to take either tension or compression—tension when the framing hangs from the bearers above, compression when the weight of the framing is carried to the bearers below. Its use obviates the need of hanging rods during the process of sinking. The angle also makes an efficient leg in a gangway support when the loads are light, or if desired, the rolled steel tee may be used for this purpose.

Lagging, if of metal, may be made of boiler plate (used in England as far back as 1886) corrugated sheets or, where extreme strength is needed, of buckle plates. The thin concrete slab, however, may well be used where acid water is present, either plain, or reinforced with expanded metal, wire mesh, or rods.

In repairing the rectangular shaft at the Mt. Lookout colliery of the Temple Iron Co. near Wilkes-Barre, Penn. in 1907, a steel lining was carried 50 ft. to rock, and made of 12 in. steel channels placed edge to edge. A similar lining was used in 1894 between two levels at the Grimsby Iron Ore Mine in the Siegen District, Prussia. Such a lining is not beyond right reason even in circular or elliptical shafts. In fact, circular steel segments, exact duplicates of the cast iron circular segments, were installed in an experimental way in one of the tunnels of the Hudson and Manhattan Railway, Jersey City, N. J., in 1909. Structurally the subaqueous tunnel and the circular shaft are identical and there is no economic reason why English or German tubbing should not be replaced by circular steel segments made of channels or built up of boiler plate webs and angle iron ribs, the thickness of the webs and ribs increasing with the depth of the shaft if necessary.

If boiler plate may be economically used in a tank many feet high to keep water in, it may, on a parity of reasoning, be used in a shaft many feet deep to keep water out, the stresses being the same and their effects on the lining alike. Indeed, at the Detroit River Tunnel of the Lake Shore and Michigan Southern Ry., completed in 1910, the shore approaches were made of circular cast iron segments while the portion under the river was made of twin riveted boiler plate tubes.

Concrete Mine Portal, Oceola Mills, Penn.



Steel Beams, Boggs Mine, Barton, Ohio

Cost of Fabrication

Steel beams for roof supports may be used just as they come, cut to length, from the rolling mill; all the other types of mine timbering need to be fabricated, that is, framed and fitted, before they are ready for use in the mines. A most important consideration is to reduce the cost of this fabrication to the lowest possible amount by simplification of the details. Blacksmith work always should

TABLE 1. STEEL GANGWAY SUPPORTS FOR A DOUBLE TRACK GANGWAY

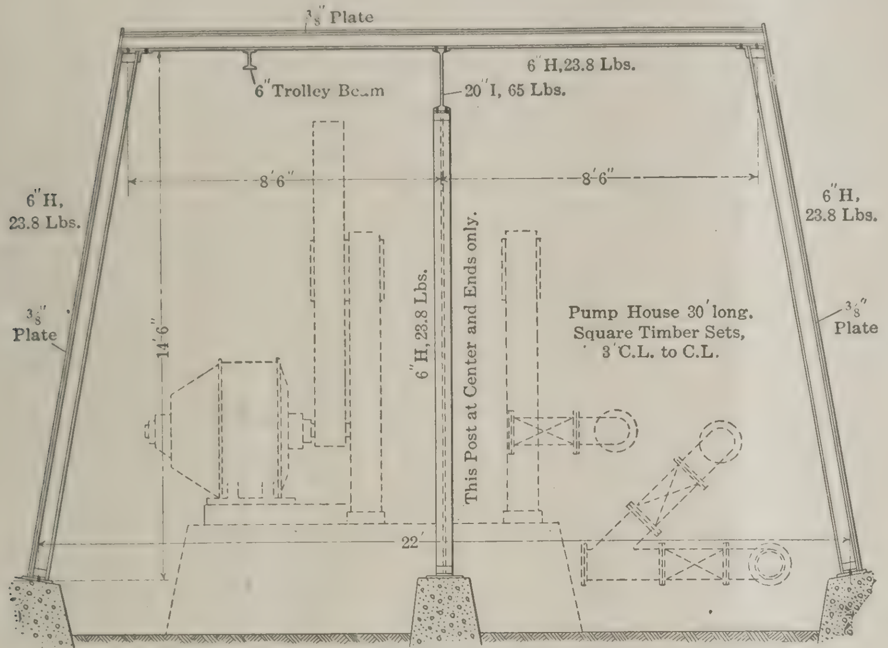
Collar 17 ft. long between legs; legs 10 ft. 6 in. high in the clear; equivalent in strength to 24 in. round long leaf yellow pine timbers.

Style	Size of Collar	Size of Pegs	Weight per Set Without Base, Lb.	Weight per Set With Base, Lb.	Cost per Set Without Base Dollars per Set	Cost per Set With Base Plates, Dollars per Set
B	20″ 65-lb. beam	2-7″ C.—14.75 lb.	1930	2030	36.82	39.48
D	20″ 65-lb. beam	2-7″ C.—14.75 lb.	1930	2100	36.82	43.95
C	20″ 65-lb. beam	1-8″ H.—34.6 lb.	1710	1800	25.39	27.80
A	20″ 65-lb. beam	2-7″ C.—14.75 lb.	1930	2500	36.82	58.50
F	20″ 65-lb. beam	1-8″ H.—34.6 lb.	1690	1730	25.81	26.88
I	20″ 65-lb. beam	1-8″ H.—34.6 lb.	1730	1780	25.22	27.12
E	20″ 65-lb. beam	2-7″ C.—14.75 lb.	1670	1770	25.94	28.60
G	20″ 65-lb. beam	1-8″ H.—34.6 lb.	1690	1730	25.81	26.88

be avoided; and that form of framing is the cheapest in which the fitting shop work is the simplest. Intelligent skill in structural design here means great saving.

In my investigations, eight different types of framing for steel gangway supports have come into serious consideration. With plain material at 1.25c. per pound f.o.b. cars Pittsburgh, and the usual extras for workmanship, the comparative costs of these styles are shown in tables 1 and 2, from which can be seen at a glance how great a part attention to details may play in the economic use of materials and the avoidance of unnecessary work in fabrication. The eight sets of each table are all of equivalent theoretical strength.

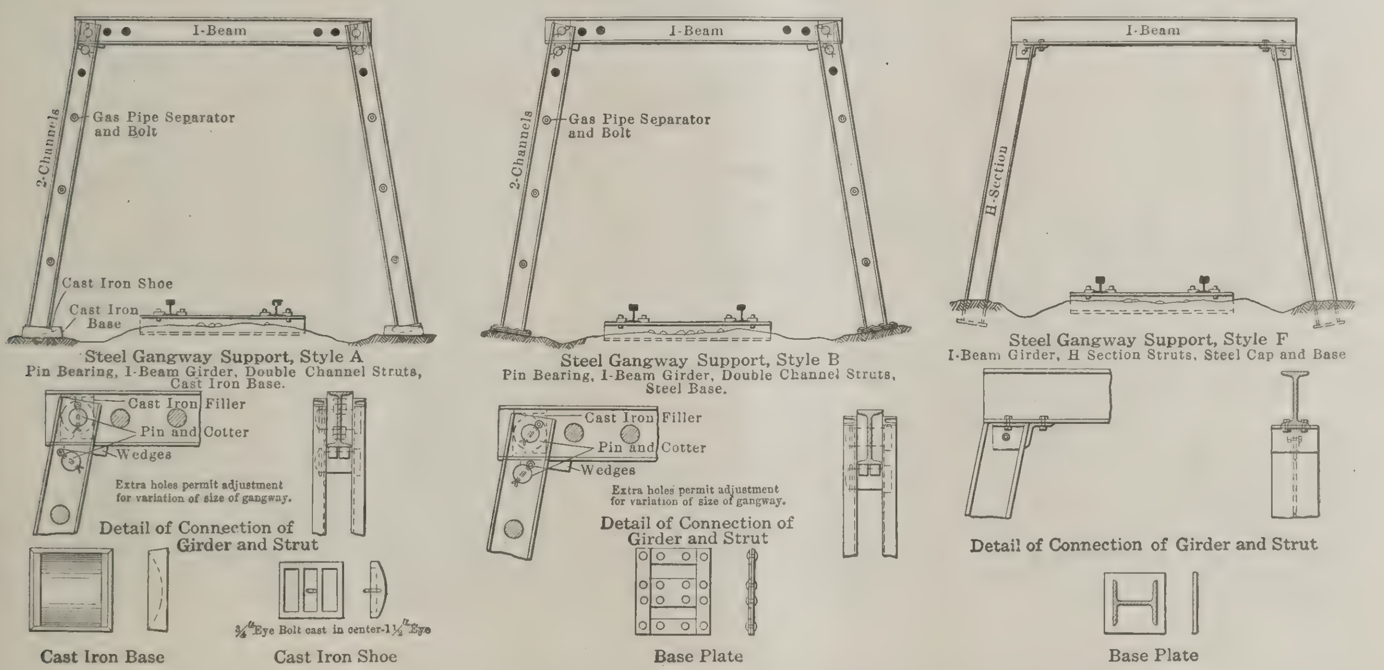
The figures in these two tables do not include painting. The cost for this varies considerably with the kind of paint used but may be estimated at $2.00 per ton.



FRAMING OF STEEL TIMBER SETS FOR PUMP ROOM

Electric Lamps in Mines

The Philadelphia & Reading Coal and Iron Company leads in the use of electric mine lights. Over 500 miners in their employ are now using this type of lamp. The lamp in question, a two-volt, three candlepower construction, will burn 12 hours. It weighs only two pounds and is easily worn under mine conditions. A reflector throws the light forward, giving a good view of haulageways, roofs, chambers and the coal to be mined. By their use, difficult work, such as that required in narrow and poorly ventilated breasts, which formerly took two weeks, can now be done in three days, as the miners are free from the evil odors of open-flame lights burning in a narrow space, and in addition they have a steady, bright light to work by. The rules of the Reading company demand the use of electric lights around all breakers, mine stables or other buildings, where a spark from an open light might cause a fire.



VARIOUS METHODS OF FRAMING AND INSTALLING STEEL GANGWAY SUPPORTS

TABLE 2. STEEL GANGWAY SUPPORTS FOR A SINGLE TRACK GANGWAY

Collar 10 ft. long between legs; legs 8 ft. high in the clear; equivalent in strength to 15 in. round long leaf yellow pine timbers.

Style	Size of Collar	Size of Legs	Weight per Set Without Base, Lb.	Weight per Set With Base, Lb.	Cost per Set Without Base Dollars, per Set	Cost per Set With Base Plates, Dollars, per Set
A	10″ 25-lb. beam	2–6″ C.—10.5 lb.	765	945	14.81	23.17
D	10″ 25-lb. beam	2–6″ C.—10.5 lb.	765	800	14.81	15.85
B	10″ 25-lb. beam	2–6″ C.—10.5 lb.	765	810	14.81	16.12
E	10″ 25-lb. beam	2–6″ C.—10.5 lb.	605	660	9.39	10.87
F	10″ 25-lb. beam	1–5″ H.—18.7 lb.	569	590	8.84	9.43
G	10″ 25-lb. beam	1–5″ H.—18.7 lb.	566	587	8.80	9.39
C	10″ 25-lb. beam	1–5″ H.—18.7 lb.	565	605	7.91	9.04
I	10″ 25-lb. beam	1–5″ H.—18.7 lb.	600	630	9.80	11.11

Explosion at Sans Bois Mine No. 2

The Sans Bois mine at Chant, Oklahoma, was the seat of a severe explosion on March 20 in which 80 men were killed and 25 were rescued or escaped. Fourteen men saved themselves by breathing the air escaping from a compressed-air pump. Gas was probably the main factor in the explosion.

The Sans Bois mine No. 2 is situated at Chant, Haskell County, Okla., about 37 miles from Fort Smith, Ark., this latter city being quite close to the state line. The village of Chant is reached by the Fort Smith & Western R.R., and has a population of about 1200 inhabitants.

Use of Explosives

Though the largest of the three mines belonging to the Sans Bois Coal Co., it is not a big producer. In the fiscal year between July 1, 1909, and June 30, 1910, the output of the mine was 70,195 tons. Ninety-five miners were employed, with 57 other inside men. Adding thereto 22 men who were employed on the outside, the total force ran up to 174 men. Two significant figures are given for that year's operation; 6260 lb. of dynamite and 1045 kegs of powder were used in blasting. The proportion of slack, as might be expected, was also abnormally high. Out of 70,195 tons shipped, 35,603 tons were of pea and slack sizes. Disregarding the large amount of dynamite mentioned, nearly 2¾ lb. of powder were used per ton of coal sent to the tipple.

Presence of Firedamp

The main entry of the mine is used as a hoisting slope and the headings are turned off directly from it to the north and south. The mine, especially on the south side, has suffered from severe squeezes. For ventilating purposes a fan is provided. The mine generates firedamp and there have been two unimportant explosions before. On Dec. 30, 1909, an explosion occurred, killing an Austrian shotfirer, and within that same week, another shotfirer, this time an Italian, was killed. It was stated by the inspector that the mine was very dry and dusty after these explosions, and instructions were left that the accumulations of dust should be loaded out and the rooms and entries sprinkled before resuming operations. Both the little explosions referred to were alleged to have originated from blown-out shots.

It is customary to sprinkle the headings and it appears that water pipes were laid for that purpose. Yet, in the year before the explosions just referred to, one complaint was made of the need for sprinkling. To mining men in other states, not so strict as Oklahoma in this matter, it might be interesting to call attention to recommendations made in May, 1909, to the effect that the company was employing more than 45 men in one air current. The company was urged to build a new overcast, that the danger resulting from having so many men in one split might be reduced.

The Explosion

The explosion occurred on Mar. 20, at 9:05 a.m., probably in the entry known as the Ninth level. About 105 men were then underground. Eleven of these escaped by a manway, located about 200 yd. from the entrance. Of these, nine, who were working in the South Fifth level, did not hear the report, but the dense smoke which soon reached them gave them warning that an explosion had occurred. They immediately made their way out. One man, who later staggered to the drift mouth unaided, was walking in an entry when the explosion took place. Hearing the sound, he leapt into a disused room, and the fiery blast passed by him. Another man, a "rope rider," was on a trip of cars when the explosion occurred. Fortunately, that trip was leaving the mine, and the man came safely to the surface.

The Tipple and Drift Mouth Sans Bois Mine No. 2 at Chant, Okla.

The Rescued

The work of rescuing began at once, and a boy named John Golivas was the first one to be brought out. It was thought at that time that everyone still

remaining in the mine was dead, so complete was the demolition of the mine workings. But about noon of the following day, 25 hours after the explosion occurred, tappings were heard on a pipe line. Fourteen men were found huddled in a little pump hole, measuring 8x10 ft. They had been thoughtful enough to gather around a water pump, which was driven by air, the flow of which had not been cut off by the explosion. To shield themselves from the foul air of the entries, they had hung a curtain over the mouth of the pump hole. They removed the valve covers from the top of the pump and were piled over one another in the endeavor to breathe in as much as possible of its life-saving air. As one man after another grew faint, his fellows held him over the top of the pump until he was revived by the fresh air driven into the mine by the compressor.

To add to the difficulties of the terrible situation, the water rose in the pump hole and lay, it is said, 6 in. deep all over the floor. It is possible that the presence of the water in this part of the mine reduced the destructive action of the explosion and served later by its absorptive qualities to purify the foul air.

Despite his precarious condition and the certain perils to which exploration would expose him, one man made two unsuccessful trips to try and rescue his brother, each time dragging back a lifeless man. He was so overcome by his exertions in the foul air that when he was rescued he, with three others, had to be carried out.

Eighty Men Are Killed

The fourteen men rescued, together with the eleven men who escaped, make up the quota of men who returned alive from Wednesday's work in mine No. 2. Eighty men are believed to have perished, and 69 bodies have already been taken out. However, one of the 14 rescued from the pump room, a boy of 16 years of age, who was of the surveying corps of W. D. Roper, died after reaching the surface. At first he was partially insensible. His senses returned and he related his experiences, but suddenly a pallor spread over his face and before he could be seized he fell heavily to the ground. The shock had been too severe for him to withstand.

John Kokoski and Frank Scott were the first men who reached the pump hole, and at first they fought for the air. But gradually more noble impulses prevailed and they left their place of security to hunt for other men, that they might give up to them a part of that air which might well have proved insufficient for themselves.

Among those killed was W. D. Roper, a surveyor, of Cleo, N. C., formerly a professor in a Georgia military academy and much respected in that section. The men killed were of various nationalities, American, Austrian and Italian. The chief inspector, E. Boyle, it is said, declared that the explosion resulted from gas, and that dust did not do much to augment its force and also that insufficient care was taken to prevent an explosion.

Side View of the Sans Bois Tipple No. 2 Mine

The Waiting Crowd at the Drift Mouth

Water-Tight Shaft Lining

An English method obtaining practically dry shafts consists in using cast-iron tubbing, the insertion of which forms a water-tight lining through the water-bearing strata. This holds back the feeders of water and provides against permanent pumping.

The tubbing consists of segments, cast to suit the circumference of the shaft and the pressure to which it is to be subjected. Usually 8 to 12 segments 4 ft. long and 18 to 36 in. deep are used. The smooth face of the segments forms the outside of the shaft and their inside face is strengthened with ribs or flanges. Each segment has at least one hole to allow the water and air to escape from behind while it is being driven into position. The thickness of such tubbing depends upon the diameter of the shaft and the vertical head; the head is usually reckoned as being equal to the depth of the shaft.

When tubbing is to be used, the shaft is put down until a good foundation is reached. Then a curb bed is prepared by hand; no blasting is done as it might disturb the bed and render it useless. After the curb bed has been carefully tested with a spirit level, a thin layer of tarred sheeting or tarred flannel is spread over it to act as a cushion between the curb and rock; the curb is then laid and fitted together with deal-sheeting between each point.

Wedges of dry yellow pine, with the grain vertical, are then driven down behind the curb until the space between the rock and the curb is filled. Harder, and thinner, oak wedges are then driven into all crevices in the pack until it is impossible to drive more; steel wedges are then driven into the pack, and in the spaces thus created, more hard-wood wedges are driven.

It is absolutely necessary that the curb be exactly level and that the exact center of the curb and shaft coincide. After the curbing is set and wedged into position, layers of elm, fir or deal-sheeting are placed on top and the segments of tubbing lowered and wedged into position. Any space between the shaft and the tubbing is filled with concrete for the first few rings, puddled clay being used for the remainder.

After one ring of tubbing has been wedged up, a layer of sheeting is placed on the top flange and the next ring laid. The vertical joints are wedged first, beginning at the bottom and working up, and the horizontal joints wedged last. When the wedging is finished, the hole made in each segment for the escape of air and water is stopped with a wooden plug driven in tight. A relief valve is located in the top ring of the tubbing to allow the air to escape so that the plates will not be forced out of position.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

Few men in the coal industry of this country have advanced to a position of high responsibility with such rapidity as has Carl Scholz. Born in Germany 40 years ago, his early education was obtained in the private schools of the Duke of Hohenlohe, at Slaventzitz, where he spent six years.

This early education was succeeded by two years of training under Professor Schmiedcke in the upper Silesian Mining School at Tarnowitz; following this, Mr. Scholz worked two years at the mines, partly as a practical miner, and the remainder of the time in the laboratories and offices, always under the direction of the mining school.

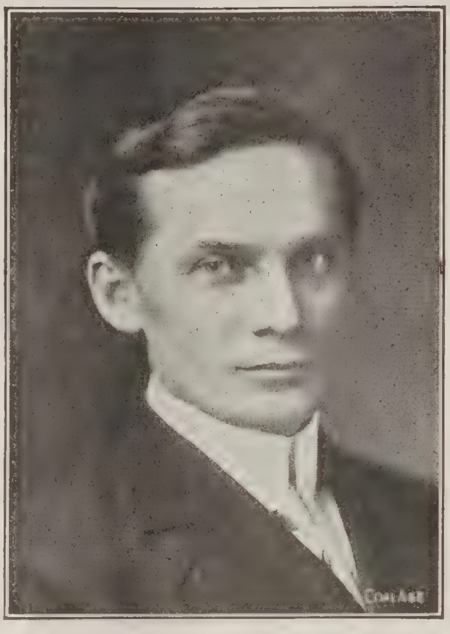
Perhaps it was his German training, administered with military precision, or probably the cause is an inherited racial characteristic, but the fact remains that Carl Scholz is 110 per cent. efficient in the matter of observing details. If each man possesses some special ability that is a key to the door of success, then a keenness for small essentials is the pass that slipped the lock for Carl.

There's any number of systems for accounting costs of mining, but few coal companies have skeleton forms superior to those adopted by Mr. Scholz. And right here let me say that his policy is to spend more than the average amount of money on the preparation of fortnightly operation charge sheets, and economize, if necessary, on some less important work. Each superintendent, therefore, is always informed where leaks exist and where attention is needed.

When Carl Scholz first came to this country, he secured employment as assistant mining engineer with the Mount Carbon Company at Powellton, W. Va. Subsequently, a partnership was formed between Mr. Scholz and James R. Thomas, the latter well known at Charleston, W. Va. Together they opened up a number of mines, being among the first to sink shafts in certain parts of the splint- and gas-coal districts of that state.

Several of these properties were afterward sold by Messrs. Thomas and Scholz to the Sunday Creek Coal Co., and in 1902, some of the men connected with the Rock Island railroad, persuaded Mr. Scholz to take up the management of its coal properties located in Oklahoma.

Gradually he became the executive in charge of all its different mining interests, until, at the present time, he is president of the Rock Island Coal Mining Company and of the Coal Valley Mining Company; vice-president of the Consolidated Indiana Coal Company and manager of the Mining Bureau of the Chicago, Rock Island & Pacific Railroad.



CARL SCHOLZ

In recent years, Carl Scholz has supplied the U. S. Geological Survey valuable information on the geology of the various sections of the country in which he is actively interested. His work as a mining engineer and scientist was well recognized by the government in 1910, when he visited the British Isles, France, Belgium and Germany, under the auspices of the Federal Bureau of Mines.

As consulting engineer for that department, his investigations were chiefly confined to a practical and scientific analysis of the foreign laws governing the operation of coal mines. Attention was paid to discipline in the mines, prevention of accidents and waste in mining, employer's liability and the German selling syndicates.

One of the hobbies of "C. S." is his advocacy of better regulated methods for selling the fuel production of our collieries. He applauds the German Syndicate system which handles the bulk of that country's output without subjecting the product to the losses and waste incurred through suicidal competition, such as has existed in our own bituminous industry. He says the German method has placed the coal industry in that country on a basis that enables the operators to mine at a reasonable profit, in consequence of which they are able to pay their employees a fair wage and to furnish better protection against injury. The coal consumer benefits through the elimination of fluctuations in price. The large user does not secure a low price at the expense of the small buyer.

When it comes to technical problems that have a direct bearing on present coal practice, our friend Carl looms brightly as a man of fixed and original ideas.

In answer to the question as to whether or not we should reverse a fan in time of distress, Carl says, "*No Never*—Not only do not reverse them, but don't even make them so they can be reversed." He would like somebody to tell him when a fan was ever reversed with beneficial results. Says he can point out dozens of instances where lives were unnecessarily sacrificed by such a maneuver. Declares that miners become creatures of habit; that they soon learn the return and intake airways, and in time of danger instinctively rush toward fresh air.

He further states that no plan is possible whereby men imprisoned underground can be notified that the system of ventilation has been changed. Says if any action at all is necessary, the fan can be stopped and this will accomplish all that is needed. In support of such opinions, Mr. Scholz is now installing only non-reversible fans, cutting his fan installation cost practically in half and in addition removing what he considers a useless danger.

In opening an immense field in Iowa, "Carl S." is putting into effect a number of ideas that are ultra-modern as coal practice in this country goes. The chief point of interest, perhaps, is his plan for using only electric hoists. He figures that the present type of steam-hoisting engine will consume on an average from 100 to 125 lb. of steam per effective horsepower; his plan for an electric hoist driven by condensing engines and including conversion losses, entails the use of only 25 lb. or steam. Thus only about 20 per cent. as much fuel is required.

As to first cost, he says the electric hoist will figure two or three times as much, but if electricity is needed for other purposes and a central power station is built, the saving that will result almost immediately will reimburse for the higher initial expenditure. He states the advantages of electric hoisting as, better control, greater safety, economy in steam consumption, lower maintenance charges and reduction in space required.

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Of this issue of Coal Age, we will print 7000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

The Labor Situation

There has been no change in the anthracite-coal controversy, and up to the present time the bituminous operators and labor leaders who are in conference in Cleveland have not reached an agreement. The chief development of the past few days is the weak and faltering policy of the bituminous operators. At the commencement of the present negotiations, the soft-coal mine owners had an excellent case, and there was every reason to anticipate that a favorable compromise would be reached with the union miners. Whether it is leadership or what not, the bituminous operators have receded from their position a half dozen times in less than that number of days.

In direct contrast to the action of the soft-coal men was the conduct of the anthracite operators in their meeting with the miners' leaders. There was no irresolution or unsteadiness of purpose when the hard-coal people met Mr. White and his lieutenants in New York. The miners did not smile and leave town filled with the idea that they controlled the outcome of the situation. They know now that whatever concessions they win in the anthracite field will come after a struggle that will test both their strength and the merits of their demands.

At Cleveland, the representatives of the bituminous mine owners started by first conceding the elimination of their demand for a 10 per cent. reduction in wages. Other backdowns followed in rapid succession and this action as a whole was supplemented by dissension within their own ranks. It is probable that Illinois as usual will be the goat when an agreement is reached.

It almost seems as though the hands of fate were busy shaping the course of events to suit the wishes of the mine workers. The latter started with slight prospect of forcing their demands to a successful conclusion. All economic conditions were against them; their finances were low, 90 per cent. of the hard-coal workers opposed the strike and 75 per cent. of the miners in the bituminous fields were adverse to a shutdown. A strong bluff constituted about all the artillery the miners possessed. It now appears the soft-coal operators did not have even that strong a hand to play.

The railroads of the country consume a lot of coal, and the bituminous operators, because of their strenuous efforts to obtain rate reductions, are not on any too friendly terms with the soft-coal carrying roads. Probably these same operators realize that the railroads will seriously oppose any advance in the price of the coal they purchase at the present time, when they have just been compelled to concede material reductions in their carrying charges. If the operators can have it appear that any advance they give has been forced by the miners, aided in their fight by public opinion, then, so the coal owners figure, a better face will be put on the entire matter and consumers will be more likely to stand for a raise in the price of coal.

The situation in the anthracite field, however, does not promise so well for the miners' side of the controversy. And it is in this district particularly that the union wants to strengthen its position. The only recognition given them by the hard-coal operators is comprised entirely in the action of the conciliation board, which commission was created to settle disputes between the employers and the men. There is absolutely no hope of the union leaders securing any further recognition here, whether it is in the form of a "check-off" system or any other principle that would bring about the same result.

The situation, therefore, with the exception of the change in the front of the soft-coal owners, remains practically the same as when the negotiations first started. The outlook is for a settlement in the bituminous states, perhaps after a short suspension, with possibly a slight advance in wages (probably 5c. per ton) awarded the miners. In the anthracite field the chances are for a suspension, the outcome of which it is difficult to prophesy.

There is little doubt but that the hard-coal owners will try to break the strike shortly after a suspension occurs. The employers know of the feeling that exists among the miners and they will take advantage of this desire on the part of their employees to remain at work. The operators can point to the prosperity that has resulted in northeastern Pennsylvania from a cessation of serious labor disputes. The men themselves realize better than anybody else that they are not the overworked, underpaid class of employees that some writers would have us believe.

It is therefore quite probable the miners will lose in their struggle and it is possible the suspension will not be as long extended as many of us at first believed. The threatened danger, however, may not end with the demolition of the United Mine Workers of America in the anthracite industry. There is another great industrial organization of workers that is planning and would be greatly pleased to see the union of the mine employees destroyed. The federation I refer to is closely allied, in fact it is really a part of a certain political party, and if the campaign as outlined by the labor leaders who are opposed to the present mine workers' organization, can be carried to a successful conclusion, a second strike fostered and financed by a body of men who have just come out of a winning fight in another industry, will be precipitated several weeks prior to the November elections, and before a normal supply of coal can be restored.

The chief difficulty to the consummation of any such comprehensive plan will be found in the attitude of the more intelligent class of miners working in the northern anthracite field. These men, mostly Welsh and generally of a high order of intelligence and efficiency, are already supporters of the old political parties and are not so easily led by radical socialistic propaganda.

Without in any way attempting to assume the position of an alarmist, we do believe the situation bears watching, and it is likely the outcome may differ a little from what many of us anticipate. There is an undercurrent of thought prevalent today wherever men work with their hands, and history has shown that oftentimes a monster structure has arisen from the ruins of some smaller and less imposing edifice. It is a question whether the miners' union should be destroyed even if such a result can be effected.

The Technical Graduate

Gradually the technical graduate is working his way toward the reconstruction of the mining industry. Years ago, when the so called practical man filled every important official position, any devices requiring technical training for installation or operating were ruthlessly denounced. They had been built, installed, operated and supervised by the inexpert and had naturally been found grievously wanting. Today developments in every line have made the graduate indispensable. His future as director of the industry is no longer in doubt.

Unfortunately, there is some good ground for abuse of the graduate, viewed as that raw product emerges from the mill. We do not refer to his overweening confidence, his arrogance, his inability to learn from the evidences of his eyes, his proneness to discount all wisdom save that proclaimed from cap and gown, his lack of the mellowing influences of experience, or even to his contemptuous attitude to all things mundane after a long sojourn in marble halls. These are personal faults, not subject to academic correction, but there is a more belittling fault than all of these.

The difficulty with the boy graduate arises from the failure of the average professor to score and underscore the primary essentials of academic teaching. Before the graduate has been one day on the job, he has discovered that some fact, known to every rodman or engine hostler, has evaded him. He has been taught all he needs to know about it, more, perhaps, than he will ever need to know, but this essential fact has been overlooked. All his teaching has been in double-leaded type, and he has been expected without experience to separate the essential from that which is merely valuable. He has felt that he could not carry the whole mass of information so prodigally bestowed on him, and he has chosen blindly that which his brain cells have most readily accommodated. He finds too late that his choice uncontrolled was grievously ill advised.

The graduate is thus rebuffed and put at a disadvantage at the very threshold of his career. His solution of equations of higher degree, his calculus and his stress analyses are above his critics, but this one thing, this one essential, is not possessed, and all his college training is condemned.

We think the college faculties could rectify this matter by making careful inquiry of the students as to the lack of knowledge which first confounded them. Why not ask some man of broad knowledge just what a young man should know before all else, to make a good appearance when he enters the practical life? And having such knowledge, the students in the senior year should be carefully examined and made to answer such questions unfalteringly, making absolutely no mistakes. If the student fails he can be reëxamined, coached and helped in every way so that he will enter his profession with at least the stock-in-trade of the office blueprinter, the chainman or the engine swabber.

What's In a Heading?

Even editors are occasionally imbued with feelings, and we must confess to a distinct shock to our own on reading the following head lines in the *Weekly Courier,* of Mar. 21:

U. S. MINE BUREAU HAS ITS MARTYRS

Two Trained Rescuers Have Given Up Their Lives in Action

Dr. Holmes Is Well Pleased

We believe we know Dr. Holmes well enough to emphatically deny that he is "well pleased," and we are sure we know the *Weekly Courier* well enough to anticipate its apology.

Contrary to general belief, editorial work is no sinecure, and its "rewards" are often the reverse of rewards. As the editor sits, in modest pride, reviewing the results of his labors in a current issue, his dreams are not infrequently dispelled by the receipt of a communication to the effect that "the crosscut between rooms 61 and 62 on the 32d Butt Entry off the 12th South Entry is shown slanting in the wrong direction!"

Strange as it seems, the more extraordinary errors are the ones that most frequently get through. For instance, the Associated Press once sent out a description of a gun fight in which the principals had shot each other to death. After describing all the bloody details, the dispatch concluded with, "it is believed the men had some misunderstanding."

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

The Fireboss Question

Much interest has been aroused by the discussion that has appeared in the columns of COAL AGE, relating to the work, qualifications and duties of the fireboss; and I beg to submit, in this connection, a few brief extracts from an address to firebosses and those aspiring to such position, delivered by James Home, at the semimonthly meeting of the New River Mining Institute, held at Scarboro, W. Va., Mar. 7, 1912. Mr. Home's remarks, in substance, were as follows:

In my opinion the fireboss is the chief guardian of any mine where his services are required. Some firebosses assume that their duties are merely to examine a mine for gas and note any derangement that may have taken place in the ventilation. These duties should be performed with great care, at all times. They cover, however, but a small portion of the dangerous conditions that should be detected by a keen, observant fireboss.

To reach a high standard of efficiency, the fireboss should be familiar with every circumstance occurring in the mine; and must have a thorough knowledge of all the difficulties to be encountered in the mining of coal. His judgment should be sound and he must have the courage of his own convictions. He should consult himself often concerning what action he would take in the event of a sudden outburst of gas, stoppage of the fan, choking of the airways by falls of roof or inflow of water, fire in any part of the mine, etc. Such a rehearsal of his actions beforehand is essential to make him cool headed and ready for action even if the process is only mentally performed. He would in all probability be able to employ some of the plans thus formed, when confronted with the real thing. While in the performance of his duties, he should be possessed of a feeling such as takes hold of the hunter when he enters the forest. The difference between them is, that the hunter is seized with a desire to destroy life, and in order to satisfy that desire he searches for a trace of any living thing, which he hopes to kill. The fireboss should be as deeply interested in his desire to save life and to discover any conditions that are dangerous, for the purpose of counteracting them and making the mine safe. I am sure there is as much inspiration to be found in the one as in the other.

Let us travel with the fireboss and see what are his duties. Arriving at the mine, three hours prior to the time of starting the shift, he carefully examines, fills and adjusts his safety lamp, visits the fan, makes a note of the water-gage barometer and thermometer readings, passes through the boiler and engine rooms, speaking to the fireman and engineer. If all is well, he erases the report on the bulletin board affixing the date of the present day, after which he descends into the mine. The absence of the O. K. on the board together with the instructions given the engineer and the locking of the travelingway gate will suffice to keep any unauthorized person from entering the mine until his return. He observes the condition of the shaft while slowly descending, and upon reaching the shaft bottom goes to the foot of the downcast to see if the usual volume of air is traveling in its proper course. Finding all satisfactory he proceeds into the mine, traveling with the intake air current, for the reason that should he encounter a mine fire or a large body of gas he has only to retreat a few steps to safety. Whereas were he approaching from the return side, his retreat from the danger zone would be less easily accomplished. As he advances, he examines all cavities in the roof, entrances to abandoned workings, and void places where gas would be likely to lodge and sees that all danger signals are in place. On arriving at the working face he observes the conditions there in detail, for it is here that 80 per cent. of the accidents occur. He not only examines each place for explosive gas, loose rock or coal, absence of timber or condition of the timbering, but he is observant to detect any dangerous practices on the part of miners in the manner of placing their shots, securing the roof and coal, and the general care taken of their working places. More lives have been sacrificed in coal mining through the indifference of mine officials to these last-mentioned dangers than from all other causes combined.

It may be asked how the fireboss is to detect these dangers while the miner is not actually engaged at his work. It is easy for any experienced fireboss to distinguish the difference between a prudent and careful miner's place where everything is neat and orderly, and the scene of disorder that prevails in a place worked by an ignorant or a careless miner. Holes drilled too deep, the absence of stemming material, huge lumps of coal thrown back 50 ft. from the face by the force of the blast, and the general ragged appearance of everything in the vicinity tell an unmistakable tale.

After examining each place in its turn for the dangers mentioned, and marking the date of inspection near the face, as evidence of his presence, the fireboss returns by the haulways, inspecting on his way the wiring and general condition of roof and the timbering and track. Having fenced off all unsafe places found and from which he was unable to remove the danger at the time, he ascends the shaft, makes a written report in the book kept for that purpose and marks the bulletin as it should be, O. K. or otherwise. It is the duty of the fireboss also to warn any man in whose place he has discovered any danger, and to make a verbal report to the mine foreman and stand ready to carry out that officials orders, during the remaining hours he is on duty.

One Who Has Firebossed.

Whipple, W. Va.

Normal Ventilation at Firing Time

I have read, with much interest, the letter of John Verner in the issue of Feb. 3. He draws attention to the fact that, where the workings have extended a considerable distance underground, mine explosions are less frequent than when mining is first commenced. This is an interesting conclusion, though Mr. Verner does not say emphatically that this extension of the workings is the sole cause of the reduction in the number of explosions. Yet he leads the reader to the inference that the ventilating current should be reduced in volume when shots are being fired.

The reductions in the quantity of moving air, in the cases Mr. Verner instances were not intentional but were caused by the extension of the mine workings without a corresponding increase in the volume of the air entering the mines. Of course, it is a natural consequence, that the air current is retarded when it meets with the extra friction of the lengthened airways. Nor is it less axiomatic that this will result in a slower feeding of the coal dust to the flame of an explosion. However, we should not forget that these considerations have solely to

do with the extension of the violence and have no influence on the primary ignition or explosion.

I am a strong advocate of fresh air, the more the better, within reason. Moreover, in the mines of Pennsylvania, if the fan is stopped or slowed down, the legal quantity of air will not be circulating. The law also requires the continuous operation of the fans or ventilators at a certain speed in accordance with a notice posted by the mine foreman. By this, with the approval of the mine inspector, the fan engineer must be guided. So there seems in the law of the state no provision made for variable air circulation.

The Results of Low Velocity

The velocity of the air is gaged to meet the normal requirements of the mine and unless the shots are fired after all the men have left the mine, the air will soon become cloudy and thick from the burning of the mine lamps and the breathing of the mules and men. Slowing a fan increases the danger. Doors are kept closed partly by the ventilating pressure existing when the fan is in operation. When this ventilating pressure is reduced a violent blast may partially open a door and in any event the door will be less forcibly closed and may pass what little air is flowing. When the fan is passing a small air current, regulators do not permit the same proportions of air to pass as they do when the air is normal. Thus the current is likely to be cut off some sections of the mine. If the fan is not merely slowed but stopped, natural ventilation may cause a reversal of the current. Such changes would be likely to make conditions ideal for explosions.

By decreasing the amount of air, we increase the gas present in the mine because while the evolution of gas continues constant, there is less air to dilute it and the gas is less rapidly removed from the mine. Hence by stopping or slowing the fan, we increase the percentage of the gas present and if we follow that reduction of ventilation by firing a number of shots, we arrange to have a dangerous condition of the atmosphere at the most critical period of the day's work.

Dangers of a Low Velocity

I am of the opinion that slowing the fan increases the dangers inherent to firing shots. When the current slows down the suspended dust is deposited on all exposed surfaces. When other shots are fired, a new accession of dust is created and this is also deposited. Had the current remained as strong as before, the dust already in suspension and that which is derived from the shotfiring would in turn have been swept out of the mine.

As a matter of precaution, we should keep all the dust we can loaded out. We should wet the faces and sides thoroughly near shot holes. All shots in any one working place should be fired simultaneously and the firing should commence at the end of the airway nearest the upcast or return entry.

R. Z. Virgin.

Johnstown, Penn.

Timber Framing for Heavy Side Pressures

Replying to the criticism offered by Mine Superintendent, Johnstown, Penn., as published in Coal Age, Feb. 24, page 651, permit me to say I am quite sure his method of timbering, as there shown, is all right for strength. I have used similar methods many times; but, in answering the original question, I had in mind a heading or drift where the room was limited. The method proposed by my critic would take up 2 or 3 ft. of space, which with the ever increasing size of the mine car would hardly be permissible.

Furthermore, "Mine Superintendent" has failed to read my statement correctly. He assumes that I suggested setting the post at an angle of 45 deg. from the perpendicular in order to support a side pressure. I suggested, in Coal Age, Jan. 20, page 490, that the cap should be cut at 45 deg. and the leg cut the same plus the batter. The batter of a post in a drift is generally 2 in. to the foot, sometimes less.

My critic will pardon me for stating that he is mistaken when he says, I would not get strength from the corner brace. If this is properly spiked and fitted to the timber frame, it would shorten the leg, and, from memory, I think the strength of a piece of timber is inversely as its length.

Joseph Virgin.

Plymouth, W. Va.

Drilling the Mine Floor

In your issue of Feb. 17, I notice an inquiry of an "Anxious Foreman," regarding "Cross Bar Timbering."

The method of support you suggest is O. K., but, if the pillars are not large enough, it will cause the floor of the mine to heave. I would suggest that "Anxious Foreman" should have holes drilled in the floor every 4 to 6 ft. along the entry to a depth of 3 or 4 ft., thus giving room for expansion. In fact, I think the longwall method of working would suit the conditions of the mine mentioned, better than room-and-pillar, as "Anxious Foreman" has 10 in. of draw slate available for packing. I have seen places driven wide under like conditions, which stood better than the narrow places.

David Fulton.

Marion, Ill.

Handling Material Excavated in Sinking Small Air Shafts

A novel method of sinking the small air shafts used in ventilating the lignite mines, at Hoyt, Wood County, Tex., was introduced in 1906, which reduced the cost of this work more than 50 per cent. This lignite lies at an average depth of 34 ft., under a cover of sand and clay, which in dry weather will stand in the shafts for weeks without caving. When the mines were first opened, fans were used for ventilating; but with the progress of mining and the drawing of the pillars, openings and cracks extended to the surface and much air was lost and the ventilation thereby weakened. In time, the fans were discarded and air shafts usually 4½x4½ ft. were sunk at suitable points in the mine and small brick furnaces installed to afford ventilation.

It occurred to the writer, in charge of the work, that if the dirt excavated from these shafts could be dropped into the mine through a drill hole in place of being loaded and hoisted in buckets, both time and money would be saved. This method was tried and proved so satisfactory that it was used afterward wherever possible. The general method of procedure was as follows:

After determining the location of the shaft underground, usually in a room-neck or in an opening driven especially for the purpose, a line was run to locate the point on the surface, and a 12-in. drill hole put down into the mine, at a cost of 20c. per ft. Two men, alternating each other in the shaft, and furnished with a couple of chisel-end picks, a short breast auger, tamping stick, dynamite and a tripod or windlass and rope, could sink 6 to 8 ft. per day, in ordinary ground. In damp ground, the drill hole often clogged or closed completely, owing to the damp earth adhering to the sides, and to keep it clear a knotted rope suspended in the hole was drawn up and down at intervals. When the ground was hard, half a stick of powder, fired in a 2½-ft. hole, in each corner of the shaft, made the digging easier and did not choke the drill hole as did heavier charges in deeper holes.

A pit car standing on the mine tracks under the hole caught the dirt and was replaced when full, by the drivers, as a part of their regular work. The dirt was used to grade the roads in the mine or was hoisted and sent to the dump. All the shafts were timbered with 2-in. oak plank set edge to edge, with the ends notched to fit into each other, all being cut from a single pattern. By this method of sinking and timbering, a shaft could be sunk and timbered at a total cost of between $1.75 and $2 per ft.

Nelson Blount.

New York City.

The Fireboss Question, A Mine Superintendent's View

In your issue of Mar. 9, I became much interested in the discussion by the various firebosses, pages 717 to 719, because I once filled that position myself. I have filled all the positions at various times in the anthracite region from slatepicker boy to mine superintendent, which is my present position; and when I look back to the eight years I spent in the capacity of fireboss, I cannot help but feel that their work is not fully understood by the average mine operator or superintendent. As a rule, these men have not filled the position themselves, and consequently fail to fully appreciate the services of firebosses.

"Fireboss," western Pennsylvania, truly suggests that the position of fireboss is often considered an unnecessary expense that operators are compelled to endure on account of the mine law. Let me say, the fireboss, if he is conscientious and faithful in the discharge of his duties, is one of the most valuable officials connected with the operation of a mine. He must be alert and fearless. But, you may say, all that is required of him is to see that the mine is free from gas. True, that is the only requirement within the purview of the law; but let us consider some of the responsibilities that devolve upon him and the dangers to which he is exposed in the daily discharge of his duties.

First, he must visit and examine all the breasts or working places in his district, any of which may contain gas in dangerous quantities, and this examination must be made before a miner is allowed to enter the mine. Not only must he test each place for gas, but he should examine the roof to see if it is sound and in safe condition. He should observe the props or posts to see that they are properly stood and have good cap pieces over them. If there is a parting or band of rock in the center of the coal seam, or if it be the custom to undermine the coal, he should examine to see whether or not the mining is too deep and the coal properly spragged. He should also observe whether or not the chamber is supplied with sufficient props and caps, which the miner may require during the day.

Picture the dangers to which the fireboss is exposed in making the rounds of these places. Rising each morning at 2 o'clock so that he may be on time at the foot of the shaft, he prepares for his lonely walk into a dangerous mine where death may be lurking in some chamber. The distance he must travel underground to reach his work is often two and may be three miles. Arriving at the first chamber on his rounds, he lowers his light and raises his lamp slowly toward the roof, watching the flame closely for any indication of gas. If none be found he places his mark, usually the figure indicating the day of the month, in a place that can be readily seen by the miner or mine foreman on entering the chamber.

Passing on to other working places, he is constantly reminded of the danger from falling roof or gas that he is liable to meet at any time. These dangers are greater, because in making his rounds he must hurry as the three hours required by law scarcely give him time to visit all the places in his district.

I have a distinct recollection of walking into breasts and being greeted with a rush of air caused by a fall in the place I was about to enter, the concussion being of sufficient force to extinguish my light. Perhaps, in another chamber, a careless miner has left his needle lying with the point facing the crosscut, and the fireboss hurrying on barely escapes having his eye put out or being impaled on the needle as with a bayonet.

In the letters of some of the firebosses I notice a slight tone of resentment, and the fact that I lay so much stress on the difficulties and dangers of the position might suggest that I too have the same feeling; such, however, is not the case. We must remember that operators, superintendents and managers of mines have crosses to bear as well as firebosses; and if the latter are laid off in idle times possibly, in many cases, it is due to the habit of the fireboss in contenting himself with simply fulfilling the dead letter of the law without any thought of working for the interest of the company that pays him. It is by honest conscientious work that the fireboss earns the commendation of his superintendent and increases his chances of promotion. The fireboss that will do this may reasonably hope to be mine foreman or superintendent at some time in the future not far distant. He should employ all his spare time in the study of mine work and familiarize himself with the principles relating to mining. This statement may cause some amazement, but I mean that very thing. Unless a man moves forward, he is certainly moving backward. I have proved this in my own experience and if space would permit I could give many concrete illustrations to show the practical working out of this truth.

By 7 o'clock the fireboss has completed his first inspection of the mine and goes to breakfast. On his return to the mine, about 8 o'clock, he consults his notes to see what is needed and orders the timber and other material required and sees that it is prepared and sent into the mine. He is then ready for his second inspection, in which he visits the more dangerous places in the mine and attends to other matters that may be required. He advises the miner concerning the cleaning and loading of the coal, the topping of cars, the location of shots, the charging and tamping of holes. On meeting the mine foreman, in the mine, the fireboss should be able to answer intelligently all questions concerning the various places he has visited, not only with respect to the danger or safety, which is strictly his concern, but he should be able to inform the mine foreman in regard to the quantity of loose coal the miner has on hand and whether or not the majority of cars in the working places are empty or loaded. He should also be able to state whether or not work ordered the previous day has been done.

This may seem to be too great a tax on his memory, but any successful fireboss of four or five years' experience will agree that he has a vivid recollection of the exact appearance of each place visited and is able to recall without difficulty in detail the condition of each place and what is needed. He knows the name and character of each miner, his laborer, and is familiar with their peculiarities. This is not given as an instance of good memory, but to impress the fact that every fireboss worthy of the name should be able to describe the condition of each place visited.

I agree that this is not required by the mine law; but, on the other hand, it does not require nine hours of a fireboss' time to fulfill all the requirements of the law, and the remainder of his time he should devote to the interests of the company that pays him. Every fireboss is or should be ambitious for promotion to the position of mine foreman, and in time to that of superintendent; and let me add there is no person so well fitted by training, for these positions, as the fireboss providing he has improved his time and fitted himself for higher work by study and reading.

In conclusion I will say the fireboss should be one of the last men suspended during a shutdown. To gain this preference, however, he should never shirk his duties and always strive to employ his entire time to the advantage of the company for whom he is working. A fireboss to be worthy of the name should be of so much value in the operation of a mine that the mine foreman would not think of such a thing as laying him off, or doing anything that would lessen his enthusiasm in the discharge of his duties. Every fireboss has the opportunity of making his services worth far more to the company than the price paid in wages. Should he do this there would be no question of the result of his efforts when he seeks promotion, because promotion will seek and find him. Remember the Chinese proverb, "I am not concerned that I have no position; I am concerned in fitting myself for a position."

Murray, Penn. M. J. Clemons,
Superintendent.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions

Gas on Falls

Ques.—If in making your examination of a mine you found gas on the "falls," what would be your method of procedure and what would you recommend for safety, the mine being operated with naked lights?

Ans.—The first step to be taken to provide for the safety of the men while removing this gas will depend upon the quantity of gas accumulated and its location with respect to the ventilating current. A thorough knowledge of the surroundings and a careful estimate of the quantity of gas present is absolutely necessary before any steps are taken for its removal. All the men on the return of the current must be notified and in case the body of gas is considerable these men must be withdrawn. In case considerable gas has accumulated on the falls and it is found that the accidental explosion of the gas would communicate to a larger body of gas in some near-by abandoned workings, all the men should be withdrawn from the mine before taking any steps to remove the gas.

Having, in this manner, provided for the safety of the men, the next step is to station reliable men at each entrance or approach to the return current. Only safety lamps must be used in the work, which must be conducted from the intake side of the gas. It may be necessary to erect temporary brattices so as to deflect the air current against the roof and cause this to sweep the cavities or pockets above the falls. The work must proceed slowly, giving sufficient time for the air current to act upon the body of gas. The progress of the work must be closely watched and tests made from time to time with safety lamps. Every precaution must be taken to avoid a fresh fall of roof as far as possible. Should a fall occur the gas will be driven out upon the workmen and possibly ignited on their lamps. It is therefore necessary that all lamps be kept in a safe place and properly guarded to avoid such an occurrence.

Fire in Downcast Shaft

Ques.—In case the downcast shaft of a mine takes fire, what are the first three important things to be considered?

Ans.—(1) Notify the men at once by phone, directing that reliable messengers be sent to warn the men at the working face, in each section of the mine, and instructing them in regard to the best way of escape. (2) Short-circuit the air current at the foot of the downcast shaft by setting open the main separation doors between the intake and the return, so as to prevent the smoke and gases of the fire from entering the mine; at the same time shut down the ventilating fan. The heat of the fire will probably convert the downcast shaft into an upcast; and, if it is possible to open the doors so as to short-circuit the air current at a point further in the mine, much of the smoke will be withdrawn from the main airway, by so doing. (3) Get water on the fire as quickly as possible. As soon as the current reverses at the foot of the shaft, if it does so, it will be possible to fight the fire from below, which should be done to prevent the flame from extending into the entries in the mine.

Expansion of Air Due to Rise of Temperature and Fall of Pressure

Ques.—The temperature of the intake current in a mine is 35° F. at a point in the airway, where the anemometer gives a reading of 2820 ft. in 3 min. The airway at this point measures 8 ft. 4 in. wide and 5 ft. 9 in. high. (a) What is the quantity of air passing into the mine per minute? (b) Assuming that this mine is ventilated by an exhaust fan, what quantity of air would be passing on the return airway, at the foot of the upcast shaft, if the temperature at this point is 65° F. and the water gage gives a reading of 3.4 in.? Assume that the barometric pressure at the foot of the downcast shaft is 25.39 in. and the coal seam is practically level.

Ans.—The sectional area of this airway is $8.33 \times 5.75 = 47.9$ sq.ft. Assuming the reading of the anemometer is an average reading for the airway, the velocity of the air current is $2820 \div 3 = 940$ ft. per min. The quantity of air in circulation is then

$$Q = av = 47.9 \times 940 = 45{,}026 = \text{say } 45{,}000 \textit{ cu.ft. per min.}$$

Since the fan is exhausting, the volume of air on the return airway is expanded in two ways; namely, by the rise of temperature and the fall of pressure. The expansion due to the rise of temperature is as follows:

$$\frac{460 + 65}{460 + 35} \times 45{,}000 = 47{,}755 \textit{ cu.ft.}$$

The expansion due to the fall of pressure is as follows: It is necessary first to reduce the water-gage reading and the reading of the barometer to a pressure in pounds per square foot; thus,

Water gage,

$$3.4 + 5.2 = 17.68 \textit{ lb. per sq.ft.}$$

Barometer,

$$29.35 \times 0.4911 \times 144 = 2075.58 \textit{ lb. per sq.ft.}$$

The absolute pressure of the air in the intake is, therefore,, 2075.58 lb. per sq.ft., while that in the return is less by the pressure due to the water gage, or $2075.58 - 17.68 =$ say, 2057.9 lb. per sq.ft.

The expansion due to the fall of pressure is, therefore,

$$\frac{2075.58}{2057.9} \times 47{,}755 = 48{,}165 \textit{ cu.ft.}$$

which is the total volume of air passing on the return airway.

Relation of Water Gage to Percentage of Gas in Current

Ques.—The air current in a certain mine is charged with marsh gas to the extent of 3 per cent. when the water-gage reading is 2.5 in.; what would be the percentage of gas in the current if it became necessary to reduce the speed of the fan till the water gage gave a reading of only 1 in.?

Ans.—In any given circulation, the volume of air varies as the square root of the water gage. Also, for the same quantity of gas, the percentage varies inversely as the volume of air. Therefore, the percentage of gas in the current, in this case, will vary inversely as the square root of the water gage. In other words, the percentage ratio is equal to the square root of the inverse water-gage ratio. Or calling the required percentage of gas x, we have

$$\frac{x}{3} = \sqrt{\frac{2.5}{1}}$$

$$x = 3\sqrt{2.5} = 4.74\%$$

Calculating Quantity of Air

Ques.—If the velocity of an air current is 75 ft. per minute in an airway $6\frac{1}{2}$ x$8\frac{1}{2}$ ft., what is the quantity of air passing per minute?

Ans.—The sectional area of this airway is $6.5 \times 8.5 = 55.25$ sq.ft. Assuming the given velocity is an average velocity for the airway, the quantity of air in circulation is

$$Q = av = 55.25 \times 785 = \text{say } 40{,}000 \textit{ cu.ft. per min.}$$

Sociological Department

For the Betterment of Living Conditions in Mining Communities

A First Aid Packet

There is need for a first-aid packet, which will always be at hand when an accident occurs, will always keep its contents in good aseptic condition and which yet will be light and portable. Such an appliance appears to have been produced by W. V. Gage, a physician for the Colorado Fuel & Iron Co., stationed at Primero, Colo. It was briefly described

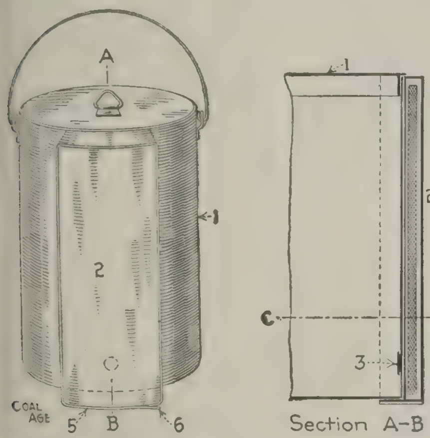


Fig. 1

Dinner Pail and Packet

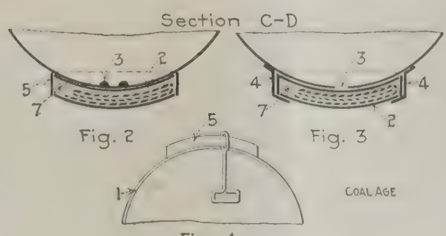
in our issue of Nov. 18 last, but will bear more extended description.

Like a Tobacco Box

The first-aid packet reminds one forcibly of those popular curved tobacco boxes, which fit the pants pocket, but in this particular instance the box is longer and narrower and fits the dinner pail. Moreover, it not only fits the pail, but is so affixed to it that the removal of the packet temporarily involves the spoiling of the dinner bucket. After the packet is removed, a new one can be affixed in its place by solder. The bucket is then as good as ever. In like manner, a packet can be torn from an old pail and soldered to the side of a new one.

An Aseptic Container

The packet being air tight remains perfectly sanitary and not subject to inleakage, even when the pail is washed and scoured. When a workingman is moved from place to place in or around a mine, his first thought is of his dinner bucket. Consequently Dr. Gates thought he could not more certainly insure that every man would carry his packet than by attaching it firmly, and, in a sense, irremovably to his dinner bucket.



Details of Packet

The packet consists of two curved pieces of tin, about 8 in. long and 3 in. wide. After picric acid gauze, a triangular bandage or whatever else may be needed has been inclosed, the two side pieces are smoothly joined by a half-inch strip of tin. Soft solder is used to make a water-tight joint. When an accident occurs demanding first-aid materials, this tin strip can be peeled off by a can opener.

In Fig. 1, the dinner pail is marked 1 and the first-aid packet is numbered 2. At 3 is shown the soldering arrangement by which the two are fastened to each other. In Fig. 2, which is a partial cross-section along the line *C D*, shown in Fig. 1, the method of attachment is made plain, though the alternative plan in Fig. 3 might be used instead. In this design, guides 4 are attached to the pail, and in these the packet 2 slides. It is, however, secured in place by a plug 3, which passes through the side of the pail. In Fig. 4, the "can opener" is shown attached to the end of the soft-tin slip 5, which has, as is shown at 6 in Fig. 1, a point of attachment at the base of the packet. A few turns of the wrist and this strip is completely withdrawn from the two curved faces of the packet.

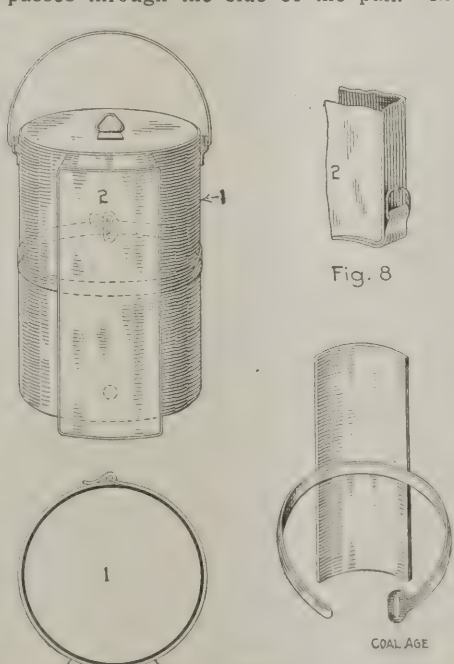
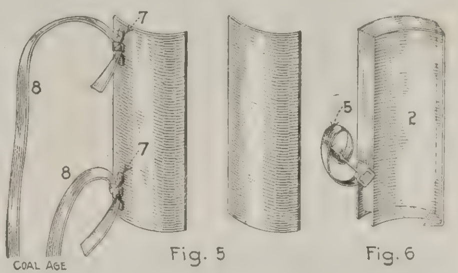


Fig. 7

Other Modifications

The contents are permitted to drop out and two curved pieces of tin of suitable flexibility and shaped like those shown in Fig. 5 are ready for use as splints. Attached to one of these are lugs, marked 7. To these are found, already tied, strings 8, by which these strips of tin



How the Splints Are Made

can be secured as splints to the sides of any broken limb which may need their support.

Fig. 6 is another view of the same packet where the manner of removing the binding strip is more clearly shown. Another proposal is that the attachment of the pail to the packet be made by the use of a movable metal strap, as shown in Fig. 7, this strap itself being of use in providing a means whereby the splint can be affixed to the limb. Fig. 8 shows a simple method of attaching the binding strap, so that the use of the can opener can be made unnecessary. It is true that a can opener can be attached to the packet, but it is better to simplify matters by dispensing with it.

If an 8-in. splint is long enough for the support of the fractured bone, then it is certain that the scheme is one of great value, and as it assures that aseptic dressings will be always available when needed, its use is to be advocated.

Mine foremen should institute a course of prevention and cure of mine explosions, fires and accidents. All such matters should be taken up, considered, and discussed, with all the minor officials of the mine, in order that they may all be thoroughly drilled in such action as would be required in the event of a disaster.

A Remarkable Photograph, Exhibiting the Violence of the Bruceton Explosion of Feb. 24. The Smoke and Flame Are Escaping from the Main Portal

Rescue Team in Helmets, Preparing to Enter Mine after Explosion

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

President Taft has deferred the conference which he had expected to call for the purpose of considering ways and means of preventing a coal strike. He has had several long talks, however, with Secretary Nagel and others, regarding the subject and is disposed to take such action as conditions seem to warrant when the proper time comes. At present, he is understood to feel that the facts in the case do not warrant active steps on the part of the federal government.

Action on Interstate Trade Commission Bill Improbable

Meetings of the Senate committee on interstate commerce, within the past few days, have shown conclusively that it will not be possible to secure a favorable report upon any measure such as has been asked for by various coal operators, whereby provision would be made for legalizing agreements of reasonable character among the coal operators, for the purpose of fixing prices and limiting production, or adjusting it to the demands of the market.

The committee is strongly divided upon the whole subject of anti-trust legislation, amendatory of the Sherman Act.

The Lee Bill for Coal Strike Arbitration

In a lengthy hearing, Mar. 25, before a subcommittee of the House committee on interstate and foreign commerce, to which the measure has been referred, Representatives Lee and Donohoe, both of Pennsylvania, presented arguments in favor of the Lee bill, which aims to give the federal government the right of intervention in coal controversies by an extension of the so called Erdman act. Mr. Lee spoke first, and urged the committee to report favorably on the bill, on the ground that it would effect an immense saving of money and of life if in any way strikes of a prolonged nature could be avoided. He estimated that the strike of 1902 cost the country $150,000,000, in direct loss of wages and profits as well as in sacrifices entailed upon manufacturers by reason of coal shortage.

Mr. Lee then described the Erdman act and showed how beneficial had been its operation. He enumerated the many and varied controversies in which it had been invoked and then read letters which he had received from organizations of railroad employees that are not now subject to the operation of the Erdman act, asking to be included within the scope of its provisions for arbitration. He laid stress on the fact that the act is not compulsory in its working but provides for voluntary arbitration.

Importance of the Industry

Mr. Donohoe spoke of the great importance of the coal industry of the country and said that it was such as to warrant a special mode of dealing with its difficulties. This accounted for the fact that the change requested in regard to the Erdman act was not to be extended to any other industry. He thought that strikes were more serious and had a greater tendency to become chronic in the coal business than in any other line and that they entailed more suffering.

The request was made by Mr. Lee that the committee call Charles P. Neill, commissioner of labor, John Mitchell and others closely identified with the strike of 1902, to testify as witnesses. This will probably be done.

Rates on Lake Coal from West Virginia

The Interstate Commerce Commission has handed down an important decision in the matter of the investigation and suspension of advances in rates for the transportation of coal by the Chesapeake & Ohio Ry., the Baltimore & Ohio R.R., the Norfolk & Western Ry. and the Kanawha & Michigan Ry. and their connections.

The principal findings of the commission are as follows:

1. From November, 1910, to March, 1911, defendants filed with the Commission tariffs advancing their rates upon lake coal, which is coal that originates in the West Virginia coal fields and moves, during the season of open navigation on the great lakes, to various ports on Lake Erie for transshipment by vessel beyond. Shippers protested that the proposed rates were unreasonable, and they were suspended pending investigation.

2. It appears that the Chesapeake & Ohio, Kanawha & Michigan, and Baltimore & Ohio made no showing which justifies the Commission in holding that the increased rates are just and reasonable; it is, therefore, held that these three defendants may not impose upon the traffic concerned higher rates than those in effect on Jan. 1, 1910.

3. As to the Norfolk & Western, the Commission is persuaded that the imposition of the increased rates here involved will not impose an unjust and unreasonable charge for the transportation service involved.

Alabama

Birmingham—The railroads in the Birmingham district are making preparations for a car shortage, which is already beginning to be felt, on account of the increased demand for coal.

Governor O'Neal visited Birmingham recently for the purpose of considering further the contract between the State of Alabama and the Sloss-Sheffield Steel & Iron Co., whereby the company's Flat Top mine is being worked by state convicts. The agreement is at present on a basis of 42½c. per ton of coal mined, and the governor maintains that this figure should be raised to 45c., in order to place the earnings of the convict labor on a parity with those of free labor. Failing a satisfactory adjustment of this rate and the correction of certain alleged unsanitary conditions at the Flat Top mine, the governor favors abrogating the contract.

Colorado

Colorado Springs—John T. Milliken, of St. Louis, and H. McGarry, of this city, president and manager, respectively, of the Golden Cycle Mining Co., have taken over the entire coal holdings of the Pike's Peak Coal Co. and the Central Fuel Co., both of this city, and the stock of the United Fuel Co., of Denver, formerly held by J. R. McKinnie and other local interests. Milliken & Garry are now sole owners of 1760 acres of coal land north of this city, including the Pike View mine, the largest in this section. Milliken is spending $35,000 in improvements and will double the daily output, making it 1000 tons.

Denver—The Interstate Commerce Commission recently heard arguments on the application of the Colorado Coal Traffic Association, to compel the Colorado & Southern and Denver & Rio Grande railways to adopt a new plan of car distribution for coal shipments.

Illinois

Springfield—The state mining board is in receipt of a letter announcing that all previous state records were broken recently by the three Gillespie mines of the Superior Coal Co., a subsidiary of the Northwestern railroad. The figures sent in show that the average for the six days of one week was 10,984 tons per day, and that the highest day's run was 11,522

tons. Mine No. 3 averaged 4094 tons per day for the week, and reports a total loss in time of 75 min.; 40 min. while waiting for cars and 30 min. while waiting for repairs to be made to the machinery.

Danville—It is stated here that the three Dering mines near this city, the two mines at Clinton, Ind., and the two at Sullivan, Ind., will not be operated by the Brazil Block Coal Co. after Apr. 1. The company's three-year lease on these properties expires on that date, and, it is understood, will not be renewed. Whether the Derings intend to sell the mines rather than lease them or whether the Brazil company does not care to operate them for another term of years, is not known. It is understood that the mines have been run at a good profit for the past three years.

Belleville—Nearly every coal mine in the Standard field in the vicinity of Belleville, and down as far as Marissa, is working two shifts of eight hours each, in an effort to double their capacity. The greater portion of this coal is going to the Illinois Central R.R.

Chicago—Discrimination by railroads of the Central West in the distribution of cars in favor of their own coal mines and to the detriment of other operators is to be the subject of an investigation by the Illinois Railroad and Warehouse Commission. Indiana and Kentucky state officials will assist in the inquiry. The work probably will begin immediately after the April session of the body, and may continue several weeks. It is said that the investigation will disclose that the railroad and mining interests in Illinois, Indiana, Ohio and Kentucky are as closely allied as the railroads and the steel industry in the North and East. The railroads are reputed to have almost absolute control of the best and largest producing mines of the three states, and it is alleged that they discriminate against other mine operators.

The Illinois Coal Operators' Association met here recently and appointed a committee to confer with officers of the United Mine Workers in an effort to avert the threatened strike of coal miners in Illinois, Apr. 1. Closely involved with the strike situation is the car-shortage problem. Complaints of car shortages in various districts were made by many of the operators. The effort of the mines to turn out large quantities of coal before the strike comes on has caused a great demand for cars.

Indiana

Brazil—The most important work advocated by the recent annual convention of mine workers of district No. 8, is the organizing of the coal strippers. A great deal of coal is being stripped, instead of mined, in this county at present, and common labor is used in the work. The miners now intend to organize the coal strippers so that they will receive the same wages as the miners and day men employed in and about the other mines of the district.

Bicknell—The record for a day's output from the mines in and around Bicknell was broken, Mar. 25, when 143 railroad cars were loaded, making a total shipment of 5720 tons. The miners in this section do not want a strike; they are satisfied with their present wage scale and are dreading the order to lay off.

Diamond—The Wizard mine of the Hall-Zimmerman Coal Co., located on the Central Indiana R.R.; the Schrepferman No. 8 mine and the Zeller-McClelland Block No. 3 mine, at Diamond, and the Bee Ridge Coal Co.'s mine, all in Clay County, are preparing to close down indefinitely after the suspension of work which is expected to follow the Cleveland wage-scale conference. The owners say they will not go to the expense of keeping the mines in shape for work following the suspension.

Linton—Mines on the Vandalia Branch have been under a great handicap lately because of a serious cave-in under the Vandalia R.R. tracks between Sponsler and the old Island City mine. It was impossible to get cars to or from the mines for a number of days. The cave was about 60 ft. long and immediately filled with water.

Iowa

Des Moines—The state mining department has sent out a warning. Citizens of the state are urged to lay in supplies of coal before the first of the coming month if they do not wish to be caught short during the period of suspension. The department says that the suspension will last at least 60 days, and possibly 90, or even longer.

Kentucky

Louisville—A peremptory writ of mandamus was issued, Mar. 20, by the Commerce Court against the Louisville & Nashville R.R. and the Southern Ry., to compel them to carry coal from the mines of the Stony Fork Coal Co. and the Ralston Coal Co. in Kentucky to the southeastern states. The refusal of the two railroads to transport the coal grew out of a dispute as to which should furnish the necessary cars. It was shown by the evidence that the coal companies, because of their inability to have their product transported to markets in the Southeast, were practically put out of business, as 80 per cent. of their coal was marketed in that territory.

Paducah—Anticipating a strike in the soft-coal mines, the Illinois Central is hauling large quantities of coal from western Kentucky mines to its yards in Paducah. This coal will be distributed over the system as needed in the event of a strike.

Barbourville—The Mineral Development Co., composed of Philadelphia capitalists, is preparing to begin coal and timber operations on a large scale in Letcher County. The property has been opened for development by the new Lexington & Eastern R.R., and as soon as branch lines are built a number of big coal operations will be started. A contract was recently made for the extension of a three-mile line into the Boone Fork district, and the first coal operations in that field will be started by the Pennsylvanians.

Maryland

Lonaconing—It is understood that, before long, operations will be resumed at the old Jackson mine and extensive developments undertaken at the Caledonia mines. This valuable property has always been looked upon as the greatest asset of Lonaconing. There is a large acreage of excellent coal, of easy access, in the smaller seams and it is thought that one of the most profitable enterprises of the Maryland field could be established here.

Ohio

Columbus—Operators in eastern Ohio are much gratified over the recent ruling of the Interstate Commerce Commission which grants a reduction on the lake rate from No. 8 field of 10c. per ton. This is the culmination of a fight between the operators and the railroads which has lasted for more than a year. It is an entirely different action from the one brought by the Eastern Ohio Operators' Association against the Wheeling & Lake Erie R.R., in which a rate reduction was ordered by the Ohio Railway Commission.

Cambridge—The Minnehaha & Little Kate No. 2 mines of the National Coal Co., near Cambridge, which lie about two miles apart, have been connected and in the future the two mines will be operated as a unit.

St. Clairsville—Work will be commenced next month on the opening of a new mine at Fairpoint, Belmont County, to employ about 600 men, when in full operation. The Provident Coal Co., a Cleveland corporation, recently purchased several hundred acres of coal lying along the Cleveland, Lorain & Wheeling division of the Baltimore & Ohio R.R., and will spend about $300,000 in opening and equipping the mine.

Lisbon—The Card & Presser Coal Co. recently announced that it would abandon the Klondyke coal mine which has been in operation here for a number of years. The company has leased about 300 acres of coal land four miles north of

town and will open a large commercial mine at once. It will take coal from the No. 6 vein, which runs from 4½ to 6 ft. in thickness and is of excellent quality. The property is located along the Erie tracks and the old West Pittsburg tipple will be used.

Cleveland—A conference of 32 operators and as many miners' representatives from western Pennsylvania, Ohio, Illinois and Indiana, met in Cleveland, Mar. 20, to negotiate new wage contracts for these states, if possible. Nothing decisive was accomplished, prior to adjournment Mar. 22, and the matter was left in the hands of the joint scale committee, consisting of eight operators and eight miners, two from each state. The policy committee of the United Mine Workers convened here Mar. 25.

Oklahoma

McCurtain—A disastrous explosion took place at the No. 2 mine of the Sans Bois Coal Co. near here, in the morning of Mar. 20. The cause of the explosion has not been determined. Eleven men escaped from a manway at the time of the blast; 25 have since been rescued alive, and at last reports, 69 bodies had been recovered. The number killed is reported as 80, based on a total of 116 men in the mine at the time of the explosion. Rescue work was started immediately; the local government mine-rescue car was soon on the scene and No. 4 car arrived from Iowa on Friday.

Pennsylvania

Bituminous

Dravosburg—Over 400 men employed in the Risher mine at Dravosburg quit work Mar. 20, alleging that the screens used at the mine allow too much coal to sift through to the slack pile. There has been no disturbance, the miners contenting themselves with standing about in small groups and discussing the situation. They have been complaining for some time that the screens are too large.

Indiana—The plant of the Tearing Run Coal Co., operated near Homer City for several years by J. M. Guthrie & Sons, of this place, has been leased to the Townsend Coal Co., of Philadelphia. The operation includes 300 acres of coal and the lessees agree to mine not less than 100,000 tons a year.

Du Bois—It is understood that the Cascade Coal & Coke Co. will begin at once the construction of 200 additional coke ovens at Sykesville. This will just double the capacity of the present plant.

St. Marys—The Shawmut Coal Mining Co. is building a new and larger tipple at Elbon, to accommodate its increased output at that point. Ten new houses have been erected and ten more are to be put up this summer. The Shawmut & Northern R.R. has plans for building four miles of new road between Mahoning and Mosgrove, points on the Allegheny River, and also two miles of new railroad between Tidal Branch Junction and the Allegheny. Other improvements are to be made at various points to meet the demands of larger operations.

Pittsburg—A sweeping victory was won, Mar. 19, by coal shippers from the Pittsburg district to lake ports when the Interstate Commerce Commission ordered a reduction of the rate on bituminous coal from 88c. to 78c. per ton. Advances of rates on coal from Virginia and West Virginia fields to lake ports, made by the Chesapeake & Ohio, Baltimore & Ohio and Kanawha & Michigan railways, were disapproved by the commerce commission. Advances made by the Norfolk & Western on the same traffic were approved.

Anthracite

Scranton—The Lackawanna R.R. was found guilty in the federal court, at Buffalo, Mar. 19, of violating the commodities clause of the Hepburn act and was fined $2000. The government charged that in 1909 the company shipped hay from Buffalo, N. Y., to Scranton, Penn., free of charge for the use of mules in mines owned by the company in Pennsylvania.

In a gas explosion caused, it is thought, by mine settlings, which disturbed the gas mains, nine persons were killed and two injured, early Mar. 20, in Dunmore. Two miners' families, comprising two women and seven children, were either blown to pieces in the explosion or burned in the fire that followed and destroyed three houses. More than twenty dwelling houses near the scene of the explosion were badly damaged by the concussion and the flying timbers.

Wilkes-Barre—The exodus of miners from the anthracite fields in anticipation of a suspension of work was augmented recently by the departure of 100 Slavonians from the Nanticoke region, who left here for New York. They will sail for Austria.

Shamokin—The 800 employees of the Scott shaft, owned by the Mineral Railroad & Mining Co., who went on strike Mar. 18, because the company refused to sell them pea coal, have returned to work.

Pottsville—The Pine Hill Coal Co., operated by Scranton capitalists, and located at Minersville, near here, posted a notice Mar. 19, announcing that the employees will be granted an increase in wages of 10 per cent., to take effect Apr. 1, and that other working matters will be adjusted satisfactorily with the men. Several years ago this company put into effect an agreement whereby the employees share in the increased earnings of the company.

Tamaqua—The rest of the mine workers, about 3500 in number, employed by the Lehigh Coal & Navigation Co., in the Panther Creek Valley, who quit work recently because some of the men in the mines refused to join the union, returned to work Mar. 18.

West Virginia

Charleston—A trial of much interest to coal men has been going on in the United States Court at Cincinnati for the past four weeks; namely, the suit of the McKell Estate vs. the Chesapeake & Ohio Ry. Co. The McKells own 23,000 acres in the heart of the New River coal field, probably the most valuable tract of the size in West Virginia, and have sued the railway company for $3,700,000 damages, with interest, on a contract made by M. E. Ingalls when president of the Chesapeake & Ohio with the late Col. T. G. McKell. Many prominent operators and engineers of the state have testified in the case, as the questions involved concern almost every phase of the coal business. Governor Harmon, of Ohio, for the railway company, and Judge Holt, of Huntington, W. Va., for the McKells, are the leading counsel, and the case has been bitterly fought at every step. Some remarkable testimony has been given, which is of great interest to coal men.

Welch—Eighty-one men were killed, Mar. 26, by a gas explosion in the Jed Coal & Coke Co.'s mine, at Jed, W. Va., six miles from here. Only 11 men escaped alive, and one of these died within an hour after being brought to the surface. So far, 33 bodies have been located. The fans, although damaged, continued to operate, with the result that enough air was present to admit searching parties immediately. Less than half an hour after the explosion, relief measures were started. Oxygen helmets and other appliances were rushed from the plant of the United States Coal & Coke Co., nearby, and a government rescue car, *en route* to Huntington, W. Va., was turned back. The mine was inspected Mar. 22, and pronounced safe. Preliminary investigations so far have not divulged the cause of the explosion. Barometers in this vicinity have been showing unusually low readings for the last week without the usual atmospheric changes.

Canada

Merritt, B. C.—The British Columbia Development Co., capitalized at $800,000, has been organized by a group of Minnesota capitalists, including several Minneapolis men, and has acquired control of 1000 acres of coal lands in and about the town of Merritt, Nicola Valley, British Columbia. S. H. Hudson, Benson, Minn., is president; J. W. Irwin, Minneapolis, vice-president, and P. M. Endsley, Minneapolis, treasurer.

Personals

G. P. Bartholomew, who has been engaged in consulting work for the Pennsylvania Coal & Coke Corporation for the past seven months, has returned to his office, 30 Church St., New York.

J. C. Maben, president of the Sloss-Sheffield Steel & Iron Co., recently visited the company's properties in the vicinity of Birmingham, Ala., and elsewhere in the state, also looking over the plans for extensive improvements that are contemplated.

William L. Martin has resigned as superintendent of the Pratt No. 1 division of the Tennessee Coal, Iron & R.R. Co.'s coal mines, effective Apr. 1, to become superintendent of the Banner mine of the Pratt Consolidated Coal Co., succeeding Milton H. Fies.

John H. Parrott, general manager of the American Coal Co., recently visited Lonaconing, Md., for the purpose of inspecting the company's properties in that locality and with a view toward possibly resuming operations at the Jackson mine, as well as undertaking development of the Caladonia mines.

Maxwell L. Barker, of Louisville, Ky., formerly president of the Straight Creek Coal Co., of Pineville, has been elected president of the reorganized Nebo Consolidated Coal & Coke Co., in which he recently purchased a controlling interest. R. B. Winkler will remain as superintendent of the Nebo mine.

N. P. Turner has resigned as chief engineer of the Cuba R.R., and in association with L. D. Moore, of New York, will engage in consulting work, general engineering and exploration in the West Indies and the tropics. Mr. Turner will be located for the present at Hotel Camagüey, Camagüey, Cuba.

Milton H. Fies has resigned as superintendent of the Banner mine, of the Pratt Consolidated Coal Co., effective Apr. 1, and will engage in business for himself. Up until several months ago, Mr. Fies was engaged by the Birmingham Coal & Iron Co. as general superintendent, in charge of the Mulga and Short Creek mines.

W. F. Guiterman has been appointed vice-president and general manager of the New River Collieries Co., which is owned by the Guggenheim interests, and is one of the largest producers in the New River field, West Virginia. It is understood that Mr. Guiterman will make his headquarters in New York, and that a resident mine manager will be appointed.

William D. MacLean, general purchasing and sales agent for the Utah Fuel Co., has resigned to become general auditor for the W. G. Sharp coal properties at Mohrland, Hiawatha and Black Hawk. A. D. Pierson, for years assistant to Mr. Mac Lean, has been named general sales agent for the Utah Fuel Co., and H. N. How has been appointed general purchasing agent to succeed Mr. MacLean.

Obituary

John Maguire, one of the best known mining men in the anthracite region of Pennsylvania, died in the Pottsville Hospital, Mar. 11, following an operation. He had been an invalid for several years. Mr. Maguire was for many years mine inspector of the eighth anthracite district and later became division superintendent for the Philadelphia & Reading Coal & Iron Co., with supervision over all collieries south of the Broad Mountain. He was born in Whitehaven, Cumberland, England, in 1845 and at early age came to this country, serving in the Union Army during the Civil War as a member of the Seventh Pennsylvania Cavalry. Under his supervision, as district superintendent, the remarkable record of winning 95 per cent. of the coal bed was made at the Brookside colliery of the Reading company. Mr. Maguire served as mine inspector from 1894 until 1902. His conduct of the office was appreciated by operators and miners alike; he was a man of sound judgment and absolutely fearless in the performance of his duty. Mr. Maguire was known as one of the men in this field most thoroughly versed on anthracite mining and his advice was always eagerly sought.

Construction News

Flint, Mich.—It is reported that Saginaw mining interests will expend $160,000 in opening a mine within the Flint city limits. A shaft will be sunk and about one mile of railroad built to connect with the Grand Trunk R.R.

Bay City, Mich.—A shaft will be sunk and a mine opened on the Handy coal property, near the Whatcheer mine, south of Bay City. The proposed equipment calls for electric mining machines and haulage motors and a first-class installation throughout.

Canton, Ill.—The Big Creek Coal Co. is planning improvements for its Cuba mine in order to materially increase the output.

Superior, Wis.—The Great Lakes Coal & Dock Co., of Minneapolis, a subsidiary of the White Oak Coal Co., plans extensive improvements for its dock here, which it has recently leased from the Great Northern Ry. These improvements will include widening the dock 150 ft., and installing at least one new bridge, besides other equipment.

Earlington, Ky.—The Nebo Consolidated Coal & Coke Co. has been reorganized, with Maxwell L. Barker, of Louisville, as president, and extensive improvements will be made in order to greatly increase the output. Modern machinery will be installed.

Charleston, W. Va.—The Gauley Mountain Coal Co., Ansted, W. Va., will open up three mines on Rich Creek to develop 12,000 acres of No. 2 Gas seam, and will erect a large central power plant. J. J. Marshall is chief engineer.

Publications Received

REPORTS RELATING TO MINERALS AND MINING IN NEW ZEALAND, 1911. 160 pages, 8½x13 in., illustrated. John Mackay, government printer, Wellington, New Zealand.

The general report on coal mines takes up 40 pages. A specially interesting section of the book is that devoted to a separate report on the operation of the government-owned coal mines.

REPORT OF WEST VIRGINIA GEOLOGICAL SURVEY ON JACKSON, MASON AND PUTNAM COUNTIES. 387 pages, 6x9 in., 36 plates and illustrations and case of 3 maps. Price, $2. West Virginia Geologic Survey, Morgantown, W. Va.

In addition to the detailed study and description of all the rocks, minerals, soils, streams, and industries found within the area, the geologic map gives the structural contours on the Pittsburg coal horizon, as well as the approximate area underlaid by that bed. The topographic map shows by contours and figures the elevation of the surface, and its character, whether steep, rolling or level, and in addition gives all the streams, roads, railways, towns, churches, school houses, mines, houses, etc., in their correct locations.

INDUCTANCE OF COILS. By Morgan Brooks and H. M. Turner. Bulletin No. 53 of the Engineering Experiment Station, University of Illinois. 72 pages, 6x9 inches, illustrated. Free on request.

This bulletin discusses the theory and determination of the self-inductance of coreless coils. An empirical modification of the common formula for the inductance of solenoids, is presented as the Brooks universal formula applicable to all forms of cylindrical coils. Easy methods are given for predetermining the dimensions of a coil for any required reactance or inductance, for any purpose from the massive power protective coils to the smallest instrument coils. Definite coil proportions are assigned for producing the maximum inductive effect with a given length of conductor and data are furnished on the relation of the mutual inductance of adjacent coils to their self-inductance.

Industrial Notes

The Dominion Iron & Steel Co., Sidney, N. S., has placed an order with the Ruggles-Coles Engineering Co., 50 Church St., New York, for one of their Class A-14 dryers for drying 40 tons of coal per hour.

The new coal-handling plant for the Metropolitan Coal Co., at Chelsea, Mass., the plans and specifications for which are being prepared by Monks & Johnson, architects and engineers, 7 Water St., Boston, Mass., includes an extensive piled wharf, discharging berth, lighterage berth for coaling tow-boats, conveying machinery, cable road, 10,000- to 15,000-ton elevated pocket, 2000-ton ground storage shed, revolving pickup tower, storage facilities for 15,000 tons of bituminous coal in the open, screening plant for sizing anthracite screenings, boiler plant, stable, offices, etc. It is estimated that this new equipment will cost over $100,000.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The tense feeling in the coal market continues unchanged. Consumers and producers are both keenly watching the results of the wage conferences, many of the larger interests having special representatives on the ground to insure reliable and prompt reports on the situation. It is purely a strike market and has been accepted as such by the trade, which is now playing a waiting game.

The movement to the Eastern markets continues to be only sufficient to meet current demands, and none of the companies are accumulating any surpluses. Prices are at the same high level, although they vary considerably with the reports on the labor situation. Water freights are somewhat lower and the railroad congestion is rapidly improving. In the Pittsburg steam markets there is a disposition on the part of the consumers to shut down their plants rather than buy at the prevailing high prices.

The improvement in transportation in Ohio, due to the milder weather, has resulted in a heavy movement of delayed coal into the consuming centers. Emergency fuel, however, still commands a substantial premium, especially in the steam grades, and there is considerable buying for speculative, as well as storage purposes. The Kentucky trade experienced a decided flurry on some heavy orders from St. Louis, but the market there soon broke and the Kentucky operators are now waiting for the strike to materialize.

The demand in the Middle West is unprecedented with the exception of St. Louis, where the market was overshipped, and now has coal on demurrage. There is no free coal to be had at other points, and the large consumers are becoming worried and bidding up prices on all grades. There is a decided stiffening in all departments and the producing companies are mostly sold well ahead.

Boston, Mass.

The week has shown a fluctuating market, according as the news tended to back up the strike talk or show possibilities of a compromise. Mild weather was followed by a northeast snow storm and prices hardened measurably. This market, even for the near inland points, is now practically confined to all-rail delivery for bituminous and a heavy tonnage is moving over the lines with Eastern connections.

Most of the regular shippers and a number of new ones have coal going to the junction points for reconsignment. Prices are being held at a high range for such coal in transit and were it not for fluctuations during warm weather and rumors of settlement early in the week they would be higher still. As it is, the average is about the same all-rail as a week ago, although at tidewater distributing points, such as Boston, Providence and Portland, new high prices are reported.

In anthracite the companies are rapidly going out of business, at least so far as concerns Eastern shipments. Consignments from New York have practically ceased on all sizes and Philadelphia has been so seriously curtailed that only a very few special kinds and sizes are to be had, and those only in small quantities.

On anthracite all-rail, and at New York, on individual coal, premiums run all the way from \$1@2, although the offerings seem small.

The following list gives some idea of current prices at wholesale:

Clearfield, or any bituminous, f.o.b. Philadelphia	\$3.60@4.10
Clearfield, f.o.b. New York	3.50@4.35
Clearfield, *en route*, f.o.b. mine basis	2.25@3.50
Pocahontas, New River, f.o.b. Hampton Roads	4.75@5.25
Thacker and Kenova, f.o.b. Hampton Roads	3.50@4.00
Pocahontas, New River, Boston, on cars	6.00@6.75
Pocahontas, New River Providence, on cars	5.75@6.75
Anthracite, stove, etc., all-rail, f.o.b. mines	4.50@5.50
Anthracite, domestic sizes, f.o.b. New York	6.00@6.75

New York

It is believed the New York trade is facing the possible suspension at the mines with very meager supplies. The demand here has been urgent in the extreme, and in many instances shippers have been obliged to go into the open market for tonnages to meet their contracts. No accumulations are being made at the piers and with the strike now practically at hand no hopes are entertained for getting any.

Prices continue to rule high, and there is no perceptible evidence of the situation easing off in either anthracite or bituminous. The lowest grades of bituminous are quoted at \$3.50@3.75, f.o.b. piers, which would be equivalent to about \$2 at the mines. A further complication, to a situation already bad enough, is now threatened by a labor shortage at the mines shipping to the New York markets. The movement on the railroads has improved considerably, but is by no means back to normal.

We continue to quote wholesale anthracite prices, f.o.b. New York, as follows:

Broken	\$5.50@6.00
Egg	5.50@6.00
Stove	6.50
Chestnut	6.50
Pea	5.00@5.25
Buckwheat No. 1	4.00@4.50

Philadelphia, Penn.

The past week has been one scramble for coal. Householders realize that every indication points to trouble at the mines on Apr. 1, and dealers have been besieged on all sides to fill orders. This is not only true of the residential districts, but the mill districts as well. Quite a number of the manufacturing plants in this city use the smaller sizes of anthracite, and none of them have any great stocks on hand. As the supply from the mines has been inadequate to fill more than current business, many of them will go into April very poorly fortified against a lengthy struggle between the miners and operators.

Pea coal is bringing from \$3@3.50 at the mines, buckwheat from \$2@2.50, and of the size called rice, there does not seem to be any at any price. As a matter of fact, most all the operators have contracts on which they are applying their entire output, and little free coal is on the market. The domestic sizes are also in excellent demand, and dealers are taking anything that is offered.

The individual operators are reaping a harvest, as the so called circular prices are entirely ignored, and most every car of coal sold now brings a good premium. For spot coal, anywhere from 50c. to \$1 above the circular is being paid. The large operators in no case, it is understood, have advanced the price over the ruling circular, for which they are receiving little credit from the press in this vicinity. Any advance in the price of any size is ascribed to the coal trust, who are also unjustly accused of holding coal back at the mines. It is possible some of them are laying aside some of the output for their own use at the mines, but outside of this, the entire production is coming to market. The first of April will see a comparatively small tonnage of anthracite coal on hand.

Pittsburg

Bituminous—The meeting at Cleveland has afforded no good reason to change the original expectation that there will be a suspension of several weeks—these reports having guessed six weeks as the most probable duration—with proposals and counter proposals in order to keep up interest and show that the respective parties were making efforts toward a settlement.

The bituminous-coal market continues in a very unsettled state, but is not as excited as it was, as consumers and producers have now accepted the scarcity, which will merely be accentuated gradually after Apr. 1 when the mines presumably will close. Several weeks ago prices reached such a point that regular large consumers, who had made some provision against the impending suspension, refused to pay them and the buying in the open market has been merely of odd lots. In many cases the requirements of consumers are of such a nature that they will cease operations rather than pay fancy prices.

The bottom of the market may be placed at the same level as in the last report, but transactions are more limited, and especially high prices are more frequently paid for odd prompt lots. We therefore quote as the minimum of the market, and coal hard to buy at the prices: Mine-run and nut, $1.50@1.60; ¾-in., $1.65@1.75; 1¼-in., $1.90@2; slack, $1.40@1.50, per net ton at mines, Pittsburg district.

The Elkins Coal & Coke Co. is reported to have closed a 20-year contract with the Lehigh Coke Co., South Bethlehem, Penn., for 1200 to 1500 tons of coal daily, for the byproduct coking plant just being completed. This plant was built by German interests, to supply coke to the Bethlehem Steel Co. for 20 years, with an option reserved to the Bethlehem company to buy the plant at the expiration of the period. The coal is to be mined from the new Bretz field.

Pittsburg-district operators are somewhat more anxious to close the wage negotiations than they were before the Interstate Commerce Commission decision reducing the lake rate from 88 to 78c. While the operators asked for a reduction to 50c., they were not certain of securing any, so that the 10c. saving is of interest and will make the district more keen in securing lake tonnage.

Connellsville Coke—The market is not closely quotable, as demand has decreased and the supply also. Consumers are trying to get along with the coke available, and are chary of buying additional tonnages at the fancy prices asked. We quote the market roughly at $2.25 for furnace and $3 for foundry coke, per net ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Mar. 16 at 408,237 tons, an increase of 10,000 tons, and shipments at 4525 cars to Pittsburg, 6271 cars to points West and 1189 cars to points East, a total of 11,985 cars, or a decrease of 149.

Baltimore, Md.

Although a few of the operators reported a tendency to ease up somewhat in the Baltimore market, the latter part of the week found the demand for coal just as strong and prices just as firm. The majority of the large operators in this city state that they are unable to supply consumers with sufficient fuel, owing to the inability of the operators to furnish the coal. It may not be generally known but there is a scarcity of labor in many of the coal fields of West Virginia at the present time. One operator who returned to Baltimore a few days ago made the remark that between 2000 and 3000 additional men could be utilized in the mining districts if they were to be had.

Lack of labor has, in many instances, handicapped the operators in their efforts to fill orders at the prevailing high prices. Prices have gradually advanced since about the time the strike started in England. This was nearly three weeks ago, and since that time almost phenomenal prices have been asked and received by the trade.

Buffalo, N. Y.

The market began to slack off several days ago and at present there are a few jobbers with coal on track that they are finding very little market for. The better weather has released a lot of coal that was held up at various points and the New England demand dropped off a week ago, on account of supplies from other fields, probably West Virginia chiefly. Besides the consumer now finds the rush prices too high for him to buy more than he is obliged to.

It is still impossible to quote actual bituminous prices. Nominally they are $2.60 for Pittsburg three-quarter, $2.50 for mine-run, $2.25 for slack, and $4.25 for the best Connellsville foundry coke, but the actual price, paid in emergency, runs all the way to $1 higher. Coke is also from 25 to 50c. above former prices, if the consumer is short. It may not go down again when the labor troubles are over, as consumption is improving and it has been very low for a long time.

The anthracite situation is unchanged, the demand being strong enough to take everything the mines can turn out. Lake shippers are very uneasy over the outlook as with many vessels loaded for early shipment, there is none to load now, while the upper-lake docks are bare, as a rule. All sizes are almost uniformly scarce, which is also a very unusual condition of things at this time.

Columbus, Ohio

The feature of the Ohio market during the past week was the strong demand for all steam sizes as a result of which prices have ruled higher than for months past. Steam users have been brought to realize that the possibilities of a suspension after Apr. 1 are great and every effort has been made to stock up. But railroad traffic has been so demoralized and the car shortage so pronounced that the efforts to collect a supply of fuel were not productive of great results.

As a result of the movement to cover, practically all of the railroads in Ohio have supplies to last from 30 to 60 days and some of the larger manufacturing establishments are also well supplied. But others are not fortified for a long suspension and much inconvenience is expected if the strike is prolonged for any great period. West Virginia is beginning to ship coal westward now, attracted by the high prices prevailing in that market.

The condition in railroad transportation is not much improved. Congestion still prevails at Toledo and other connecting points and empties are slow in finding their way back to the mines. As a result operations have been restricted to about 65 per cent. of normal during the past week.

Prices prevailing in Ohio are as follows:

Hocking Valley	
Domestic lump	$1.65
¾-in.	1.80
Mine-run	1.60
Nut	1.75
Nut, pea and slack	1.65
Coarse slack	1.55
Pittsburg No. 8	
¾-in	$1.70
Mine-run	1.70
Coarse slack	1.70
Pomeroy Bend	
Domestic lump	$1.75
¾-in	1.60
Nut	1.50
Mine-run	1.50
Nut, pea and slack	1.50
Coarse slack	1.40
Kanawha	
Domestic lump	$1.45
¾-in	1.60
Mine-run	1.60
Slack	1.50

Cleveland, Ohio

Conditions in this market are such that it is a difficult matter to give any accurate information as to which way the market will go. Operators and miners, at their meetings held in this city, have not arrived at any definite results, and the market at the present time is in such a condition that it is impossible to determine what will happen between now and Apr. 1.

There has been considerable coal shipped to this market in the past week by parties, who are holding it on track with the expectancy of obtaining higher

prices. They will, no doubt, realize their expectations, as whether or not the operators and miners get together, there certainly will be a suspension for at least 30 days, and the prices on all grades will in consequence increase very materially.

The larger manufacturers in this vicinity have stocked up sufficiently to keep them running for at least 30 days or more. The smaller concerns not having facilities to handle the coal, will have to pay the increased prices should the strike materialize.

Charleston, W. Va.

The conditions that prevailed in this state a week ago have not been materially changed—the car supply has not improved, although there is just as great a demand for coal and prices are getting stronger. Shipments East are handled without trouble and instances have been cited where the same car has been loaded at the same mine twice within the same week, but shipments to the West have not been so satisfactory. The question of motive power which for a while interfered greatly with the handling of cars has been relieved.

Opinions among operators differ as to whether many men will go out on Apr. 1. Some believe there will be a considerable number while others only look for a strike in several places where the miners' organization has any material strength.

Predictions are freely made that if the anthracite miners go out, bituminous coal will reach $5 a ton by Apr. 10, or practically three times the prices prevailing at this time.

Louisville, Ky.

The outcome of the controversy between the operators of Pennsylvania, Ohio, Indiana and Illinois, on the one hand, and the miners on the other, over wage scales, is being watched with keen interest by the operators in Kentucky. The miners of the western Kentucky fields are affiliated with the United Mine Workers of America, with headquarters in Indianapolis. The Kentucky miners, however, are left to their own resources unless they appeal to the union, or are called upon by the latter to strike. As a result, the operators in Kentucky will not be certain just where they stand until the contest between the miners and operators in the tri-state agreement is decided.

Louisville has a supply of soft coal, including Pittsburg, sufficient to last six months, but if this is drawn upon by other cities as a result of the general shortage, the local supply would be converted into a shortage in a comparatively short space of time. Representatives of coal companies from Chicago and other points have been here recently seeking to purchase coal in the event of a general suspension of work among both the hard- and the soft-coal fields. If this shortage materializes it will mean materially higher prices locally, especially if the stringency lasts very long.

Nashville, Tenn.

Up until Mar. 15, the west Kentucky coal fields were making heavy shipments, both into St. Louis and Chicago, the markets there being very bullish up to that time, but on Mar. 16 the bottom dropped out of the market in St. Louis. At the present time the Louisville & Nashville R.R. has something like 400 cars of coal on demurrage at that point and an embargo has been placed on many prominent firms shipping into St. Louis.

The demand for screenings is still very great, although the market is dead at the present on the other sizes. Everyone is waiting on the conference at Cleveland, and a number of large buyers have discounted the results ahead of time and prepared for a disagreement. Should a general suspension occur in the bituminous field, the nonunion mines on the L. & N. and the I. C. in west Kentucky will reap one of the richest harvests they have ever known and operators in this section are hoping that such will be the case.

Indianapolis

Indications show an impending crisis in the coal situation in this state. The unexpected cold weather occasioned a coal famine in a number of towns and cities. The wholesale dealers refuse to quote prices and retailers, in the market for coal, either do without or pay the high price asked by the operators.

It does not make much difference as to quality. The question of quality is becoming secondary as all coal looks alike to the would-be purchaser who needs it. The railroads continue to store in great quantities, the only exception being the Southeastern, the old Walsh Southern Indiana. It has made an agreement by which the operators have been favored by getting as much coal to the market as possible, in preference to filling orders for storage purposes. In return the operators in the Linton or Green County field have agreed to give the railroads the entire output of 30 mines the last day before the suspension, which will amount to nearly 300 cars.

Minneapolis—St. Paul

Wholesale men here spend most of their time turning down orders or discussing the strike situation. Very little fuel is to be had as practically all coal is sold at the docks and most Illinois mines are reported to be sold up to Apr. 1. Of the coal coming into Minneapolis from Illinois fields, it is reported that only one or two cars now *en route* are not sold.

Steam users in and around the Twin Cities are beginning to be worried as the strike time approaches and have been asking for quotations quite freely on any kind of coal regardless of grades or sizes. They are beginning to realize now that they have taken too optimistic a view of the situation and some of them are clamoring right and left for supplies. The bituminous supply at the head of the lakes is almost exhausted and dock men are not taking any new orders but are holding what they have to supply their regular customers.

A canvas of the retail yards here showed that very little anthracite was in stock. Only small 30- or 40-ton lots were found here and there of nut, stove and egg sizes. No dealers report having any cargo pea or buckwheat. One large retailer had enough foresight to order several cars of anthracite all-rail which he says is coming along nicely and will be here shortly. With the docks swept clean of hard coal and no prospects now of having orders filled, all-rail from the East, it is the general belief that prices will not decline on anthracite as is customary Apr. 1.

Chicago

There has been a stiffening all along the line in the Chicago coal market. Steam lump and mine-run range from $2@2.22 f.o.b. the mines, screenings at from $2.10@2.32 and the same for domestic lump.

Producing companies which supply the most of the Chicago market have sold out their available supply for the remainder of this month. About the only coal in this market commanding attention is smokeless mine-run; this is now selling f.o.b. Chicago at $4.25@4.50, which is on the basis of $2.20@2.45 f.o.b. the mines. Most all of the Carterville operators are sold up, but some few companies have a little coal remaining.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$3.00
Egg	3.00
Steam lump	3.00
Screenings	$3.00@3.10
Springfield:	
Domestic lump	$3.00
Steam lump	3.00
Mine-run	3.00
Screenings	3.00
Clinton:	
Domestic lump	$3.00
Steam lump	3.00
Mine-run	3.00
Screenings	$3.00@3.10
Pocahontas and New River:	
Mine-run	$4.25@4.50
Lump and egg	4.25@4.50

Prices asked for coke are: Connellsville and Wise County, $4.85; byproduct, egg and stove, $4.95; byproduct, nut, $4.75; gas house, $4.90@5.

St. Louis, Mo.

As prophesied in last week's report, the break in the market that has been expected for the past two or three weeks came the latter part of the past week. Everything in the way of local coals took a slump, and the beginning of the present week finds the market in a demoralized condition. Railroad orders are about cleaned up, and this has thrown considerable free coal on the market, for which there is no demand.

The chances are from now on, unless something unexpected turns up, the market will continue weak. One of the causes of the St. Louis market breaking was the buying of between 800 and 900 cars of Kentucky coal by St. Louis jobbers, who were anticipating a rise in the market. The close of last week found close to 500 cars of Kentucky coal under demurrage at East St. Louis, and several hundred more in transit. It was simply impossible to move this coal at any figure, and everything indicates that a portion of it will remain on track for a week possibly before it is cleaned up. Buyers who had not stocked, bought Kentucky coal at their own figures, and this demoralized the Illinois market.

The market opened the early part of the week about as follows:

Franklin County	
Lump and egg	$1.90@2.00
No. 1 nut	1.90@2.00
No. 2 nut	1.75@1.87
No. 3 nut	1.75@1.80
2-in. screenings	1.60@1.70
Carterville	
Lump and egg	$1.85@2.00
No. 1 nut	1.85@1.95
No. 2 nut	1.75@1.85
No. 3 nut	1.70@1.75
Screenings	1.60@1.70
Mine-run	1.55@1.65
No. 1 washed	2.00@2.10
No. 2 washed	1.90@2.00
No. 3 washed	1.85@1.95
No. 4 washed	1.75@1.85
No. 5 washed	1.60@1.70
Standard	
6-in. lump	$1.70@1.80
2-in. lump	1.60@1.70
Screenings	1.55@1.65
Mt. Olive	
6-in. lump	$1.85
3-in. lump	1.75

San Francisco, Calif.

In the past week heavy rain has fallen throughout California; this, coupled with a cold, chilly wind, has materially increased the consumption of coal. A continuance of these conditions should reduce stocks considerably, affording the dealers an opportunity to get their yards in good shape prior to the slack summer months' trade.

Current prices to the trade are as follows, per long ton:

Wellington, B. C.	$8.00
Pelane Main (Australia)	8.00
American canal	8.15
Rock Springs	9.00
Cumberland	12.50
Peacock (Rock Springs)	7.90

Portland, Ore.

The British ship "Kircudbrightshire" arrived in the Columbia River this week with a cargo of coal from Australia. This will be the last cargo to come here this season from Australia, and coal dealers are glad of it because the overhold stock is quite sufficient as it is.

The market here is inactive and from now on till fall the demand is not expected to come from the regular sources. Oregon and Washington are enjoying ideal spring weather but snow fell in some parts of Idaho during the week. It is expected that storage prices will be announced early this year, owing to the large carry-over stock.

Production and Transportation Statistics

Norfolk & Western Ry.

The following is a comparative statement of coal and coke shipments over the lines of the N. & W. Ry. for the first two months of the years 1911-12, in short tons:

Destination	1912	1911
Coal		
Tidewater, foreign	219,893	175,851
Tidewater, coastwise	535,943	398,518
Domestic	2,716,413	2,219,078
Coke		
Tidewater, foreign	8,544	20,466
Domestic	261,020	294,103
TOTALS	3,741,813	3,108,021

Chesapeake & Ohio Ry.

The following is a statement of coal and coke traffic over the lines of the C. & O. Ry. for January and 7 months ending January, 1912, in short tons:

C. & O. Ry. Shipments

Destination	January	7 Months
COAL		
Tidewater	335,290	2,305,754
East	212,314	1,281,733
West	750,103	6,485,874
Total	1,297,707	10,073,361
Bituminous from connections	18,914	136,240
Anthracite from connections	3,155	21,904
Grand total	1,319,776	10,231,505
COKE		
Tidewater	58	1,338
East	8,540	66,494
West	7,605	50,228
Total	16,203	118,060
From connections	1,237	9,997
Grand total	17,440	128,037

The Car Situation

Statement of idle cars as reported to the American Railway Association as of Mar. 13, shows that the peculiar conditions which have been reflected in recent weeks still prevail. The net surplus on the last date reported was but 3033. Two weeks ago the surplus was 7842. The gross surplus of idle cars is 46,028, but shortages totaling 42,985 made the net surplus the smallest in years. This condition resulted from an unequal distribution of the empty cars. In the two weeks ended Mar. 13 the surplus of coal cars decreased from 10,239 to 9844, and the box-car surplus increased from 9024 to 12,910. Shortages in these classes of cars, however, increased decidedly.

Foreign Markets

Prussia

The total production of coal in Prussia for the year 1911 was 13,721,845 tons, as compared with 12,731,097 for 1910. Production of other fuels in 1911 was: Lignite, 5,609,731 tons; coke, 2,326,966; coal briquettes, 419,028; lignite briquettes, 1,265,335. The total production of these latter in 1910 was: Lignite, 5,195,384; coke, 2,219,226; coal briquettes, 401,514; lignite briquettes, 1,170,529 tons.

German Empire

Fuel production in the German Empire for 1911 was: Coal, 14,565,606; lignite, 6,865,208; coke, 2,340,366; coal briquettes, 424,961; lignite briquettes, 1,497,060. The production of these same fuels in 1910 was: Coal, 13,527,215; lignite, 6,319,544; coke, 2,231,865; coal briquettes, 405,625; lignite briquettes, 1,383,503.

Financial Notes

Westmoreland Coal Co. declared the semi-annual dividend of 3 per cent. and an extra dividend of ½ of 1 per cent., payable Apr. 1 to stock of record Mar. 19.

The American Coal Products Co. has declared the regular quarterly dividend of 1¾ per cent. on its common and preferred stocks. The former is payable Apr. 1 to holders of record Mar. 25, and the latter on Apr. 15 to holders of record Apr. 10.

Notwithstanding the fact that the New England Coal & Coke Co. delivered 14 per cent. more coal in January of this year than in January, 1911, and 4 per cent. more in February this year than in the same month in 1911, the net profits for the two months are substantially less.

Annual report of the Consolidation Coal Co. for the year ended Dec. 31, 1911, shows gross earnings of $11,420,694, as compared with $12,712,256 for the year 1910. Net earnings after deducting depreciation were $2,652,414, as compared with $3,215,226 for the year 1910. Dividends for the year 1911 were $1,201,513, and the balance surplus was $182,322, as compared with $1,141,522 and $571,024, respectively, for the year 1910.

A syndicate composed of the National City Bank, Lee, Higginson & Co. and Kissel, Kinnicut & Co., has bought from the Tidewater Co., which controls the Virginian Ry. in the interest of the H. H. Rogers estate, $25,000,000 of first mortgage 5 per cent. 50-year gold bonds of the Virginian company. The principal purpose of the sale is the payment of $17,000,000 of Tidewater Co. 6 per cent. notes which have been called for redemption on June 1. Another $1,000,000 of the proceeds will be used for improvements.

Alphabetical Index to Advertisers

Classified Index to Articles Advertised

POSITIONS VACANT

Advertisements under this heading 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Wanted—A graduate mining engineer to take charge as general superintendent of a coal operation producing about 1,000,000 tons per annum; must be an organizer and possessed of unusual executive ability; salary about six thousand dollars per annum. Address "Miner," Coal Age. Apr. 13.

SITUATIONS WANTED

Advertisements under this head 25 cents for 25 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

Position as master mechanic by a young man of electrical and mechanical experience; able to handle anything of either line around a modern equipped mine; Sullivan cutting equipment preferred; open for engagement after April 1. Address Box 17, Coal Age. Mar. 30.

Wanted—Position as mine foreman; prefer a large mine; 20 years' experience as pit boss, also in electric haulage and machine mining; can furnish first-class references as to temperate habits and ability to handle men; hold a first-class certificate of West Virginia; open at present. Address Box 21, Coal Age. Mar. 30.

Wanted—Change of position by experienced superintendent; have engineering experience; have worked colored and foreign labor, rope and electric haulages, air and electric machines; good record for tonnage and economy; 10 years' experience in charge of mines for some of the largest coal companies in United States. Address Box 18, Coal Age. Apr. 13.

State of New York } ss:
Office of the Secretary of State }

THIS CERTIFICATE issued in duplicate, hereby certifies that THE ENGINEERING NEWS PUBLISHING COMPANY, a domestic stock corporation, has filed in this office on this 20th day of March 1912, papers for the voluntary dissolution of such corporation under section 221 of the General Corporation Law, and that it appears therefrom that such corporation has complied with said section in order to be dissolved.

WITNESS my hand and the seal of office of the Secretary of State, at the City of Albany, this twentieth day of March, one thousand nine hundred and twelve.

(Signed) Jose E. Pidgeon, Second Deputy, Secretary of State

Moments with the Advertising Editor

There was some "good stuff" in an article on "Honesty in Advertising," in the New York "Globe" the other evening. It was written by Bert M. Moses, President of the Association of American Advertisers, and was so interesting that we are going to reprint it here:

"So far as can be learned from History, the wail of the world has ever been for honest men.

"With honest men in control, every problem that has confronted civilization from the Beginning to the Now would be solved.

"There would be no poverty, no crime, no wars, no epidemics, no race or religious hatreds, no discordant note anywhere.

"No one has ever undertaken to count the laws that have been passed to make honesty compulsory.

"These statistics, however, are available: In the year 1910 alone there were passed by the Federal and State Legislatures over 44,000 new laws.

"A law is something whose purpose is to compel people to do or not to do certain things.

"A law, if just, aims to make men do that which they would do without law if they were honest.

"So it seems that a great majority of the enactments passed have as their object the promotion of honesty.

"What has been the result of all these hundreds of thousands of laws?

"Is honesty any more of a glut on the market than it ever was?

"The trouble has been this:

"The law never changed human nature. It never made anybody permanently honest.

"Mankind cannot be legislated into goodness. Morality does not find its source in a Legislature, but must leap straight from the heart.

"Just now there is a nation-wide movement to make advertising honest.

"Every decent man in America is supporting that movement, and all over the land advertising clubs and associations are lifting up their voices in favor of it.

"Perhaps a majority believes the remedy lies in the law.

"Others feel that there is a better way, and an only way, that ever banished any evil. That way is the Power of Public Opinion.

"Ten years ago dishonest, deceiving and false advertising was at its zenith.

"Exaggeration, falsehood, and plain lying were universal.

"The fakir and swindler were not the only offenders, but practically every advertiser indulged in extravagant and unwarranted forms of speech in promoting his wares.

"Then the real work of reform started.

"Publishers began to refuse that particular form of advertising which was fraudulent on its face.

"More and more closely was the copy scanned as time passed, until to day the professional swindler finds his way so almost completely barred that his vocation of collecting coin by fraudulent advertising is about gone.

"There still remains that semi-respectable form of advertising that deals largely in superlatives and exaggeration. But progress upward has been rapid, and it has come about, not because of law, but because men are learning without enactment that honesty is a paying proposition.

"They are learning that truthful advertising, which the public believes, 'pulls' better than misleading advertising that the public suspects.

"Public opinion is a power above and beyond laws, and, so far as I can learn, no law ever made public opinion.

"Laws are for lawyers.

"Once get advertising into their hands, and the issue will be so clouded that no man will know what he may or may not say in public print.

"Truth is a point of view, and in all History no man has yet appeared who was wise enough to say, 'This is surely so, or that is surely not so,' in the matter of merchandise.

"Public Opinion is at work, and its influence is widening and broadening daily.

"To now rush in and try to accomplish by law that which is being accomplished without law would be a blunder.

"That is the way the thing looks to me."

Doesn't this help to show why it pays to read the advertisements in your paper, and to buy advertised goods?

COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 26.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, APRIL 6, 1912

Ten Cents per Copy.
U. S. and Mexico, $3 per Year.
Canada, $4; Other Countries, $5.

CONCRETE AND STEEL UNDERGROUND MULE BARN.
ROSS VEIN, TRUESDALE MINE, NANTICOKE, PENN.

COAL AGE

CA

COAL AGE

Vol. 1 NEW YORK, APRIL 6, 1912 No. 26

HALTING conservatism is the keynote of our mining methods. We have been afraid to blaze a brand new trail, and we tinker along, modifying old contrivances. No other nation adheres so dutifully in mining to antiquated principles and first ideas.

Make no question, the man who will succeed will think a new thought, or, at the very least, will *take up* with a new one. There are minds aplenty which follow, but few that lead. The masses who march in the ranks have already worked out all the possibilities of initial methods.

How ineffectual is all our mining machinery, how ineffective our shooting, how difficult the introduction of loading machines, face conveyors and pneumatic tubes with such disjointed room-and-pillar systems as we persistently follow. Waste of coal, waste of labor, poor product, low output, all are the net results of present-day conservatism.

At any colliery where coke is made, a small proportion of the overs could be harnessed to a boiler plant. One oven will supply an average of 20 h.p. every day in the week. Not only will the operator find the first cost of the installation about the same, but he will discover that the coke is brighter, denser and heavier from the process.

The recovery of tar and ammonium sulphate by the use of byproduct ovens, and the utilization of waste gas, would pay interest on the total installation charges, and in addition, would cover the cost of coal, leaving the coke as velvet.

The gas producer at first seemed but the vain dream of enthusiasts, and many persons believed it could never be set at work on dollar coal or ten-cent slack. But European colliery managers proved beyond doubt the practicability and success of the system.

It's a fact therefore today, that many of us advocate the installation of producers so as to make it possible to use fuel which can't be employed under a boiler, or to burn a better grade with increased economy. One ton of coal will turn more wheels operating through a producer and gas engine than 2½ times as much of the same fuel with a boiler and steam reciprocator of normal type.

One ton of low-grade lignite from the Dakotas will give better results by the all-gas route than a ton of the best West Virginia product used in the stereotyped fashion. No coal is too poor for producer gas, and fuel containing 70 per cent. ash has been utilized. In England, carbonaceous shales and belt pickings are added to increase the heat value and to augment the sulphate output.

Our action with regard to turbines has been the same. We needed greater power, so we put in more reciprocators and had to install additional boilers and employ more men to maneuver the shovel. If we had acted in accord with advanced ideas, we could have obtained all the power needed, by using a low-pressure turbine to take care of the exhaust steam.

Many of the new steam-electric plants are reciprocator-driven, direct-current installations, ignoring the fact that reciprocators are less efficient and that the transmission of direct current is expensive.

A new era approaches. It is unreasonable that coal companies should be compelled to waste all the gas generated, because of hobbling charters which permit them only to market coal and coke. Collieries will not always ship their output to market, but will deliver gas or electric current, and we may yet see a large yield of ammonium sulphate made possible by the use of offal and the waste of sludge tanks and cesspools.

Even now, a ton of bituminous coal in a producer will give 85 lb. of sulphate, worth, say $2.64. One hundred-weight of sulphate is used to fertilize an acre. It is evident therefore, that a good sale can be obtained for the product. The tar can be used for briquetting; so that, over and above the 140 to 160 thousand cu.ft. of gas, a considerable profit remains.

The coal industry has only just begun. Before the century is over we may extract gas from the fuel deposits without mining, or we may consume the coal as an electrical anode in a giant battery cell.

Extensive Use of Coke-Oven Gas

By C. A. Tupper*

The use of coke-oven gas in combustion engines for the generation of power has rapidly developed until now a great number of large plants of this kind are in successful operation. These are found chiefly in Germany. There are many opportunities in this country for taking advantage of German experience and converting the waste gases of coke ovens into electric power and other valuable products.

In a recent issue of COAL AGE, I mentioned some of the possibilities of generating electric power from coke-oven gas, and described a plant typical of a number that I inspected during a tour of the coal-mining and coking districts of Europe. The plant referred to was that of the Gewerkschaft Minister Aachenbach, at Brambauer, Germany, which was equipped by Haniel & Lueg, of Düsseldorf.

The accompanying illustrations, however, will serve to give a much better idea of the extent to which such gas power is being utilized abroad. Fig. 5 shows the interior of the electric generating station, at Alsdorf, Germany, of the Eschweiler Bergwerks Verein, current from which is distributed to motors and used for lighting at all of that company's operations. This is the largest power station in the world, operated on coke-oven gas. It is equipped with engines built by the Maschinenfabrik Augsburg-Nürnberg, direct-coupled to alternating-current generators from the shops of the Allgemeine Elektricitäts Gesellschaft, at Berlin. There are nine of these units at present installed, with an aggregate rated capacity of 15,000 hp., and provision is being made for others. The gas used here is supplied from several batteries of Koppers regenerative coke ovens, partially illustrated in Fig. 4 in connection with which there is operated a byproduct plant for the recovery of ammonium sulphate, tar compounds, etc.

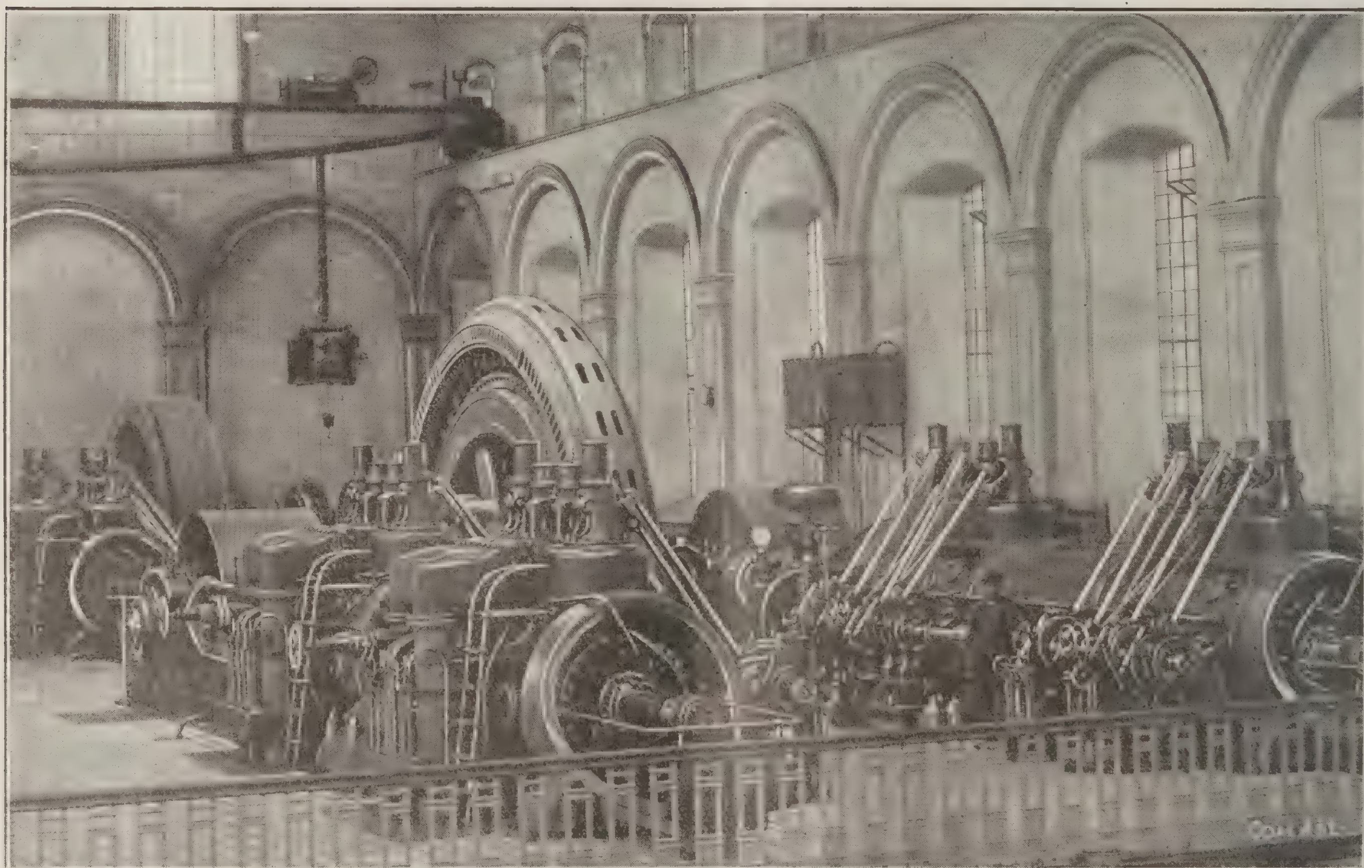


FIG. 1. GAS-POWER PLANT AT BARGOED, WALES

Originally, the gas from the coke ovens in use here, was burned under boilers, and the steam thus produced was consumed in a number of isolated engine plants installed, wherever necessary, over the wide area of the company's operations. For these comparatively small power stations, the total running expense and cost of upkeep were relatively high, particularly as it was necessary to carry a spare engine in each locality. The losses through condensation in some of the steam feeder pipes, which were, in places, of considerable length, also increased operating costs.

Gas-engine Driven Electric Plant

The obvious remedy for such conditions lay in the construction of a central electric-generating station and the complete electrification of all the company's plants. When it came, however, to deciding upon the type of prime mover to be installed, the verdict was in favor of gas engines, rather than the continued use of steam, for the reason that, with a steam plant of even the most efficient type ordinarily used, it is possible to convert into power only a much smaller percentage of the calorific value of the gas than can be utilized with gas engines. The management therefore decided to dispose of the steam engines, one after another, and gradually concentrate the production of power in a gas-engine-driven electric plant.

The gas being used under the boilers at that time would not, however, do for use in gas engines; and the next problem was to secure a product sufficiently free from impurities to serve this latter pur-

*Consulting engineer, 389 Thirty-first Ave., Milwaukee, Wis.

pose. The installation of a byproduct recovery plant was determined upon at the same time, and this provided for the removal of tar compounds, as well as some other deleterious substances; but the necessity remained for extracting the large percentage of sulphur present, and to provide for the effective removal of this, a special cleaning plant was constructed, which, like the one illustrated in the Nov. 25 issue of COAL AGE, consists primarily of layers of bog iron laid out on rough wooden lattice-work shelves. However, in this installation, fans are used for forcing the gas through the filter frames, and the tar extractors, originally used, have been eliminated. After the Koppers-type ovens had been substituted for an older type, these extractors were found unnecessary, as the byproduct plant effectually removed all tar. A central chamber also has been provided, where, as the ore becomes saturated, it can be dumped from the frames and regenerated by exposure to the air. The two sides of the filter are operated alternately, so as to afford opportunity for this freshening process, and thus the same ore can be used for a considerable length of time.

FIG. 2. KOPPERS BYPRODUCT PLANT, AT OESPEL

The gas, as cleaned, has a composition approximately as follows:

		Per cent.
Carbon dioxide	CO_2	2.00
Oxygen	O_2	0.82
Carbon monoxide	CO	5.82
Methane	CH_4	20.83
Other hydrocarbons	CnHm	1.40
Hydrogen	H_2	55.11
Nitrogen	N_2	14.02
		100.00

From the filter plant, the gas can be sent directly to the gas engines or to one of two gas holders, having a combined capacity of 52,500 cu.ft., from each of which two separate lines, with drain-off valves, etc., lead to the power station. Ordinarily the gas passes through these holders. To insure a sufficient supply of gas when the number of ovens in service is not equal to the demand, gas producers have been installed as auxiliaries. The present output of power represents about twice the amount, proportionately, that was formerly obtainable from the same number of ovens when steam engines were used.

COMBINED GAS-ENGINE AND STEAM-TURBINE SYSTEM

Without going further into the details of this station, which can be considered collectively with those of other plants, let us turn to the gas-power plant of the Royal Prussian Mines for the Saarbrücken district, at Heinitz, Germany. This contains seven engines, totaling 10,000 hp., and two more, which are to be put in operation before long, will increase the total to 16,000 hp. All the gas here used is supplied from Koppers ovens, similar to those shown in Fig. 4. This first passes through a byproduct plant and gas holders of 210,000 cu.ft. capacity. There are no producers held in reserve, but a steam-turbine plant at the other end of the district is connected with this station by transmission lines and operated in parallel with it, supplying whatever excess power is needed.

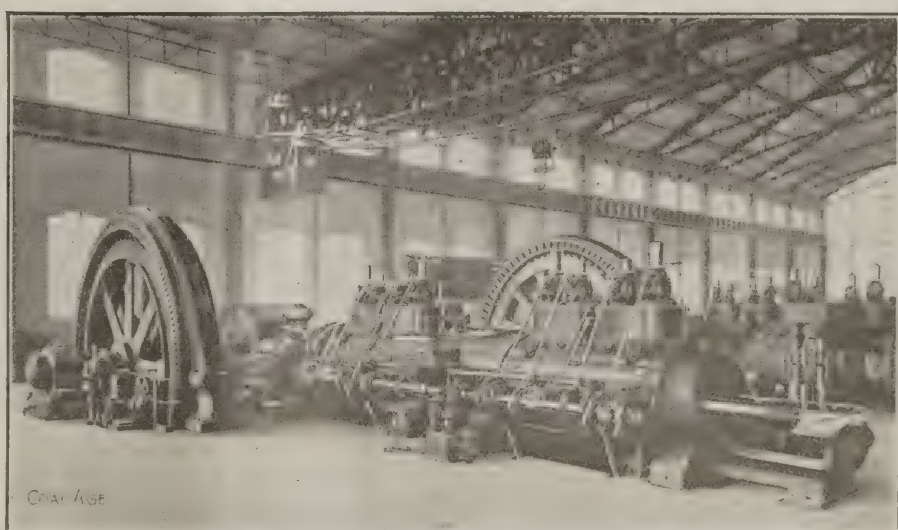


FIG. 3. GAS-POWER PLANT, AT NANCY, FRANCE

The gas, as it leaves the byproduct plant, is cleansed in a dry filter, which differs but little from those already described, and its average composition may be given as follows:

		Per cent.
Carbon dioxide	CO_2	2.87
Oxygen	O_2	0.98
Carbon monoxide	CO	7.46
Methane	CH_4	26.78
Other hydrocarbons	CnHm	3.70
Hydrogen	H_2	48.20
Nitrogen	N_2	10.01
		100.00

It will be noted, in both the cases above cited, that the gas from coke ovens is not unlike natural gas, although lower in methane. At Alsdorf it runs from 340 to 450 B.t.u. per cu.ft., and at Heinitz from 470 to 540 B.t.u. The producer gas generated in the auxiliary plant of the Eschweiler Bergswerk Verein, at Alsdorf, averages only 113 B.t.u.; so it will be seen that the coke ovens furnish a comparatively rich gas.

The situation in the Saarbrücken district is similar to that at Alsdorf, but the field is vastly more extensive, as the distribution system serves 27 mines and aggregates more than 70 miles in main cables, with a network of feeder lines. This is all linked together on the "ring" plan, and any point can be supplied from either the gas-engine plant or the steam auxiliary station at the other end of the district. Originally, each mine or group of mines was served by its own steam-engine plant. The gas engines for the Heinitz station were built by Ehrhardt & Sehmer, of Schleifmühle, near Saarbrücken, and the generators by the Felten & Guillaume-Lahmeyerwerke A. G., Frankfurt-am-Main.

In Fig. 3 is shown the 4000-hp. power station of the Societe Anonyme des Hauts-Fourneaux, Pompey, near Nancy, France, which is practically identical in appearance and in the design of the electric units with the 3000-hp. plant of the Rheinpreussen Colliery, Homberg, Ger-

many, operating on coke-oven gas. The equipment for both was furnished by Haniel & Lueg, mentioned above.

Fig. 1 illustrates one of three Nürnberg gas engines, aggregating 6000 hp., running on coke-oven gas in the power plant of the Powell Duffryn Steam Coal Co., Ltd., at Bargoed near Cardiff, Wales, and a similar plant of the same capacity, but with direct-current generators, is operated by the Luxemburger Bergwerks & Saarbrückner Eisenhütten A. G. at Burbach, near Saarbrücken, Germany, on a combination of blast-furnace and coke-oven gas.

Fig. 4. Koppers Coke Ovens with Byproduct Plant in Background

Power Equivalent of Coke-oven Gases

Taking the gas-power station at Heinitz as fairly representative of advanced German practice in the utilization of coke-oven gas, it may be said that 120 ovens now in service there, with the long coking period of 41 hours and a daily production of 6.7 tons of coke per oven, yield surplus gas to the quantity of 3,600,000 cu.ft. during each 24 hours. This is found, in actual operation as utilized in gas engines driving alternating-current generators, to be equivalent in electric power to about 100,000 kw.hr., or 120 kw.-hr. per ton.

Comparing this with the installation of 560 Koppers ovens made for the Steel Corporation at Gary, Ind., with a coking time of 16 to 18 hours and a yield of surplus gas amounting to about 45,000,000 cu.ft., some idea can be obtained of the enormous power possibilities of the latest byproduct system. By "surplus" gas is meant the quantity available after heating the regenerative ovens, which requires from 50 to 65 per cent. of the whole, and after deductions are made for other minor purposes. Taking as a basis, the figures compiled from all over the world by German engineers, notably those of the Maschinenfabrik Augsburg-Nürnberg, prior to the recent enormous percentage of increase in coking capacity, it is apparent that upward of 2,800,000 kilowatt-hours of electric energy would be available each day of the year, if all the coke consumed were to be produced in modern byproducts ovens; and even this does not allow for reduced coking periods and refinements of practice such as have been introduced at Joliet, Gary, Birmingham and elsewhere in this country. However, it might not be economical to convert all this energy into electric power, as there is usually a good market for much of the gas for illumination and heating in cities or towns; but the surplus for utilization in internal combustion engines would still be large.

The enormous value of the byproducts of the coking operation is also to be considered, and, as the market for these is extended, there will be more and more of a disposition to erect modern plants in place of the older types. Where the gas is to be used in gas engines, the byproduct plant is a necessity; for otherwise the matter carried in suspension and chemically combined with the gas cannot be removed without disproportionate expense. In connection with the origin of the byproduct system, it is interesting to note that an Alsatian coke-maker named Stauf, of Saarbrücken, made practical experiments along this line with a battery of ovens, as far back as 1772.

BYPRODUCT RECOVERY PLANTS

Since that time, and particularly in recent years, a number of effective systems have been developed; among the best known are the Semet-Solvay, Otto Hoffman, Otto and Koppers. A typical plant for the recovery of byproducts, and consequently the preliminary cleansing of the gas, is described by Prof. Chas. E. Munroe, of George Washington University, in his report to the U. S. Government on coke making. First in importance in such plants, are the exhausters, which remove the gas from the ovens, draw it through the mains and coolers, force it through tar scrubbers, where the tar, which exists in finely divided particles in suspension, is removed through friction, and thence lead it to the ammonia scrubbers. These are followed by the ammonia recovery plant, where weak ammoniacal liquor is converted by distillation into concentrated crude liquor or into ammonium sulphate. The gas itself passes from the ammonia scrubbers to the benzol recovery plant, where benzol is obtained by scrubbing it with dead oil. It is then drawn through the dry filter previously described, for the separation of the remaining sulphur and cyanogen compounds. The details and ramifications of byproducts plants vary widely, because the substances obtainable from crude coke-oven gas are quite numerous. So far as the subject of this article is concerned, however, the main object is to strip the gas of everything carried in suspension which would be deleterious to the cylinders or other parts of gas engines, and deliver it at the final dry filter plant with only such chemical compounds as are there readily removable. Fig. 2 is a view taken at a Koppers plant, Oespel, Germany, showing condensers, coolers, tanks, etc.

Additional power from coke ovens can also be obtained by utilization of the waste coke, or coke "riddlings" in a producer especially designed for that purpose. This system will be described in a later article. .

As previously mentioned, the gas is customarily passed through holders, in which it is blended, and then drawn by natural suction to the cylinders of the gas engines. The four-cycle, double-acting type of engine has been most successfully used abroad; and for large plants twin-tandem machines, with heavy fly-wheel rotors in the generators are preferred. Quality, or constant compression, regulation has displaced the quantity regulation originally tried, and with this change there have been removed the principal difficulties which were still encountered after the problem of cleaning the gas had been solved. Trouble with the stuffing boxes, uneven heating of the cylinders, distortion of piston rods, defective ignition systems, etc., which were so discouraging at first and had such a deterrent influence upon similar efforts in this country, have practically been eliminated. Water jacketing and cooling, lubrication, etc., have also been made both effective and economical. In short, the Germans have been entirely successful in utilizing coke-oven gas for power, and there is no reason why Americans should not take due advantage of their experience.

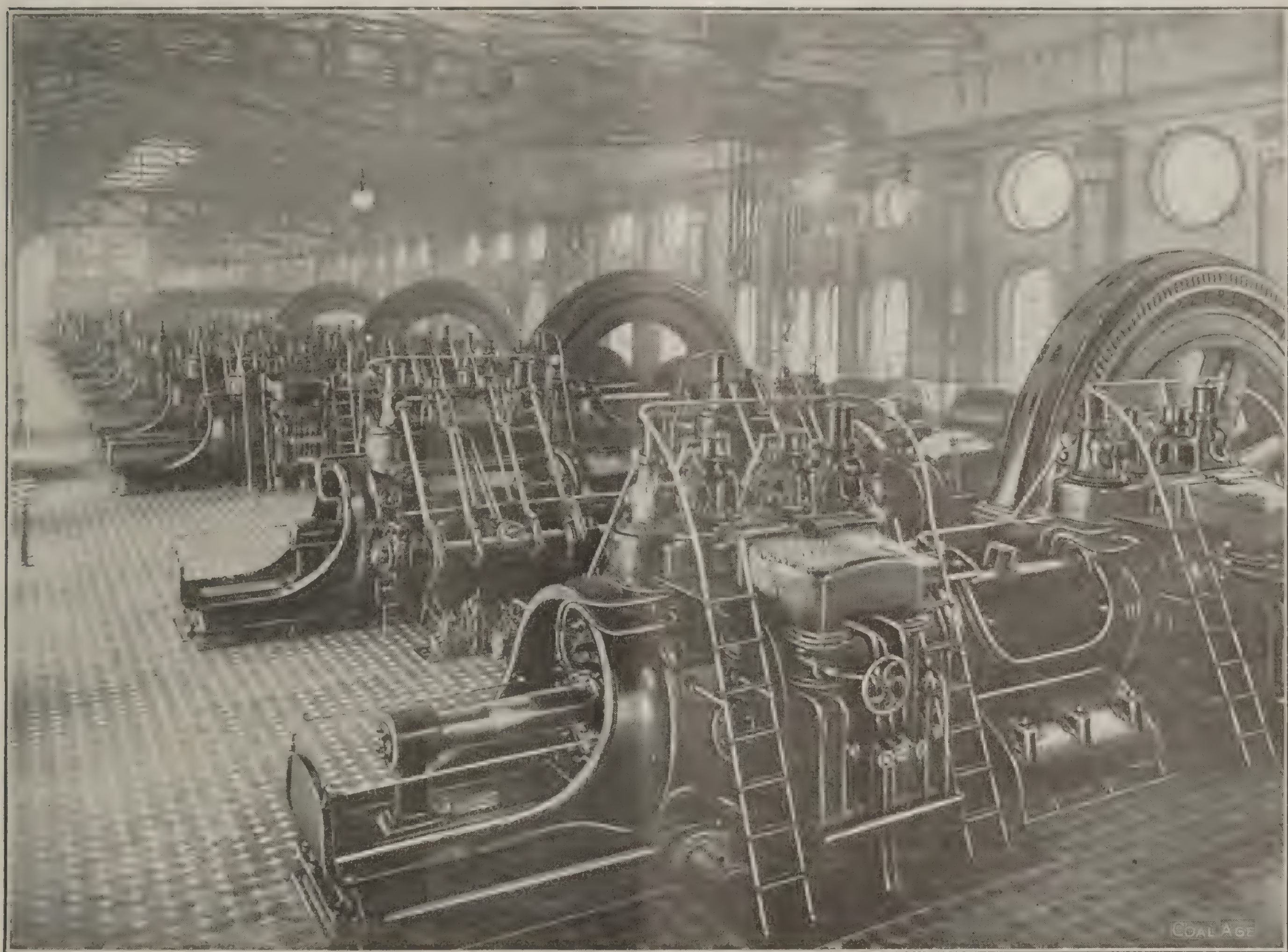


FIG. 5. POWER PLANT USING COKE-OVEN GAS, ESCHWEILER BERGWERKS VEREIN

The successful working of a coal seam depends to a large extent upon the equal distribution of the weight of the overlying strata upon the pillars. Many a seam has been lost for lack of attention to this important detail.

Portable Electric Lamps for Miners

Careful experiments which the Lehigh Coal & Navigation Co. have conducted for an extended period with the portable electric storage-battery system of lighting for mine workers have given such encouraging results that the management has been prompted to take another step forward in the application of this system to the operation of its mines.

The company's electrical engineer, G. M. Kennedy, was recently directed to design a modern charging plant for the storage batteries, which would insure their being charged at constant voltage, and provide means for measuring the consumption of current, so that an accurate account of the cost of operating and maintaining the system would, at all times, be available.

There are several such charging stations in the coal fields at present, but they all receive the necessary current from nearby trolley lines, and as the line voltage on mine-haulage systems usually fluctuates from 250 volts to zero, it can readily be seen that under such conditions no storage battery will operate at a maximum efficiency. By keeping in view the conditions that should govern the recharging of storage batteries, an installation has been designed and completed that will undoubtedly set a standard to be followed by many other coal companies.

The Charging Plant

This equipment is shown in Fig. 1, as temporarily located in the safety-lamp house at the company's No. 5 colliery. As soon as the weather permits, a permanent installation will be made in a brick building, to be erected for the purpose of housing the entire equipment, and it may be well to ignore some of the details of the temporary installation and outline the permanent equipment to be located at No. 5 colliery.

A diagram of the plant, which is of ample capacity for charging 400 cells, is shown in Fig. 3. From the power house, located two miles distant, current is transmitted at 2300 volts, and is stepped down through three 2-kw., General Electric, Type H transformers to 220 volts, and thence transmitted through 1½-in. conduits to the switchboard, which was specially built for this installation by Eynon & Evans, of Philadelphia, Penn. The current passes through a 50-amp., triple-pole switch to a starting compensator, which controls the 7½-hp., General Electric, three-phase, 220-volt motor, running at 1500 r.p.m. This is direct-connected to a 5-hp., 125-volt, d.-c. interpole, compound-wound generator that furnishes the charging current. This power is transmitted through 1½-in. conduits to the switch on No. 2 panel, where one Westinghouse, 150 d.-c. volt meter,

Special Correspondence

Electric lamps, worn by the mine worker and giving a reliable light continuously for more than 12 hours, are being introduced at a number of collieries. The equipment installed at one operation of The Lehigh Coal & Navigation Co. is here described, with special reference to a charging station for the lamp batteries.

one 7½-amp. current meter, and one 5 amp. polyphase wattmeter are provided. These enable the operator to ascertain the exact amount of current that is being consumed and from these data the engineering department will be able to determine the actual cost of operation and maintenance.

There is also provided on No. 2 panel of the switchboard, an automatic reverse

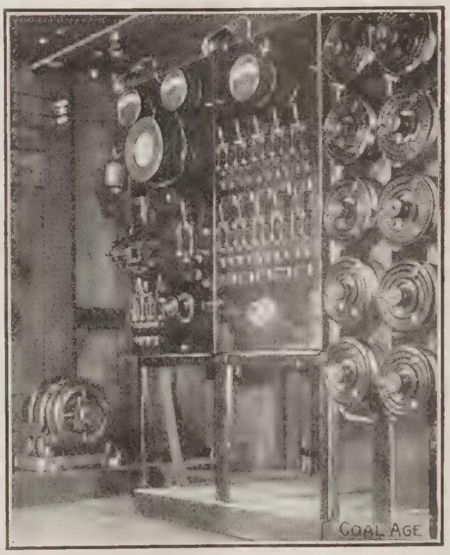


Fig. 1. Switchboard and Charging Motor

current and overload circuit breaker, furnished by the Cutter Co., which automatically opens when the current in the cells reaches a predetermined point, and thus prevents the battery current from flowing back into the generator circuit.

From the generator switch, a set of busbars connects with ten 25-amp. White return-bend switches, each equipped with a shunt coil. On No. 3 panel are 10 wall rheostats, furnished by the Cutler Hammer Co., of Milwaukee, designed to regulate the voltage, so that from 20 to 40 cells may be charged at one time in each of the 10 circuits. The charging current is measured by an 8 amp. meter that is switched into the desired circuit through the 10-circuit ammeter-shunt switch, manufactured for this installation by the Crause Hinds Co., of Syracuse.

Rack for the Batteries

The rack for supporting the batteries while they are being charged, deserves special consideration. As shown in Fig. 2, it consists of a series of shelves built one above the other on an angle of 45 deg., and easily accommodates 400 cells. The most important feature of this outfit is the contact device that runs the entire length of each shelf, and is made of No. 12 gage sheet brass, 1 in. wide. In order to charge one of the batteries, it is only necessary for the operator to push it between any pair of the jaws and it then forms a part of the circuit. By this method, all danger is removed of reversing the flow of current through the batteries, and the tedious work of connecting and disconnecting a large number of wires is obviated. Moreover, the racks always present a neat and clean appearance. The negative portion of the circuit is carried by a No. 6 wire, which terminates at the top of the racks, and from there the current is carried by a ⅜-in. brass rod which connects with each one of the contact strips. The positive leads are carried from the switchboard to the opposite end of the table and are there connected to each one of the ten brass switches.

As is usual in the case of all inventions that have successfully reached the commercial stage, there have arisen many claimants for the credit of perfecting the storage battery to the present efficient form, that now enables miners to use an electric light in their daily work. While some of the coal companies have conducted a number of experiments with storage batteries, their work has been limited to the task of making life and efficiency tests of such storage batteries as the various manufacturers have submitted for that purpose.

It remained for H. H. Hirsch, of Philadelphia, after many years of exacting research, to develop and perfect a battery that has now been accepted by coal-mining companies, as one that meets the rigid requirements of mine work, and there are now in use in the anthracite field nearly 4000 portable lamps of the Hirsch type, manufactured by the Pennsylvania Storage Battery Co., of Philadelphia.

The Hirsch Lamp

The construction of the battery is unique, in that the two electrodes are arranged horizontally and the plates are separated by a substance which is a combination of wood fiber and hard rubber. After a number of experiments directed toward finding a solid electrolyte, a material was found that, when treated with certain acids, formed a gelatinous silicic acid, which sets to a congealed jelly in

a half hour after charging, without adding to the internal resistance of the battery.

The new type of battery measures 2x3x4 in. It is supported by a 1¼-in. leather belt, that either can be slung over the shoulder or secured around the waist, and, as the batteries weigh only 2 lb., the miner is not encumbered in his work.

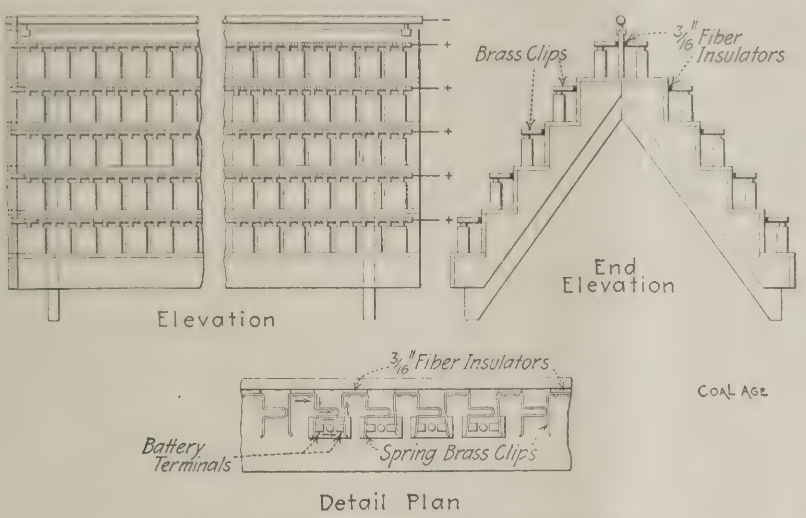


FIG. 2. CHARGING TABLE AND CONNECTIONS

From the battery, a No. 16 brewery lamp cord, with copper terminals, carries the current to the 2-cp. special Mazda lamp, which is secured to the miner's cap, furnished with the equipment. The efficiency of the light is increased by the use of a strong parabolic reflector, specially designed to produce a clear light, without shadows, and is protected from dirt or injury by a heavy glass front.

Constant use of the equipment pointed out several minor defects that were quickly eliminated by the hearty coöperation of miner, employer and inventor, and today it is possible for the miner to work for as much as 16 hours with a clean and reliable electric light furnished from one battery. In fact, on several occasions, batteries have furnished current for as long as 30 hours, and it is the hope of the Lehigh Coal & Navigation Co.'s management that when the batteries are charged under more favorable conditions than those that have hitherto obtained, a much desired increase in the life of the batteries will result, or possibly their weight may be reduced still further. The operation of the plant will be supervised by Harold Ramsey, assistant electrical engineer, who assisted in the design and supervision of the installation.

Advantages and Economy

Up to the present time, this company has furnished its employees with the portable lights free of charge, and once used, no mine worker has desired to go back to the old inefficient, smoky and dirty open light. The electric lamp has been used by the men in parts of the mines where gas was present. Also, it has been of material assistance to the firebosses on their daily tours of inspection, and although they have to carry safety lamps for the detection of gas, they now find the portable electric lights indispensable. It does not require a great deal of foresight to predict that the safety lamp will be used eventually only for the detection of gas, and that before long nearly all mine workers will be equipped with electric lights. The low voltage at which the lamp operates, precludes the possibility of igniting a body of gas by a spark from a loose connection or a short-circuit across the battery terminals, and, as the filament of the lamp will remain incandescent only in a perfect vacuum, danger from that source is quite impossible.

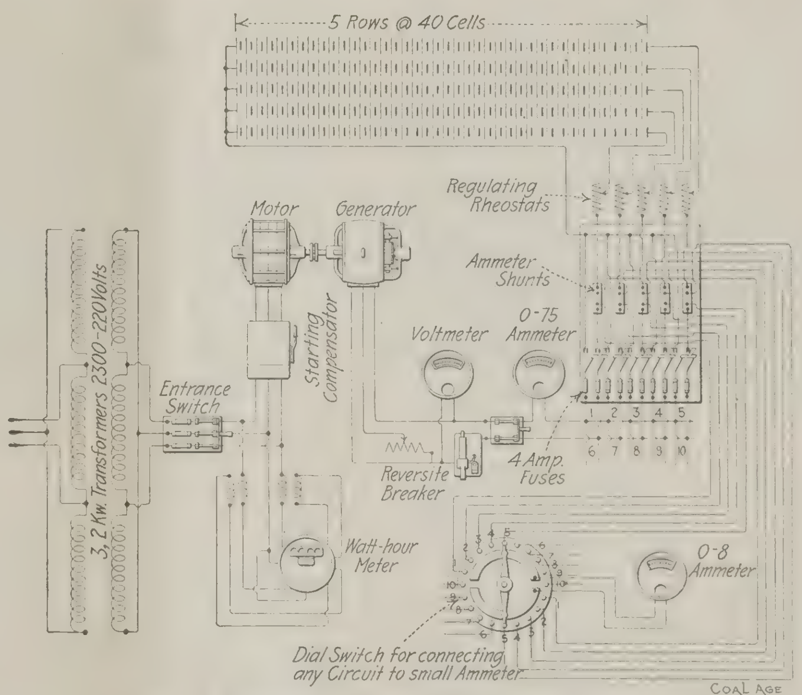


FIG. 3. DIAGRAM OF ELECTRIC CHARGING APPARATUS

From an economic viewpoint, the use of the electric lamp is destined to increase. It now costs a miner from 30 to 40c. per week for oil for the naked light. The same amount weekly will cover the interest on the investment in a portable electric light, and also the cost of maintenance. Even if the coal-mining companies should ask each miner to purchase his own equipment, it would entail no added expense.

Universal use of the electric lamp would relegate to oblivion the dangerous naked light, and thus materially decrease the fire hazard underground, and mark the passing of one of the sources of preventable mine fires. The lamps are being used above ground also, where the danger of causing fires is considerable, and it is now no longer necessary for repair men to use open torches while working in the breakers. Shotfirers have found the batteries adequate for their work, and they are thus provided with an additional safeguard.

In this day and generation, when it seems popular to assail corporate interests, it is a pleasure to record a work on which progressive managers of coal companies have expended both much time and money, so that the burden of the mine workers may be lightened and the mines freed in part of their hazards and dangers.

Experience has shown that it is wise to install electric locomotives of a larger capacity than is necessary to deliver the required draw-bar pull, for if the motor has no reserve power but is only just able to develop the required pull under favorable conditions, then when these conditions are altered, as is sure to be the case at times, the motor is apt to prove unsatisfactory.

Central Station for Colliery Service

By E. B. Wagner*

The proposed electrification of a considerable portion of the Lehigh Valley Coal Co.'s operations in the vicinity of Centralia, Penn., has resulted recently in the construction of a central station at that point. The equipment of this installation is here described in detail.

During the past year, the Lehigh Valley Coal Co. has put in operation the first part of its new central station, at Centralia, Penn. This company has extensive operations in the vicinity, which are widely distributed over a large territory and consequently can be served with steam power, only by a number of isolated boiler plants. The purpose of the new central power plant is to replace the steam-driven hoists, pumps and fans that are operated by the isolated steam plants, with more economical electrically-driven equipment.

The Centralia Colliery was selected as the site for the new power station, not only because it is most centrally located, but also because it is the receiving point for coal from the numerous shafts and slopes in the neighborhood. There is thus insured a plentiful supply of cheap fuel, obtained directly from the nearby breaker. To take care of the increased steam consumption at this point, due to the centralization of power supply, the erection of a new boiler plant has been started and two batteries of Stirling boilers have been installed, provisions being made for more to follow as necessity arises. A working steam pressure of 150 lb. is maintained.

The power house is of reinforced concrete, pilaster construction, with 4-in. curtain walls. Large size Fenestra steel window frames in each panel give a well lighted interior. The plant is equipped with a hand-operated 18-ton crane. Owing to the natural contour of the ground it was possible to build a retaining wall just behind the steam cylinders of the engine, thus forming a pipe way, in which are placed the steam and exhaust lines. The wall at the west end of the building was made of temporary construction so that an extension to the building could readily be made.

A general floor plan of the plant is shown in Fig. 3. The large foundation is for a 22 and 36 x 36 in. cross-compound corliss engine, running at a speed of 107 r.p.m. Directly connected to this engine is a 500 kv.-a 2300 volt three phase, 25 cycle alternator. The low frequency was adopted because the power generated will be used exclusively for hoisting, pumping, fan and haulage work, in which low speed motors can be employed to advantage.

In the northwest corner of the building is located the switchboard, with the electrolytic lighting arresters in the rear. Directly in front of this is a 75 kw. 125 volt motor-driven exciter set, operated by a 112 hp., 2200 volt, 750 r.p.m. induction motor, with s uirrel cage rotor. At the side of the motor is the autostarter. The steam-driven exciter is placed behind the motor-driven unit and consists of a 13x14-in. side crank engine connected to an 80 kw. 125 volt generator, running at a speed of 255 r.p.m. Both the exciters are shunt wound and are of sufficient capacity to supply three 500 kv.-a. generators. All generator and field wires are run in conduits placed under the floor, pot heads being placed on the end of the 2200 volt cables and condulets on the direct-current wires.

The switchboard is built of black marine-finished slate panels, 90 in. high and arranged in the following manner: Starting at the right, panel No. 1 is a double exciter panel having mounted on it two double-pole main switches, two d.-c. ammeters, a d.-c. volt meter and plugs and two field rheostats. Panel No. 2 has an oil switch equipped with an overload release for the motor-driven exciter set, and on its upper section is mounted a Tirrill regulator. Panel No. 3 is a generator panel and is equipped with an a.-c. ammeter and switch, a.-c. volt-meter and plugs, d.-c. field ammeter, indicating polyphase wattmeter, field switch, rheostat handle, main oil switch and integrating polyphase watt-hour meter.

Panels Nos. 4 and 5 are blank generator panels. Panels Nos. 6, 7 and 8 are feeder panels, each being equipped with one ammeter and automatic oil circuit breaker with inverse time element relays. At the right of the switchboard, is a swinging bracket holding synchroscope, frequency meter and power-factor meter. Following standard practice, no circuit breakers are placed on the d.-c. exciters or alternator main switches.

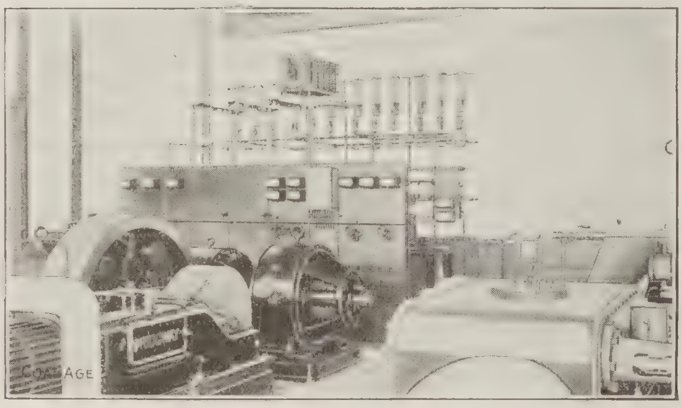


Fig. 1. Northwest Corner of Power Plant

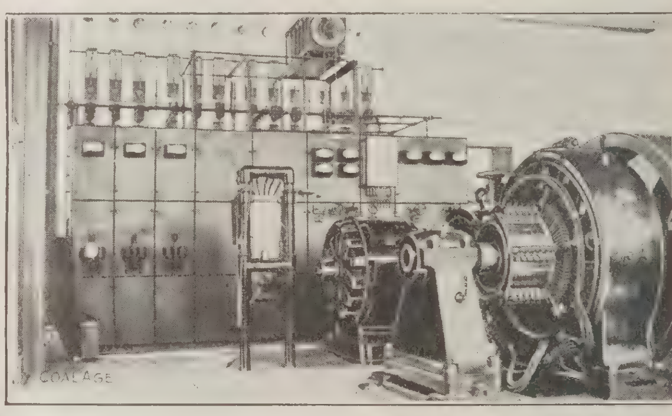


Fig. 2. Exciters and Switchboard

Figs. 1 and 2 show interior views of this central station. Fig. 1 gives a general view of the exciter and switchboard. It will be noted that the alternator field rheostat is shown mounted on a pipe framework directly over the generator panel. In the rear, and above the top of the panels, the choke coils and disconnecting switches are mounted on a pipe framework, while just above them are the wall insulators, through which the 2200-volt feeders pass to the wire tower outside the building.

The method of mounting the autostarter for the exciter motor is plainly shown in Fig. 2. This mounting consists of a 3-in. gas-pipe framework with a triple - conductor varnished - cambric cable running up inside each vertical pipe. The elbows at the top are types *LR* and *LL* condulets, the wires coming out through the porcelain bushings and entering the starter.

*Electrical engineer, 56 North Washington St., Wilkes-Barre, Penn.

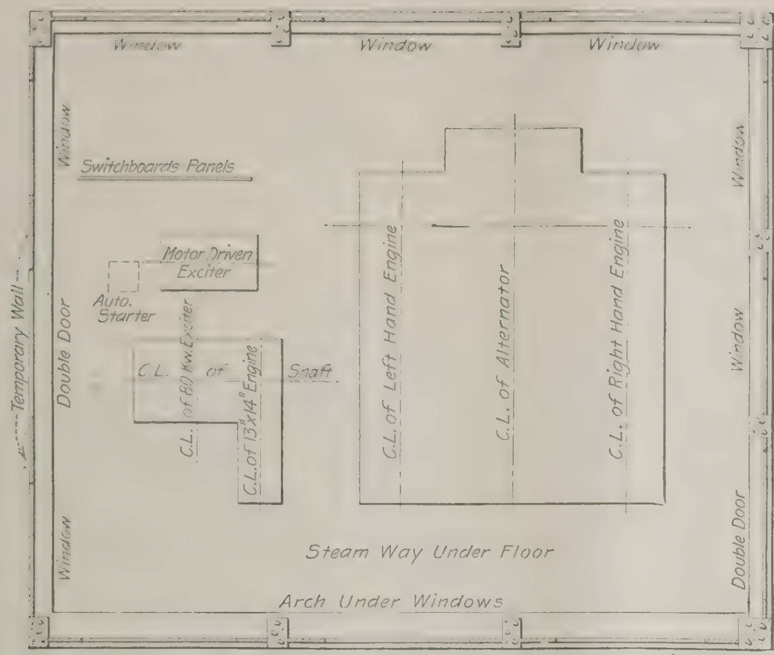


FIG. 3. GENERAL PLAN OF STATION

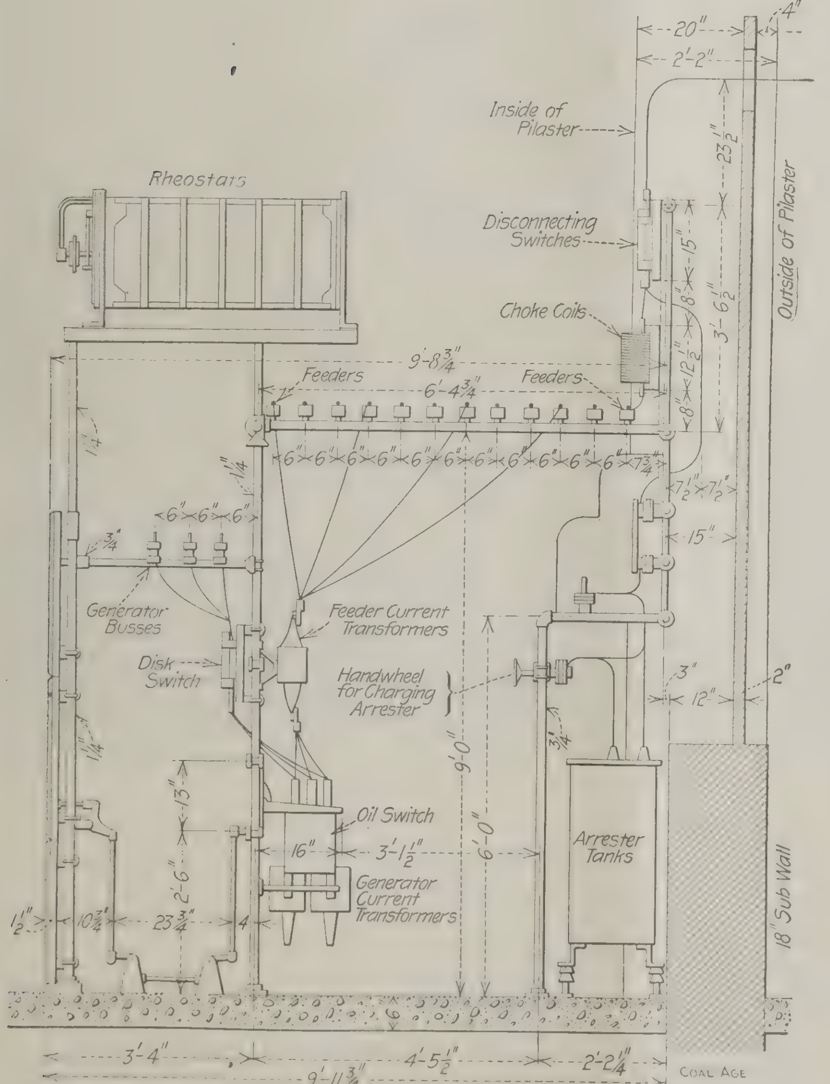


FIG. 4. SIDE ELEVATION, SWITCHBOARD AND CONNECTIONS

The insulators supporting the feed wires which run from the choke coils to the oil switches, are shown fastened to the horizontal pipe framework in Fig. 5. These were made from porcelain insulators, such as were used on the pole line, cemented to the wood screw of a gem wire clamp. A satisfactory and inexpensive insulator was thus obtained.

An end view of the switchboard is shown in Fig. 4. From this, a good idea of the general arrangement of the apparatus may be obtained. The space of 3 ft. 1½ in., from the oil switch tanks to the lightening-arrester framework, is enough to allow the attendant to enter and charge the arresters. There is also ample room to permit his reaching the

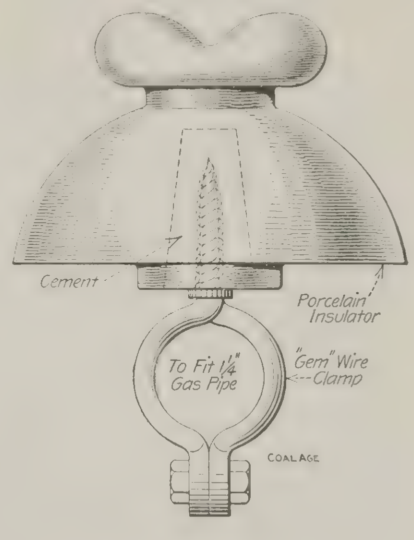


FIG. 5. DETAIL OF INSULATOR

rear of the switchboard panels if necessary, without danger of coming in contact with any of the high-tension apparatus.

For lighting the power house, the ceiling was divided into nine squares and a lighting unit consisting of one 150-watt, 115-volt, wire-type Tungsten lamp with Holophane focussing reflector was placed at the center of each square. In order to clear the crane, the mounting height was made about 22 ft. above the floor. The ceiling and walls of the building are painted white so that an illumination of from 3 to 3½-foot candles is obtained, which is ample for this class of service. A double-pole, double-throw switch is provided so that the lamps can be connected either across the 115-volt side of a small transformer placed behind the switchboard or to the exciter buss bars for lighting when the alternator is shut down. The flickering caused by the low frequency is unnoticeable in the case of the Tungsten lamps in the power house but where carbon filaments are used it is plain enought to be objectionable.

Explosion at Welch, West Virginia

By H. J. Brook*

The Jed mine explosion resulted in the death of 81 men. Thirteen were rescued, but one soon succumbed to his injuries. The mine generated gas but open lights were used. Otherwise the mine was excellently conducted. In 1908 the chief mine inspector tried to compel the use of safety lamps but was overruled by the county court.

*Consulting engineer, Welch, W. Va.

Jed mine, operated by the Jed Coal & Coke Co., is located two miles from Welch, the county seat of McDowell Co., W. Va. It is situated on the Tug River and ships its coal over a branch of the N. & W. R. R. The mine explosion which occurred in that mine on Mar. 26 at 8:10 a.m. was another of those startling surprises which the coal operator often experiences when he feels most secure, having taken due precaution against any such an occurrence by the employment of competent men to look after the general safety of the mine and miners, and having followed willingly every suggestion of the mine inspector.

An Uptodate Mine

The coal worked is the No. 3 or Pocahontas bed, and is about 5½ ft. thick in this locality. The draw slate is from 12 in. to 18 in. thick and can generally be held up in the rooms until they are driven up their full length. Draw slate is taken down in all entries, but held in place by timber in the airways and rooms.

The mine is laid out on the four-entry system and is projected for two distinct and separate mine sections. It will be operated eventually with a separate air system for each section and divided throughout by a 200-ft. barrier pillar. Each separate district is subdivided into panels. At the time of the explosion the mine was ventilated by two air splits, and the fan was exhausting.

Manner of Digging Coal

The coal is dug by machines, the undercutting being done mostly at night. It is shot and loaded out during the day. R. C. Niediffes, a certificated fire boss, had charge of the night shift and he examined the mine every day before the men entered. He made report that every place was safe on the morning of the explosion.

The night shift quits at 4 a.m. and the day shift goes on at 7 a.m. As the coal which is to be removed, has all been undercut, the first duty of the miners on arriving at the working face is to place the "breaking" shots and these are fired therefore at about the same time throughout the mine. The two rib shots follow as soon as the coal from the first shot is cleaned up. No two shots are fired at once in any one working place. Three shot firers, who are certificated fire bosses, fire all shots, each taking a separate section of the mine. They use batteries for this purpose. The mine is known to give off gas, but not in dangerous quantities, and open lights are used. Where necessary, the mine is sprinkled to prevent its becoming dangerous from accumulations of coal dust. During both day and night shifts the mine was well guarded by competent mine officials.

The Jed mine, which normally employs about 125 men, was, fortunately, at the time of the explosion, working shorthanded. Owing to Saturday, Mar. 24, having been pay day, only 93 miners and company men were in the mine at the time of the explosion. The check system used at the mine shows exactly what men are below the surface at any time. Twelve men nearest the shaft bottom escaped practically unhurt, and were hoisted on the cage immediately after the explosion.

Jed Colliery, McDowell County, W. Va., Shortly after the Explosion

Surface Evidences of Explosion

The main shaft is 280 ft. deep and the mine is ventilated by a large Capell fan, built so that it can be reversed when necessary. The explosion was not heard far from the mine, and the report, which was of short duration, resembled the blowing

off of a boiler. At the same time black smoke issued from the fan and hoisting shaft. Neither the main shaft nor any of the hoisting apparatus was damaged by the explosion. The fan was crippled it is true but nevertheless for a while it was kept running. After all hope of rescuing any of the 81 entombed men had been abandoned, the fan was stopped, and the three damaged blades repaired, so as to make its operation more effective.

THE VILLAGE OF JED

CROWD AT MINE LANDING

PREPARING FOR THE DEAD

RESCUE WORK

Immediately following the hoisting of the twelve men who escaped, a rescue party, comprised of O. M. Knouff, superintendent, J. Harvey Williams, mining engineer, Fred Henrichs, outside foreman, J. S. Henry, mine foreman, and three others, were lowered into the mine and proceeded as far as the mouth of Second Main Entry, about 600 ft. from the shaft, at which point they found the door-tender, who was badly hurt. He was sent up and taken to his home, but died shortly afterward from internal injuries. The men encountered blackdamp and could proceed no further without the aid of more men and supplies to restore the ventilation. They returned to the surface where they were met shortly afterward by William Nicholson, the state mine inspector, in whose district (the 11th) the mine is located. He was accompanied by P. A. Grady, inspector of the 12th district. These men were about to descend the shaft mine of the Middle States Coal and Coke Co. on a joint inspection, when word reached them, and they lost no time in covering the four miles which separated them from the scene of the disaster.

After the arrival of the inspectors, according to the custom, the mine was taken in complete charge by them. They showed themselves to be most efficient in their duties. They had the assistance of Edward O'Toole, general manager of the United States Coal and Coke Co., and J. M. Vest, superintendent of the Standard Pocahontas Coal Co., both of whom responded quickly, bringing men, tools, safety lamps and other safety devices. Edward O'Toole brought with him two men fully equipped with safety helmets. The inspectors soon organized the men into parties for the restoration of ventilation and the recovery of the dead. It was soon discovered that there was little hope that any of the entombed men could be alive.

The local inspectors were joined by Inspector Arthur Mitchell of the 10th district, who arrived at 5 p.m. on the day of the explosion. He took charge of the night relief crew. Federal Mine Rescue Car No. 7, which was *en route* to Huntington, arrived at the mine at 2:30 p.m. in charge of Mr. Burke. He and his assistants entered the mine in company with the two men from Gary, all equipped with safety helmets. They were unable to accomplish much or cover much of the mine, owing to the heavy falls of slate which made it difficult to travel with so heavy a burden.

Later the State and Federal officials, joined by Chief Inspector John Laing and State Inspectors James Martin, H. Y. Muir and Lance B. Holliday, arrived and George S. Rice, James W. Paul, M. Roudenbusch, and Dan Davis, of the Bureau of Mines, also came to aid in the rescue work and in the investigation. Both State and Federal officials will leave representatives on the ground to make a thorough examination of the mine that the cause of the explosion may be determined.

Left Entries Most Affected

It is generally supposed from the resulting condition of the mine that the explosion originated in First butt-heading left off Second main entry. This supposition is based on the fact that the air traveled to the left butt-headings and thence up the Second main airway. On this side the explosion occurred. Moreover, the bodies brought out from the First left butt-entry and vicinity were the most badly burned. The other split traveled up the right-hand butt-headings off the First main entry and thence to the face of the latter and returned by way of the First main airway. Three of the men working in the Second butt-heading right, which is ventilated by this split, succeeded in escaping from the mine. The other nine men who escaped were also in same split but near the shaft.

Up to Saturday night 72 bodies had been recovered from the mine. Considerable difficulty was encountered in this work, owing to the blocking of the roads by heavy falls of slate and the rebratticing needed to restore ventilation. Most of the stone stoppings on the butt-entries and the concrete brattices on the mains were blown out along the course of the explosion.

Some of these bodies were covered by heavy falls of slate, which had to be removed before they could be recovered. During this rescue work in some places portable electric lights had to be used and the safety lamp discarded on account of meeting with explosive firedamp. On one occasion, by the use of these lamps, six bodies were recovered, which could not have been safely removed had safety lamps been used.

W. M. Leckie, general manager of Jed mine, was away at the time of disaster, but returned as soon as word reached him. He immediately did everything he could to relieve the situation. It is expected that by next Tuesday the mine will be in a condition that a thorough examination may be made to determine the cause of the explosion.

[Mr. Brook fails to call attention to a point of great interest in connection with this disaster. The coal beds continuously dip toward Welch from the east and at Jed much gas is encountered. Even at Vivian where the bed still outcrops to the surface at an elevation of about 30 ft. above the valley, a gas explosion recently occurred. J. G. Boyd, who was mine inspector of the 11th district in 1908, called attention in his report to the condition of the Jed mine, saying that it was not as safe in his judgment as it ought to be. In accordance with Sec. 14 of the mining law, which required all mines generating gas in dangerous quantities to be worked exclusively by locked safety lamps, he demanded that within a month open lights should be completely excluded from all parts of the mine. The general manager, Wm. Leckie, finally appealed the matter to Jas. W. Paul, then chief of the department of mines, and now in charge of the rescue work of the Federal Bureau. For a while Mr. Leckie favored conceding the demands of the department and even sent a telegram ordering the safety lamps, but he later notified the inspector of his change of opinion. J. W. Paul, D. R. Phillips and P. A. Grady then reëxamined the mine and as a result suspended operations. Finally the court granted an order for the reopening of the mine.—Editor.]

(Another Article on Jed Explosion Next Week)

A Comparative Test for Air Drills

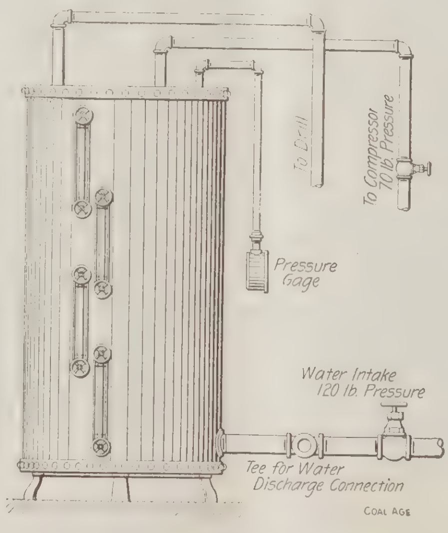
Special Correspondence

Nearly all users of drills find it necessary or desirable from time to time, especially when about to undertake important new work or when about to purchase a large number of drilling machines, to determine the performances and relative efficiencies of the various types of drills found on the market. The arrangement described in the following paragraphs has been satisfactorily used in conducting such tests on different forms of compressed-air drills.

As shown in the illustration, a vertical air receiver is connected to the compressor line by a 1-in. pipe, fitted with a globe valve, and a 1-in. outlet pipe is led from the receiver to the drill. Water gages are placed one above the other throughout the entire height of the receiver, and a pressure gage is supplied. At the bottom of the receiver a 3-in. pipe with globe valve furnishes a water supply, and between the receiver and intake valve a tee connection is provided as a discharge.

Before starting the test, water is allowed to flow into the receiver until it is just visible in the lower gage, and a chalk mark is made opposite this level. The receiver is then filled with air at the desired pressure, the air shut off and the test begun. As the drill takes air from the receiver, the operator maintains a constant pressure by regulating the water valve. Simultaneously with the stopping of the machine a chalk mark is made at the water level then shown by the gage and the water drained off in preparation for the next test.

The distance between chalk marks, depth of drilled hole and time of drilling are noted. The cross-section of the tank being known, the distance between the chalk marks makes it possible to find



Air Tank and Connections

the volume of air used, at the given pressure, and from these figures the amount of free air can be computed. A convenient form for arranging the data and results of the test is shown in Table I. The average values obtained for the last three items in the table give the information that is usually desired in this connection.

It may happen, however, that in spite of the control provided by the water supply, the air pressure will decrease during a test. In this event, the amount of free air used may be calculated as follows:

Let

P = Initial pressure,
P_1 = Final pressure,
B = Height above initial water level to top of receiver,
A = Cross-sectional area of receiver, in sq.ft.,
R = Rise of water in receiver, in ft.,
H = Atmospheric pressure.

Then each foot rise of water in the tank represents the consumption of A cu.ft. of air and if the pressure had remained constant at P, the volume of free air used would have been given by

$$V = RA \times \frac{P+H}{H}$$

However, the expansion of the air that remains in the receiver, from pressure P to P_1 represents the consumption of a volume of free air equal to

$$V_1 = A\,(B-R)\left(\frac{P+H}{H} - \frac{P_1+H}{H}\right)$$

and the total amount of free air used is then $V + V_1$.

[It may prove more simple to let V represent the initial amount of free air in the tank at pressure P and V_1 represent the final amount of free air at pressure P_1. Then

$$V = AB\frac{P+H}{H}$$

$$V_1 = A\,(B-R)\frac{P_1+H}{H}$$

and $V - V_1$ will give the amount of free air consumed during the test.—ED.]

TABLE I. TEST OF AIR DRILLS

Name of Drill

Cyl. Diam. Stroke Feed Weight

Condition.

Test No.	1	2	3	4	5	6	7	8	Average
Air pressure, (gage), lb. per sq. in.									
Size of bit, in.									
Net time of run, min.									
Depth drilled in ft.									
Rise of water in tank, in ft.									
Depth drilled in ft. per ft. rise in tank									
Depth drilled per min. in ft.									
Cu. ft. free air per min.									
Cu. ft. free air per ft. drilled									

Remarks. ....

Winners in First Aid Contest

At a competitive first-aid contest, held in Connellsville, on Mar. 27, the Phillips Mine first-aid squad, of Uniontown, Penn., under the superintendence of W. J. Culleton, made a perfect score of 100 per cent. efficiency, in a series of difficult events. This particular team will represent the H. C. Frick Coke Co. at the National Meet of First Aid to the Injured, to be held in Washington, D. C., at the invitation of Major Charles Lynch, of the United States Army.

The Phillips team competed with 14 of the best squads of the Frick company, and it is therefore considered a great distinction to have made this remarkable record. The members of the squad are: Captain Harry A. Sigafoes, John Birsky, Andrew Secosky, William Shaw, Elmer Moody and Walter R. Kuhns.

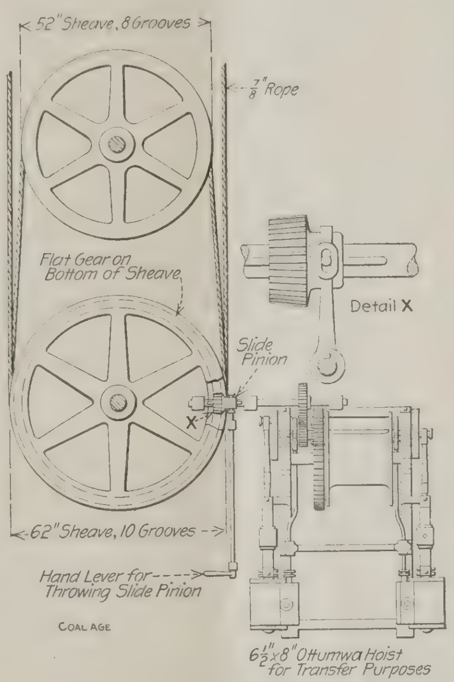
Combined Gravity Plane and Hoist

BY JOSEPH DANIELS*

A number of mines in the Roslyn district of the State of Washington are located in the hills at some height above the tipples and railroad tracks. The coal is usually sent down to the tipples by an engine, or gravity, plane. At the Roslyn Fuel Co.'s No. 2 mine, the gravity plane is 3400 ft. long, with an average grade of 14½ per cent., and crosses three ravines on timber trestles. From the mouth of the mine tunnel, the plane has three rails to the midway point. The pass-by here is 120 ft. long and below this point a single track runs to the tipple. The track gage is 30 inches.

*Department of mining, University of Washington, Seattle, Wash.

Cars are handled in trips of ten. The weight of an empty car is 825 to 850 lb.; the weight of the average loaded car is 2400 lb.; the size of the rope is ⅞ in.; and the time required to hoist or lower a trip is 2½ min. A set of gravity-plane sheaves is used to lower the cars to the tipple, but the usual arrangement has been modified, as shown in the illustration. A gear wheel is fastened to the under side of the larger sheave. This gear meshes with a small pinion, mounted on a shaft, which is driven from the main gear of the hoisting engine, as shown in the sketch. The small beveled pinion is thrown in or out of mesh by being moved back and forth along the shaft, under the control of a hand lever, located



GRAVITY SHEAVE AND HOIST

conveniently near the throttle and operating levers of the hoisting engine. This latter is a small second-motion, friction-clutch, single-drum engine, used for transfer purposes at the mouth of the tunnel.

Purpose of Arrangement

The purpose of this arrangement is to enable the sheave to be driven when occasion demands; that is, if, for any reason, it is necessary to hoist the empty cars from the tipple to the tunnel mouth and there are no loaded cars available for sending down, the engine is started up and by throwing the pinion in mesh with the large gear, the sheave of the gravity arrangement is made to act as a drum for hoisting purposes. The device is also useful in case of breakdowns and derailments at any point along the road, when it may be used for putting the cars on the track, hoisting ditched cars out of the ravine and in many like contingencies.

Strike Situation in the Anthracite Field

SPECIAL CORRESPONDENCE

Anthracite mine operators are accepting with equanimity, the suspension ordered by officials of the mine workers' union. They are making no effort to mine coal and apparently will not, for some time at least, endeavor to induce any of the men to return to work. There is a general feeling on both sides that within the month an agreement will be reached and that work will be resumed within six weeks. If this happens neither mine operators nor mine workers will suffer from the suspension of work, as it will merely give the consumers time to use up much of the stock they have stored in anticipation of a strike, and make the demand for new supplies so general that fairly steady work will be assured for the summer.

Had the mine workers decided to renew their former contract for three more years, thus obviating a suspension, there would still have been a lack of work for a period about equal to the probable length of the present shutdown.

If the operators decide to offer the men a flat increase of 10 per cent., and ignore their other demands, most of the mine workers will be eager to accept these terms and return to work. Among the leaders, however, there is a great desire to fight for a recognition of the union as well as an increase in wages. Coal operators are unanimous in stating that while they might be willing to grant a 10 per cent. increase they will never agree to recognize the union, and they predict that if the miners' leaders insist on this point, then a long and bitterly fought strike is certain.

It was at first intended to submit whatever offer the operators finally made, to a referendum vote, permitting all the mine workers to express their individual decision on the question of accepting or rejecting the offer. Now, however, this plan has been changed. The miners' leaders announce that any offer will be submitted to a convention. This convention will be composed of delegates elected by the union locals, and the non-union men, who are in the great majority, will, of course, not be recognized. It is natural to expect that the delegates at such a convention will be guided largely by the advice of their leaders, and if the latter insist upon holding out for recognition of the union, as well as an advance in wages, then it is almost certain that the convention will reject the offer of the operators and follow the dictates of their leaders.

Some of the coal companies have been bringing men into the region from outside, but these are being used so far only to guard the collieries.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Freezing Method of Shaft Sinking

The following is taken from Ad. Breyre's report in the Annales des Mines de Belgique, book, LVI. Entitled "Sinking of Shafts by Freezing Method":

Considered by itself the process of freezing has on the whole, received few modifications since its first introduction; it remains in its broadest lines just as Poëtsch utilized it in 1883 in the Archibald shaft at Schneidlungen. On the other hand, the development it has taken has extended its applicability since that time to a degree that could not have been foreseen by the most optimistic, several years ago. When in 1898 the shaft at Harchies, belonging to the mines at Bernissart, was sunk by freezing to a depth of 774 ft., the attempt was rightly regarded as quite bold, for in the 15 years of the existence of the process, this shaft was the first to attain like depth; before that time they had not exceeded 410 ft.

Today applications to 656 ft. of depth are frequent. In Belgium a depth of 1000 to 1083 ft. was actually attained at Levant-du-Flénu, and in a greater part of the shafts being sunk in the Campine district of Limburg, the depth to which freezing extends approaches or exceeds 1312 ft. (400 meters).

In Germany the two shafts of the Lohberg Works which the Deutscher Kaiser Co. has established near Binslaken have attained a depth of 1361 feet.

Silesian Mining Methods

Special Correspondence

In northern Silesia the coal of the thick seams is developed by narrow stall workings driven in the lower benches of the bed. Final recovery is effected by retreating panel methods, the whole bed being extracted. Sand filling is used sometimes to replace the lower benches before the upper part of the seam is attacked.

The following is an abstract from a paper, by Berent Conrad Gullachsen, entitled the "Working of the Thick Coal Seams of Upper Silesia." The paper was presented at the meeting of the North of England Institute of Mining and Mechanical Engineers.

In the upper Silesian coalfield the workable seams amount to the great thickness of about 623 ft. and what are known as the Suddle strata contain some five to eight workable seams of from 5 to 32¾ ft. in thickness, which together give nearly 98½ ft. of workable coal, chiefly suitable for steam and household uses. Fig. 1 is a section of the strata from Zabrze to Myslowitz. The average thickness of the coal measures is 23,130 ft., the percentage of workable seams being 3.2 in the Crzescher, 11.7 in the Suddle, and 1.9 in the Rybnik strata.

Preliminary Working

In all cases the places are nearly 10 ft. wide and 6½ ft. high, except the cross-cuts, which are only 6½ ft. in width. Bore-hammers driven by compressed air, are used for driving the places; and gas being practically unknown, explosives, chiefly powder fired by fuses, are used. Very little timbering is required, as the coal is generally hard, and forms a good strong roof.

The general method of working is as follows:—When the drift reaches the seam, two headings usually 10 ft. wide and 6½ ft. high are driven water level with a coal pillar 32¾-ft. wide between them. Crosscuts are driven between these headings at 88½-ft. centers. Traveling ways and inclines are driven directly up the pitch, the first serving as a return airway for the second. They are separated by square pillars measuring 32¾-ft. in the clear between headings and crosscuts. From the incline of one pair of steep headings to the traveling way of the next pair is 256 ft., measuring from center to center. Opposite every crosscut on the traveling way, a 10-ft. stall is driven parallel to the main ground level, but as the system is a retreating one the last stall is driven first. The distance from one ground level to the next is 328 ft. The stalls are driven from the traveling way completely through to the next incline, crosscuts being cut from stall to stall every 88½-ft.

Working on The Retreat

When the first stall is extended to the required limit a block of coal at the end is attacked. A pillar 6½-ft. wide is left near the fallen workings adjacent, to protect the workmen, and a wide crosscut or short room is driven up the slope 20 ft. wide.

The 6½-ft. pillar separating the mine from the caved area is here called the "barrier" pillar for lack of a better name. The barrier is removed later if possible. Retreating work is commenced either at the boundary, or at old workings; and, as the working always retreats and descends, the coal is thus gradually worked out toward the ground-levels. Fig. 2 shows the method of working a district. As the barriers are often from 26 to 32¾ ft. in height, they are the most difficult portion of the coal to secure, and consequently much of it is often lost, especially where the roof is poor—the loss amounting in many mines to between 10 and 18 per cent. By sandfilling the gob, however, this loss is reduced to between 3 and 5 per cent.

The coal on the retreat is worked by two methods. That shown in the upper half of Fig. 3 is the form most generally employed. The coal is first undermined, then heavy charges of powder

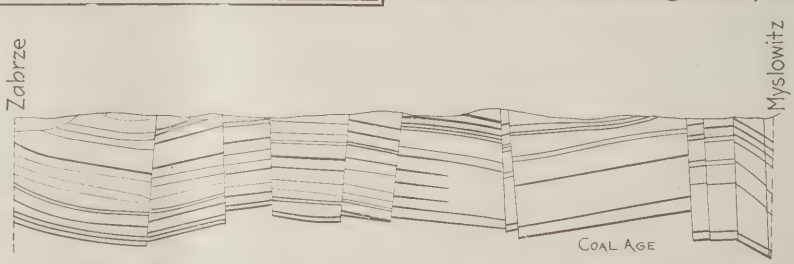


Fig. 1. Cross-section of the Badly Contorted Upper Silesian Coal Field

are put in near the roof, and large quantities of coal are brought down. The method shown at the foot of Fig. 3 is only adopted in cases where the coal is soft and liable to break away, and in the case of a weak roof.

Fig. 4 shows the general method of timbering. When the pillars are worked out, as much timber as possible is drawn, but it is usual to leave the side props, *a, b,* as a protection during the working of the barrier at the side of the next lift. To make these the more apparent they are marked in solid black. The posts which sustain crossbars are shown in the appropriate places but they could not of course be seen in a correct plan view.

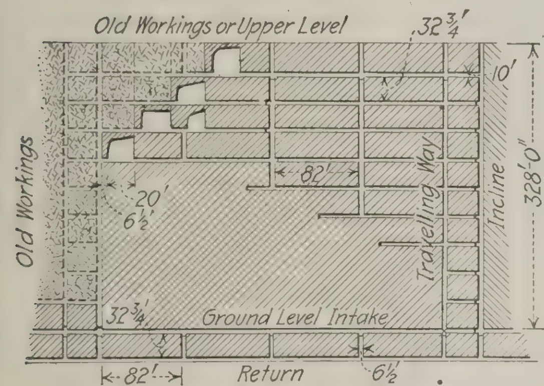


Fig. 2. Usual Method of Working

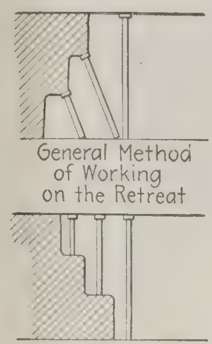


Fig. 3. Drawing Pillars

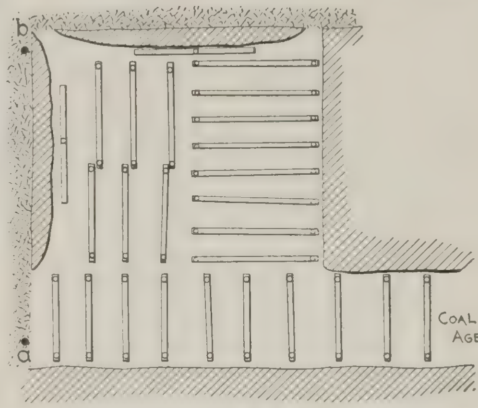


Fig. 4. Posting a Lift and Stall

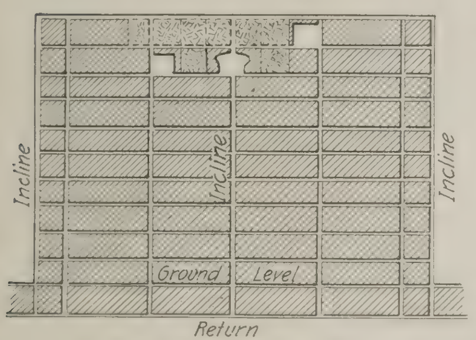


Fig. 5. Rapid Method of Working

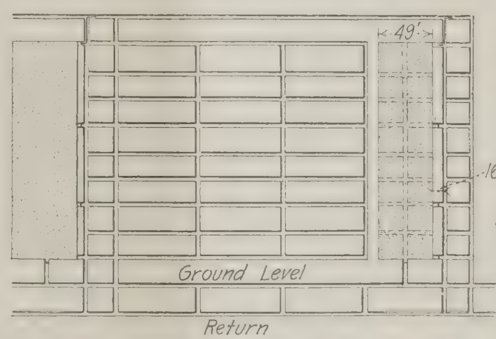


Fig. 6. Partial Sand-filling Method

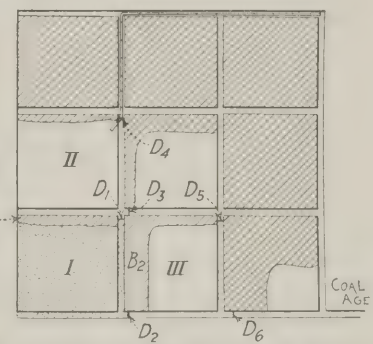


Fig. 7. Complete Sand-filling Plan

Much of the timber has to be left in, especially in case of sand-filling.

When it is desired to extract the pillars rapidly from a district, the method shown in Fig. 5 is employed. Half-way between the inclines, that is 164 ft. from each, a third incline is driven from one level to the level above. At the top of this incline ten-foot stalls are set away on both the right and left-hand sides, one pillar 32¾ ft. in width being left to protect the incline top, this pillar being worked out last. Thus, this middle incline is used for the extraction of three lifts, which, each being about 32¾ ft. in width, give a total of 98½ ft., leaving 114¾ ft. of coal on each side to be won from the other two inclines. In this manner the district is rapidly worked out. The middle incline also serves the purpose of ventilating the workings.

Partial Sand Filling Method

Sand-filling is now being employed more or less extensively in the majority of the thick coal mines of Upper Silesia. It is especially advantageous where spontaneous combustion is prevalent, and in mines which are worked under towns, railways, rivers, etc. There are two methods of sand-filling. In one the coal is partly and in the other the coal is wholly replaced by sand.

The former method as will be seen from Fig. 6 consists in making barriers of sand, 49 ft. in width, on both sides of each district. In order to do this a gangway is started from the ground-level, at a point 41 ft. from the traveling way, and, after being driven to the rise for a distance of 32¾ ft., stalls are set away right and left, and driven 24½ ft. in both directions, thus forming a face 49 ft. in length, which is then worked off in ascending slices. When the face has advanced some 49 to 65½ ft., a small incline-wheel is put in, and the coal is run down the incline to the level, the wheel being moved forward as the face advances. When within 32½ ft. of the boundary of the panel, the place is stopped and a connection made with the incline, and along this gangway the sand-filling pipe-line is laid, and carried to the top of the worked out area. Dams are now built at all entrances, and when they are completed sand-filling is commenced, and carried on until the entire area is filled up. A second barrier is formed in a similar manner at the other side of the district. The area of coal remaining between the two sand-barriers is now removed by the general method of working.

Sand Filling By Slices

In the working of beds from 26 to 32¾ ft. thick the coal is entirely replaced by sand. In Fig. 7, the seam is worked in two slices, the pillars being worked out in an ascending order. The coal is first abstracted from pillar No. 1 in the usual manner, the pillar being about 32¾ ft. square, and should the seam be 32¾ ft. thick, the lower half only is worked. A barrier of coal, B_1, about 10 ft. wide is left, and dams D_1, and D_2 built, the sand-filling pipes being brought through the top of dam D_1 and sand filled into the worked out area. Pillar No. II is then worked, together with barrier B_1. Dams D_3, and D_4 are built, the sand-filling pipes being brought through the top of dam D_4, and sand filled into the worked-out area. At the same time as these arrangements are being carried out, pillar No. III is being worked, by a place 19¾ ft. in width, the barrier B_2 being left. Concurrently with the removal of the main part of pillar III, the barrier pillar of panel II is removed. Dams D_5 and D_6 are now built, and this lift is likewise filled with sand. Thus the work proceeds in a diagonal line towards the incline, and when all the pillars in the district have been removed and replaced by sand, the remaining overlying half of the seam is worked in precisely the same manner.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

Quite a few years ago, when Charles F. Huber was a student at the Anthracite Mine Managers' University (now commonly called the Pottsville High School), he decided that when he grew up, he would get a job as boss pilot of a great coal company.

Just how to accomplish this laudable aim was not quite clear, until one day the teacher made each pupil memorize the maxim: "A Rolling Stone Gathers no Moss."

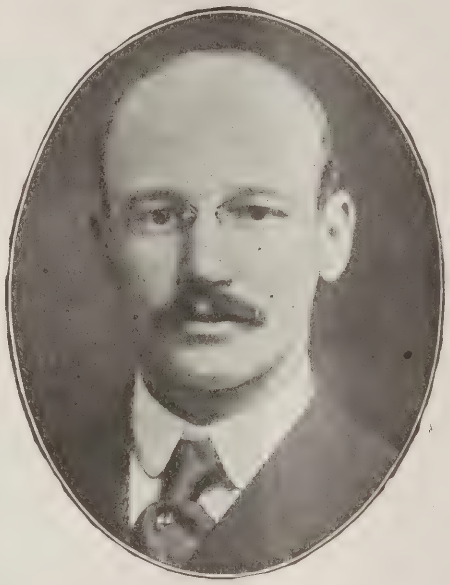
Now, Charles thought a little moss would not only relieve the sombreness of the landscape, but that it might prove useful as well as ornamental. He accordingly suited action to thought and, in 1887, when but 16 years of age, "C. F." landed a job on the engineering corps of the Lehigh & Wilkes-Barre Coal Co., at Audenried, Penn. That was just 25 years ago, and today Mr. Huber is vice-president and general manager of this same company, without having once left its employ. Not much rolling there, do you think?

The advance from backsight to mine manager was mighty gradual, and even a high-powered telescope wouldn't reveal in the career of "Charles F." any attached object bearing semblance to favoritism or pull. The motive power back of his rise was "dreary drudgery," and the fuel burned was "persistent application."

At twenty, Mr. Huber was made division engineer for his company, taking charge of the Honey Brook collieries. Seven years later (1878), he came to Wilkes-Barre as chief engineer, serving under W. J. Richards, who was then general superintendent. In 1903, when Mr. Richards switched over to the Reading company, "Charles F." succeeded him, and was still further honored in 1909, when the L. & W.-B. people appointed him vice-president and general manager of all their operations.

Mr. Huber is quick to grasp details, and there is no faltering after his decision is made. Alert, keen, with every tingling nerve right on the job, his administration has been remarkably successful, one of the chief features being the unusually low accident rate in his mines.

Right here let me disgress long enough to say that "C. F." has considerable latent ability as a political reformer. This was clearly evident when he turned his attention momentarily from mining to the exposure of a rather extended system of graft on the part of township and borough officials in the districts where his mining interests were located.



CHARLES F. HUBER

The chief requisite for the making of a successful coal-mine manager is ability to scan a broad horizon. The fellow who starts as an engineer and who believes he can never see except when looking through a transit, will eventually cause his belief to become a positive reality. Charles Huber knows underground mining and is intimately acquainted with the methods employed at all his collieries, but he can follow the course of the coal through the stages of preparation with equal understanding, and it is really in the breaker where his genius has been most apparent.

During the past decade, the greatest advance in anthracite practice has occurred in screening, cleaning and general preparation of coal. The percentage recovery, if I may borrow a metal miner's phrase, is far greater today than it was a few years ago. Culm banks filled with commercial coal are now either monuments of past waste or present ignorance.

When I asked Mr. Huber whether the next few years would witness a still further advance in breaker practice, his answer showed plainly his belief that we have pretty well tied up the loose ends and corrected the most glaring leaks. He said, "Soon we may build another breaker, and when we do, I am quite sure it will be planned along the lines of our recent Stanton plant. Here we have embodied about all we know concerning coal preparation, and I anticipate no further radical changes."

While on the subject of breakers, I naturally inquired concerning the use of concrete, as compared with steel and wood as a material of construction, and I found "C. F.'s" views on the subject quite definite. He stated, "The great trouble with steel is its inflexibility, or rather the difficulty that necessarily follows an attempt to make any considerable alteration in the arrangement of the breaker building. Because of the frequent changes in the nature of the coal at a mine where sometimes as many as nine seams are worked, we often are compelled to cut away here and there and rebuild on somewhat new lines; I am quite certain that by having a concrete substructure and bins, with timber framing above, a condition is created that will lend itself readily to whatever changes become necessary."

Answering my query about the action of acid mine waters on concrete, he replied that he believed his company had pretty well overcome this trouble at Stanton. In this new breaker, the concrete floors of the bin were treated with one coat of pigment cement filler; then a coat of No. 1375 R. I. W., and finally another coat of No. 110 R. I. W. The guarantees on this were that R. I. W. would be heatproof, coldproof, acid- and waterproof. On top of this, was placed a hardwood lining or floor. Up to the present time, there has been absolutely no absorption of water by the concrete, and Mr. Huber believes the plan adopted will remedy the serious troubles that have resulted from sulphuric acid in mine water.

I doubt if any collieries in the entire anthracite field present a more cleanly or orderly appearance than the mines of the Lehigh & Wilkes-Barre Coal Co. When I suggested to Mr. Huber that I believed his chief hobby was "cleanliness about his plants," he smiled and replied: "One of the first ideas in relation to coal I ever conceived, was that it did not necessarily follow because coal was black and in the nature of things, dirty, we should readily concede that a coal plant must be an exhibition of dirt and disorder."

Mr. Huber agrees with Carl Scholz, of Chicago, that reversible fans are an unnecessary danger. In the matter of sealing off a mine fire, he advocates closing the intake side first, and states that in following this plan he has always been successful and never had an explosion as a result.

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CIRCULATION STATEMENT

Of this issue of Coal Age, we will print 7500 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

Diplomacy

Perhaps the strongest diplomats are those who have an engaging way of expressing facts. Judged by appearances, the coal-miners' leaders have no clear understanding of the art of diplomacy. Every time a rise in wages is sought, they start to vilify the operator and try to make the man on the street bring pressure to bear on him. Already the papers are helping matters along by publishing trenchant editorials.

But what are the facts? The consumer seems convinced that the miner should have more money. He won't buy a paper which does not accord with that idea. He likes the editorials which advocate the interests of the worker, and he believes the latter has right on his side.

If the average layman only had a broader and better understanding of the situation, he would soon discover that he is the man principally interested. Eventually *he* pays the miner. We cannot see that the operator has overmuch to do with wages, so why should he take up the cudgels for the consumer who does not desire protection? Rather, let the operator rejoice that his men are doing well and better every year. He is thereby pleasing the miner and the consumer is also glad.

It is true that the bituminous operator has real competition to face from nonunion fields, and a wage advance might make conditions hard. But even here it is fairly certain that a like increase will be secured in nonunion districts.

In the anthracite region, however, with the restricted opportunity to increase output, the operators are relatively in a strong position and are more certain to retain their trade regardless of the price of coal. If competition in steam sizes troubles the hard-coal owners, they can save themselves by raising the price on their domestic output. Let the consumer pay the raise in wages; he has been clamoring to do so. Why deny him this privilege?

We would advise that the coal operator and coal miner meet as friends and connive to make an unthinking philanthropic public pay for the junket. That is diplomacy and diplomacy is peace.

The Coal Market

With the coal production of the country now seriously crippled, the condition of the fuel market becomes one of the predominating features in the industry. Until the trade is again in a normal state, COAL AGE will devote an additional page to the trade review department, in order to cover this branch in greater detail.

The market is essentially a strike market, and has been such for a number of weeks. The general trend of prices has been strongly upward for the past month, but has been accompanied by violent fluctuations, due to the varying reports from the labor conferences. These fluctuations have been so rapid and spectacular at times that the trade appeared to be almost on the verge of a panic.

Present interest is centered on the storage supplies, as any heavy, forced, buying movement at this time will undoubtedly precipitate a runaway market. No direct estimate of available supplies can be compiled for the reason that these are confined almost entirely to the bins of the consumer, and the retailer who has bought heavily in a number of instances for speculative purposes. Indirectly, most of the evidence seems to point to a substantial surplus.

That the railroad movement has been exceptionally heavy is evidenced by the report of the American Railway Association, which shows the gross surplus of idle cars, Mar. 13, to be the smallest in years. The Norfolk & Western Railroad handled a half-million more tons of coal during the first two months of the present year than in the same period last year, while the statement of net earnings of the Philadelphia & Reading Coal & Iron Co. for the month of January shows an increase of 17 per cent. It is also a fact that the anthracite shipments

for February exceeded those for the same month last year by over 800,000 tons; the awards to the anthracite miners for February amounted to 7 per cent. above the standard, the average being about 4½ per cent.

On the other hand, it is pointed out that the shortage of over 25 million tons in the foreign markets will cause a drain on our supplies. Also, that the anthracite consumption in January was 50 per cent. above normal while the surplus of 3 million tons usually on hand at the head of the lakes at this time, has been exhausted.

It will be shown later that American operators have profited considerable in the way of export business because of the strike in Great Britain. We have all heard about the futility of carrying coal to Newcastle, and most of us hardly believed that it would ever come to pass. The South American trade should be ours, and will be if we show an average order of intelligence in handling the matter.

Our Index of Coal Literature

With this number of Coal Age we present for the first time our index of coal literature, which henceforth will appear in the first issue of each month. This list will cover in its scope, all books and articles of technical merit published throughout the world, which pertain to the coal and coke industries in their various phases and developments.

It is a noticeable fact that each separate region where coal is mined is somewhat prone to regard itself with a certain degree of self-sufficiency, and is consequently inclined to perpetuate its own methods and practices. In this connection it should be recalled that the coal industry is well-nigh universal in extent, and no one of its fields is either so alien or so remote that it may not have a practical bearing on the needs of any other district.

While the United States has outstripped all other nations in the quantity of its coal production, the mere size of this enterprise, reared as it is so largely on the abundance of our natural resources, is scarcely to be taken as evidence of the excellence of our methods; and although the coal-mining industry in this country is probably as advanced and efficient as in any other, it should be recalled that the mines of England, for instance, have already tried and discarded many of our newest schemes, and that Germany, spurred on by the exigencies of economic conditions, is constantly bringing forth developments by which we will do well to profit.

Even within the boundaries of our own country, there is a considerable lack of comprehension between the various fields and the several districts of one field. Too often, we are apt to regard conditions as peculiar to a certain region when in reality they are only a phase of a problem which is common to many. One man here labors over a difficulty which someone elsewhere has already successfully solved.

It is the mission of industrial papers, technical books and the published proceedings of our engineering and learned societies, to bring the experience of the whole industry to a focus for the benefit of the individual reader. However, these means of collecting and disseminating knowledge necessarily have their limits, and the average man has neither the time nor inclination to wade through a great deal that does not interest him in search of that which will meet his particular needs.

More often than not, the requirements of the busy man arise on the instant and at once demand all the information it is possible to gather on a certain subject. If, through the aid of an adequate index, he has previously collected such publications as have appealed to him from time to time as possible necessities, then this required fund of information is at once available.

It is scarcely necessary to emphasize the value of such a list as Coal Age now offers to its readers. In carrying on this work we are fortunate in having effected an exclusive arrangement whereby we have the collaboration of the International Institute of Technical Bibliography. The journal of this Institute, which is not a commercial venture, is published monthly in seven sections, dealing with various branches of science and presenting abstracts which cover the entire field of engineering and technical industry. Our lists will embody such portions of these abstracts as are of special interest to our readers and the coal industry in general, together with certain additions of our own and a supervision that we are in a particularly advantageous position to give. We present this new feature with considerable confidence that it will prove of real value and will meet with general appreciation.

Social Revision

These are the days in which history is made in a hurry; opinions are being revised and changes of viewpoint take place with lightning rapidity. The sentiment of the dreamer of today becomes the accepted practice of tomorrow. A few years ago the "minimum wage" without trimmings would have served in England all the purposes of an amusing joke. Today even the London *Times*, despite its conservatism, is advocating that obnoxious socialist provision and the Premier is even urging its acceptance on the national parliament.

We are drifting faster and faster toward socialistic conditions. This would not be so deplorable if the desires of the people were not so steadfastly set in the direction of *political* as opposed to moral regeneration. As a matter of fact, socialism of any kind, whether of Marx, Lassalle or Bellamy, whether radical or Fabian, needs real socialists for success just as much as republicanism needs real republicans. It is not likely to be successfully inaugurated among people whose aims are entirely non-social and self-centered.

If everyone in a socialistic commonwealth seeks release from toil, restricted hours of work, excessive comfort, freedom from industrial restraint and such a profit from the use of the world's goods as conditions will not permit, then the provisions which the individual is seeking so diligently will only make for his impoverishment.

We have noticed that the growth of a sense of social obligation has failed to keep step with the growth of socialism. The many idle corner loafers of our cities and large towns, the needless number of men occupied at other work than industrial production, no less than the extension of the long ranks of our gilded youth, show that the burdens of a socialistic life are to be shifted, mose infelicitously, onto the backs of shirkers, whose dream is ever of rest and not of labor.

The new social doctrines will find their fitting environment only among those who understand that labor and bread are two inseparable entities. A few exceptions to that rule may challenge its truth, but the communities at large are fast bound to recognize its validity.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Reducing Ventilation when Firing

The question raised by U. S. Wilson and Nelson Rigsby, "Should Ventilation Be Reduced Before Firing Shots,'" COAL AGE, March 9, page 718, is, in my opinion, a very important question and should interest all mining men.

The advocates of "slowing down the fan" before or during the firing of shots in a mine, contend that while the fan is running at its usual speed a large volume of air is carried into the mine. This current of air not only aids combustion but carries in suspension more or less fine coal dust, which intensifies what might otherwise be a local and harmless explosion. They point out several instances where explosions have occurred when shots have been fired where the air current was particularly brisk. As a prevention of such occurrences they advise "slowing down the fan" and thereby reducing the air current.

The question may properly be asked: Does not the trouble from gas or dust explosion arise more frequently from the excessive use of powder in blasting, rather than from an excessive quantity of air in circulation? There is not the slightest doubt, in my mind, but that it is a dangerous practice to employ such enormous quantities of powder as are commonly used in the preparation of shots in the average coal mine and especially where the air current is strong. But, on the other hand, is it a safe expedient to adopt, at all times and under all conditions, to slow down the fan when firing? It may be that in trying to escape one danger we are running into another even greater danger.

Almost every mine generates marsh gas in greater or less quantity. In some mines, it takes every available cubic foot of air to carry off the gases generated and to keep the mine in a safe condition. To reduce the air current before firing in such mines would create a condition that does not require the aid of a blown-out shot to cause an explosion. The application of a small open light is sufficient to fire the gas that would accumulate while the circulation of air is reduced.

To illustrate this point I beg to borrow a little example that appeared in COAL AGE, January 6th, page 430, in a communication by A. T. Wade, entitled "Danger In Gassy Mines." In this case a current of 50,000 cu.ft. of air is passing per minute. The safety lamp shows one-half of 1 per cent. of gas, in the return air current; and the quantity of gas given off in the mine is therefore

$0.005 \times 50{,}000 = 250$ cu.ft. per min.

It is shown that if this air current is reduced to 3000 cu.ft. per min. the percentage of gas will then be $\frac{250}{3000} \times 100 = 8\frac{1}{3}$ per cent. Under certain conditions of shooting down coal and exposing fresh feeders of gas, this percentage might be even greater.

A little study of the matter has convinced me that, as long as we use so much powder in blasting coal, just so long will shots and explosions occur, irrespective of whether the fan is slowed down or kept running at its normal speed. It is only when we decide to adopt a different method of working, such as longwall where it is possible; and eliminate, as far as practicable, the use of powder; or reduce the amount employed to a minimum, that gas and coal dust explosions in mines will cease.

PAT HOGAN.

Canton, Ill.

Stone Dust Pioneers

Referring to the communication of A. B Jessup contained in the issue of Mar. 9, permit me to point out that J. Taffanel was not the first to form the opinion that stone dust might be of use in mitigating the violence of an explosion. It is only just that J. W. Garforth's work in this direction should be given recognition. When giving evidence before a British commission in 1891 he advocated the use of stone dust. This was nearly 20 years before the results of the Liéven experiments were published. The Atkinsons in a book published a quarter of a century ago, suggested the same means of immunizing the coal dust in the mine.

I am not a strong advocate of either barriers or zones, as a means of preventing the propagation of a coal-dust explosion because the proper aim should be not to stop such an action after it has started, but to prevent it from ever getting a start. And with this end in view, every part of a mine should constitute a stone-dust zone.

Now that stone dust appears to be coming into its own, the question may arise as to where the method was first adopted in the United States. I may say that the Victor American Fuel Co., Colo., commenced to treat their mines extensively with stone dust or rather adobe dust in March, 1911.

SAMUEL DEAN.

Delagua, Colo.

Method of Working Coal Seam

In regard to the best method of working a coal seam of the character and thickness described by Charter Subscriber, Lexington, Ky., in COAL AGE, March 2, page 686, I would recommend the following system:

Assuming that the underlying stratum forming the floor of the seam is such as can be lifted without afterward causing trouble from the swelling and heaving of the bottom, as is the case with some fireclay floors when once disturbed, I would take up from 18 to 20 inches of the bottom to gain sufficient headroom on the main entry and other haulways. Assuming the top bench of coal, 14 inches thick, to be sufficiently strong and tenaceous to make a good roof, I would leave up this top coal in all rooms and entries. The parallel entry or air course and all crosscuts and rooms should be driven in the coal under the 14-in. top bench; it will not be necessary to lift bottom in driving any of these openings.

I would turn the rooms narrow, 8 ft. wide, for a distance of 15 ft. and then gradually widen out to a width decided upon and which would be governed by existing conditions, which under a cover of 100 ft. would be, say 30 ft. wide, with 15-ft. pillars between adjacent rooms. As the rooms reach the limit or boundary I would start the work of drawing back the pillars, at the same time dropping the top coal. It is important to keep the line of pillar work at an angle that would correspond to the line of fracture of the overlying stratum or roof of the seam.

I have seen this system worked very successfully in a seam of this kind but under a thicker cover. As will be noted by all practical men this system will reduce timbering to a minimum and at the same time reduce the possibility of accidents from falls of roofs which is the cause of the largest percentage of accidents in mining. Keeping up the top or roof coal until the work of pillar drawing is commenced will also give cleaner coal than can be secured by the

adoption of any other system, because the exposed fireclay above this coal weathers easily and drops into the coal both at the face and in transit.

J. W. Powell,
Mine Superintendent.
Coalmont, B. C., Canada.

Ice in Shaft

Replying to the inquiry of Thomas H. Devlin, superintendent, asking for suggestion as to best method of preventing the formation of ice in a wet shaft, in winter, Coal Age, Mar. 2, page 688, would say that if the matter of expense is not a presing consideration, I would consider the most practical plan to prevent the freezing of a downcast shaft in winter is as follows:

Select a place at the side of the shaft and make a dumb drift; or, better still, excavate a place 10 ft. wide and 20 ft. in length between walls. The walls can be made of stone, brick or concrete, the last being preferable. The foundation of the walls should be 12 ft. deep, but the headrom of the finished work need only be 6 ft. high. Roof this place with 40-lb. steel rails, with good fireclay bricks cemented between the rails, as when building an overcast, to make it air-tight.

Cover this with 12 in. of concrete to make the roof absolutely waterproof and fill in making the surface level. Put in a cement floor about 6 in. deep, laying a tile drain if necessary to provide for good drainage. Provide an opening and steps leading down into the cellar. Close this opening with sliding or hinged doors at the bottom of the steps, so as to regulate the quantity of air passing into the shaft through the cellar. Leave an opening in the walls next to the shaft, say from 4 to 6 ft. square, protected by 1-in. iron bars. This opening can also be provided with iron shutters for use in case of emergency, if desired.

This cellar is the hot-air chamber and is perfectly safe for attendants, being fireproof and waterproof. Place in this chamber as many steam radiators as may be necessary to heat the volume of air pasing through the chamber and down the shaft. These radiators should be so arranged as to heat the air to the best advantage. If desired, a portable boiler can be placed in this chamber, to be used for generating steam for use in pumping or other purposes. In this case, a hole should be left in the roof for the smokestack of the boiler.

As a further safeguard, the top of the shaft can be provided, if desired, with cheap iron shutters, which can be closed at night to cut off the cold downward current of air and prevent freezing. This plan will not require any reversing of the fan or changing of the direction of the air current, or the use of any double doors or overcasts other than those used in the present system of ventilation.

If desired, a further safeguard can be provided by placing water rings around the shaft, at different intervals, and arranging these rings so that hot salt water can be run from the surface into them and drained down the sides of the shaft. For this purpose, a common oil barrel can be used, provided with an exhaust steam pipe to heat the water, salt being added to the barrel, from time to time, as required. A pipe will be needed to conduct the water from the barrel to the water rings in the shaft. By this means very wet shafts can be kept comparatively free from ice in the coldest weather.

G. T. M.
Republic, Ala.

Carbon Dioxide vs. Carbon Monoxide

Referring to Coal Age inquiry, page 688, Mar. 2, I desire to indorse the answer given to "Two Subscribers," Dayton, Tenn., in regard to the difference between carbon dioxide and carbon monoxide, with respect to the extinction of the flame of a lamp.

The oxygen in carbon dioxide does not exist in a free state as it does in the atmosphere, but is chemically combined with the carbon. This is true also of carbon monoxide; the oxygen it contains is combined chemically with the carbon. Carbon dioxide (CO_2), however, contains all of the oxygen with which carbon is capable of combining; but carbon monoxide (CO) can take up more oxygen, under certain conditions. On this account these two gases act very differently on the flame of a lamp. Carbon dioxide does not support combustion and extinguishes a lamp flame, this gas being incombustible. Carbon monoxide, on the other hand, is combustible; and when a light is introduced into the gas, if air is present, the CO burns, forming CO_2; in other words, the gas takes up more oxygen. It burns with a pale blue flame.

James Northover.
Seanor, Penn.

Reducing Ventilation When Firing

Referring to the discussion of the question, "Should Ventilation Be Reduced Before Firing Shots," p. 718, Coal Age, Mar. 9, I desire to say, this might work in some mines with safety; perhaps in the coal regions employing pick work, and where all the shots are fired between shifts when, in most cases, all the men are out of the mine except the shotfirers. In the anthracite region, however, shots are fired at any time during the shifts when the miner is ready. The anthracite mining law, Article 12, Rule 11, forbids the firing of any shots in a mine where locked safety lamps are used, except by permission from the mine foreman or his assistant; and requires the person in charge to examine the place and the adjoining places and satisfy himself that it is safe to fire the blast before permission is given. For this reason, the ventilating current could not be reduced before firing the shot, in anthracite mines.

There is another reason for not reducing the ventilation before firing, in such mines. In the anthracite region, the rooms are high and wide, generally, and the whole quantity of air is required to keep the place clear from gas. It would not be safe under these conditions to reduce the ventilation, if this could be done otherwise. I have worked in mines where they stopped the fan for 20 min., and the places were in the same condition after that time as before.

It would be inconsistent for me to advise slowing down the fan, or reducing the ventilation at the time of firing, knowing as I do the different methods of working here and in the "old country," where the means employed are more economical and greater safety is attained, and where firedamp is not passing from one working place to another, but is conducted directly into the return current.

George Knight,
Fireboss.
Plainville, Penn.

Ice in Shaft

Referring to Thomas H. Devlin's question relating to the accumulation of ice in wet downcast shafts, Coal Age, March 2, page 688, it seems to me that the appended note to this question does not help the solution of the problem; except by the suggestion that suitable water rings might be installed at different levels in the shaft to collect the water and render the shaft drier; and by the use of steam pipes in the shaft. I have pleasure in asking Mr. Devlin to try keeping one or two coke fires going at the top of the intake shaft and about two or three yards from the same. I have seen this remedy tried and it was very successful. The shaft was brick lined having buntons two fathoms (6 ft.) apart that carried the wooden cage guides and furnished the necessary support for the pumping apparatus, pipes, signal wires, etc.

The cages were fitted with shoes, which, in the writer's opinion, were a greater source of trouble than rope guides would have been under the same circumstances. In this shaft, however, the trouble from the accumulation of ice only occurs in the severest weather.

Matthew Stafford.
South Wellington, B. C., Canada.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Duties of Fireboss Required by Anthracite Mine Law

In reading the anthracite mine law I find that it specifies in a number of places the duties of the mine foreman and his assistants, but makes very few references to the duties of the fireboss. Article 12, Rule 3, gives the mine foreman full charge of all matters pertaining to the ventilation of the mine. Rule 4 makes it the duty of the mine foremen, or his assistant, to examine all accessible parts of the abandoned portions of the mine in which explosive gases have been found, etc. Only in one place do I find a direct reference to the duties of the fireboss. This occurs in Rule 7 of Article 12, which states, "It shall be the duty of the fireboss to remain at the danger station until relieved by some person authorized by himself or the mine foreman, etc."

Can you tell me what duties belong to a fireboss under the anthracite mine law, and do coal companies have to employ a fireboss for such duties? Also, are firebosses required to have a certificate the same as mine foremen and assistant mine foremen? P. H. MAGINNIS.

Shamokin, Penn.

There are two distinct references to the fireboss in the anthracite mine law. These occur in Article 8, Section 9; and Article 12, Rule 7. The former reference is as follows:

Section 9. And no person shall be permitted to act as fireboss in any coal mine or colliery, unless he has had five years' practical experience in mines as a miner, three of which he shall have had as a miner in mines wherein noxious and explosive gases are evolved, and the said fireboss shall certify to the same before entering upon his duties before an alderman, justice of the peace, or other person authorized to administer oaths, and a copy of said deposition shall be filed with the district inspector of mines wherein said person is employed.

The second reference is as follows:

Rule 7. A station or stations shall be established at the entrance to each mine or different parts of each mine, as the case may require, and a workman shall not pass beyond any such station until the mine or part of the mine beyond the same has been inspected and reported to be safe. It shall be the duty of the fireboss to remain at the danger station until relieved by some person authorized by himself or the mine foreman, who shall stand guard until said mine or part of mine shall be reported safe, and he shall not let any person pass without permission from the fireboss.

The present anthracite mine law certainly leaves a great deal to be assumed or understood in regard to the fireboss and his duties, in a mine generating explosive gases. Article 8 provides for the certification, by a duly appointed examining board, of the mine foreman, who must have had at least five years' practical experience as a miner and be of good conduct, capable, and sober. He must pass a satisfactory examination before the examining board and be certified by said board to the Secretary of Internal Affairs, who shall issue a certificate in due form bearing the seal of the State of Pennsylvania. The law makes no provision for the examination or certification of the fireboss, in this article, but clearly states (Section 9) that no person shall be permitted to act as fireboss in any coal mine, etc., as given above.

The usual work of the fireboss is the examination of the mine for gas by means of a safety lamp at least three hours before the time for the workmen to enter the mine, each day. By the anthracite law, Article 12, Rule 5, this work is made the duty of "The mine foreman or his assistant," no reference here being made to the fireboss. It is generally assumed in the anthracite region that the assistant foreman is the acting fireboss. According to Article 8, Section 9, no person shall be permitted to act as fireboss in any coal mine except he has had five years' practical experience in mines as a miner, three of which shall have been in mines generating noxious and explosive gases. It would seem that this requirement would prevent some mine foremen from acting as fireboss, because they have not had the required experience in mines generating explosive gases.

In the anthracite region the assistant mine foreman is the fireboss and must perform all the duties assigned to the assistant foreman in the law. The law requires (Article 12, Rule 1) the owner, operator, or superintendent of the mine or colliery to employ a competent person who shall be called mine foreman. The law also requires (Rule 2) that whenever a mine foreman cannot personally carry out the provisions of this act, he shall employ a sufficient number of competent persons to act as his assistants. Further than this, the law does not compel the employment of an assistant foreman or fireboss. The law forbids (Article 8, Section 1) any person to act as mine foreman or assistant mine foreman who is not registered as holding a certificate of qualification or service under the act.

Arrangement of Colliery Buildings

I would like to draw the attention of the readers of COAL AGE to a subject that we mining engineers in charge of construction work have long felt should receive more attention than it has in the past. It is the need of a more systematic grouping and arrangement of the buildings forming the surface plant, at a bituminous mine.

The demand is more and more urgent each year for increased economy in operation. Much attention has been given to the adoption of new methods and the installation of new and improved machinery for the handling of coal at the surface, its loading and shipment; but this very fact, the adoption and installation of methods and machinery not anticipated in the previous arrangement of the surface plant, has, in most cases, led to a most unsystematic arrangement of the buildings. As a consequence it is often necessary to transmit power long distances; to transport by inconvenient tracks and trams, parts of machinery needing repairs, or work undergoing construction; to say nothing of increased danger and annoyance caused by the multiplicity of tracks, live wires and other evils that might be avoided and should be eliminated in the design of a more up-to-date plant.

Can we not have a discussion of this subject by colliery engineers, superintendents and foremen, who have been up against the annoyances and delays growing out of a lack of arrangement? Give plans of proposed arrangements that will reduce time and cost of handling.

F. D. BUFFUM,
Mining Engineer.

Ellsworth, Penn.

Developing a Thick Vertical Coal Seam

I may soon have to take up the development of a vertical coal seam 16 ft. thick, 1000 ft. deep and one mile long. I would greatly appreciate having this question thoroughly discussed in COAL AGE. Many of the older readers must have had valuable experience in the development of such a seam of coal.

CHAS. M. SHERMAN.

Farmington, Ill.

[This is an interesting and important question, and we hope it will receive the attention it deserves.—EDITOR.]

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions

Calculations Required in Pumping

Ques.—What is the theoretical pressure, or the pressure ignoring friction, corresponding to a vertical head of 300 ft. of water?

Ans.—Ignoring friction, the pressure at the bottom of a column pipe in a shaft 300 ft. deep is the static pressure due to this head; or

$$p = 300 \times 0.434 = 130.2 \text{ lb. per sq.in.}$$

Ques.—When pumping 400 gal. of water per min. through a 5-in. discharge or column pipe, in a shaft 300 ft. deep, what is the friction head due to this flow; and what is the total head (h) and the pressure (p) at the pump, in action?

Ans.—The friction head, in feet, due to the flow of water in column pipe, in ordinary mining practice, is calculated thus,

$$h_f = \frac{0.01 \times 300 \times 400^2}{8 \times 5^5} = 19.2, \text{ say } 20 \text{ ft.}$$

The total head against the pump, in this case, is, then,

$$h = 300 + 20 = 320 \text{ ft.}$$

The pressure at the pump when pumping is

$$p = 320 \times 0.434 = 138.88 \text{ lb. per sq.in.}$$

Ques.—(a) Find the diameter of the water cylinder or plunger of a pump required to handle a flow of 250 gal. a min., in 10 hours each day, assuming a piston speed of 120 ft. per min. (b) Calculate the diameter of the suction and discharge pipes for this flow. (3) If the shaft is 480 ft. deep and the available steam pressure at the pump is 60 lb. per sq.in., what will be the required diameter of the steam cylinder for this work?

Ans.—(a) The pump must handle in 10 hours all the water the shaft makes in 24 hours; or

$$G = \frac{250 \times 24}{10} = 600 \text{ gal. a min.}$$

For a piston speed $S = 120$ ft. per min. the required diameter (d) of the water end of the pump is

$$d = 5.37\sqrt{\frac{600}{120}} = 5.37\sqrt{5} = 12 \text{ in.}$$

(b) Suction pipe,

$$d\ 0.35\sqrt{600} = 8.57, \text{ say } 8\tfrac{1}{2} \text{ in.}$$

Discharge pipe,

$$d = 0.25\sqrt{600} = 6.12, \text{ say } 6 \text{ in.}$$

(c) It is necessary, first to calculate the friction head caused by a flow of 600 gal. per min. through 480 ft. of 6-in. column pipe, and, say, 20 ft. of 8.5-in. suction pipe; thus,

$$h_f = \frac{0.01 \times 600^2}{8}\left(\frac{480}{6^5} + \frac{20}{8.5^5}\right) = \text{say } 28 \text{ ft.}$$

The total effective head on the pump is then $h = 480 + 28 = 508$ ft.

The diameter (D) of steam end, for an available steam pressure of 60 lb. at the pump, is then found thus,

$$\frac{D}{12} = 0.7\sqrt{\frac{508}{60}}$$

and

$$D = 0.7 \times 12\sqrt{\frac{508}{60}} = 24.4, \text{ say } 24 \text{ in.}$$

Ques.—What horsepower of engine will be required to pump 165 gal. of water per min. from a shaft 1200 ft. deep?

Ans.—The formula in common use for calculating the horsepower of a pump assumes an efficiency of 75 per cent. for the steam end. It is

$$H = 0.00034\ Gh$$

$$= 0.00034 \times 165 \times 1200 = 67.3 \text{ hp.}$$

Ventilation

Ques.—An airway 8x9 ft. is passing 45,000 cu.ft. of air per minute; what is the velocity of the air current?

Ans.—The sectional area of this airway is $8 \times 9 = 72$ sq.ft. The volume of air passing is then

$$v = \frac{q}{a} = \frac{45,000}{72} = 625 \text{ cu.ft. per min.}$$

Effect of Fall of Barometer on Percentage of Gas

Ques.—Assuming that the abandoned workings in a mine have a total volume of 1,000,000 cu.ft. and that the air in this space contains 10 per cent. of marsh gas, how would the air current on the entry skirting these old workings be affected if the barometer should fall suddenly from 29.55 in. to 28.74 in. in nine hours? Supposing that this air current is 10,000 cu.ft. per min. and carries normally 2 per cent. of gas, what would be the percentage of gas in the current during the barometric fall, and would this change be detected readily on the safety lamp?

Ans.—Assuming the temperature of the mine air remains constant, the volume of air contained in the abandoned workings will increase or expand in the inverse ratio of the fall of the barometer. In other words, the volume ratio is equal to the inverse barometric ratio. Thus, calling the expanded volume of the air in the abandoned workings x,

$$\frac{x}{1,000,000} = \frac{29.55}{28.74}$$

$$x = \frac{29.55 \times 1,000,000}{28.74} = 1,028,183 \text{ cu.ft.}$$

Now, subtracting the original volume of the air in the abandoned workings, the volume of air thrown out on the entries is 1,028,183 — 1,000,000 = 28,183 cu.ft. of air in nine hours, or, say, 52 cu.ft. per min.

Expanded volume of air in goaves	1,028,183 cu.ft.
Original volume of air in goaves	1,000,000 cu.ft.
Volume of air thrown out on entry	28,183 cu.ft.

Quantity of gas in air thrown out

$$\frac{28,183 \times 0.1}{9 \times 60} = 5.2 \text{ cu.ft. per min.}$$

Quantity of gas in air current before change

$$10,000 \times 0.02 = 200 \text{ cu.ft. per min.}$$

Total quantity of gas during fall of barometer

$$200 + 5.2 = 205.2 \text{ cu.ft. per min.}$$

Percentage of gas

$$\frac{205.2 \times 100}{10,000} = 2.052\%$$

It would not be possible to detect this slight increase in the percentage of gas in the air current by a safety lamp.

Causes of Mine Accidents

Ques.—What causes the greatest number of accidents in coal mines (explosions excepted) and what precaution should be taken to prevent them?

Ans.—The largest number of coal-mine accidents is caused by falls of roof and coal at the working face. The precautions to be taken to prevent these accidents or reduce their number are, a more thorough inspection of the working face to discover any slips or faults in the roof, or any loose slate or rock that should be taken down, and to ascertain where timber is needed to support the roof or coal. Miners should be instructed to inspect their own working faces and to set any necessary timbers before proceeding to load their coal. The failure to do this is the cause of many accidents. In some mines it is important to adopt a systematic method of timbering the faces of rooms. A plentiful supply of the proper size of mine timbers must be kept constantly on hand and all orders for timber be promptly filed.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The apparently better news from the coal regions with reference to the chance of avoiding a long strike, has led to a decided increase in the disfavor with which propositions like the Lee bill are being viewed in Congress. Nothing has been heard thus far from the subcommittee, to which the Lee bill was sent, and so far as can be learned, nothing has been done by the Senate Interstate Commerce Committee with regard to the so called Townsend strike bill, which provides for the appointment of a commission by the President to investigate and report upon cases in which serious strikes occurred. The Townsend bill has proved distasteful to a good many members of the interstate commerce committee, and it is understood that a substitute for it will shortly be offered. In this, it will be sought to eliminate the features that have been most sharply objected to in the Townsend measure.

Attitude of Administration

Meanwhile, it is well understood that President Taft favors doing anything that the federal government legitimately can to prevent the threatened strike from becoming acute, although he is not disposed to strain the provisions of the law in order to attain that end. He has given full assurance of his interest in the situation and those who are closest to him are convinced that the problem will not be neglected in any degree whatever. It is expected that some report on the Lee bill will be made shortly, and that in this the Democrats will state the views of their party as an organization with respect to the question of federal intervention of this kind. The notion of federal interference with state activities is, of course, foreign to their principles, but they have in some instances been inclined to make an exception of so serious a matter as the coal situation has appeared likely to become.

Stonega Coal Co. Discrimination Case

The recent decision of the Interstate Commerce Commission in the case of the Stonega Coal & Coke Co. against the Louisville & Nashville R.R. presents a number of points that are of considerable interest and importance even outside the region which is immediately affected.

Some of the principal findings of the commission in this case are as follows:

A railroad company which holds itself out to the public as a common carrier, files tariffs with and makes reports to the Interstate Commerce Commission as required by law of common carriers, and engages in the transportation of interstate traffic, is a common carrier subject to the provisions of the act to regulate commerce. The character of service a railroad company renders, and holds itself out as willing to render, is the controlling inquiry in a proceeding to determine whether such company is a common carrier. The fact that a carrier maintains lower rates from points on its own line than rates in force on the same kind of traffic from nearby points on the line of another railway and not on its own line, does not of itself amount to undue discrimination against shippers at the latter points. The principal defendant renders a transportation service to owners of coal operations in the Black Mountain district of Virginia, on the line of the Virginia & Southwestern Railway, but refuses to render a like service, under substantially similar circumstances and conditions, to complainants' coal operations in the Appalachia district on the Interstate Railroad. It is, therefore, held that such conduct amounts to undue discrimination against complainants.

With reference to the question of rates, the commission expresses itself as of the opinion that there is an undue discrimination against the complainants, but that the reasonableness of the transportation charges, although investigated to some extent, is not directly involved in this case. Accordingly the Commission adds:

In the present state of the record, we are unable to determine what the rates should be in order to remove the discrimination. It may be that the defendants will be willing to establish a service to and from complainants' mines and plants, on the Interstate R.R., on the same basis as the service now in effect to and from the St. Charles mines, on the Virginia & Southwestern, and thereby remove the discrimination; and an opportunity will be given them to do so. Should they fail to reach a satisfactory adjustment, a further inquiry will be had by the Commission and such order made as may be found necessary and proper.

Alabama

Birmingham—There was some talk in this vicinity recently, to the effect that if a national strike of bituminous miners should be called, about 20,000 mine workers in the Birmingham district would respond by going out on strike. The miners here are only partially organized but it is reported that their sentiment is quite strongly in favor of backing up the demands of their fellow workers in the central states. J. R. Kenamer represented the local organization at the meeting of the miners' policy committee, in Cleveland, Mar. 25.

The controversy between Gov. O'Neal and the Sloss-Sheffield Coal & Iron Co., over the price paid for convicts is being watched with keen interest. It is believed that the company will decline to pay the requested increase for the convicts and that the controversy will eventually develop a most interesting situation. In the event of the Sloss company declining to pay the advance requested by the governor, it is believed that the entire convict supply of that company will be given to the Banner mines for service there.

Colorado

Oak Creek—E. E. Shumway, president and general manager of the Rocky Mountain Fuel Co., has purchased the property of the Junction City Coal Co., of Oak Creek. This consists of 160 acres of rich coal land on the main line of the Moffat road, four miles north of Oak Creek. The purchase price was $70,000. Mr. Shumway has given a 20-year lease on the Junction City property to W. C. Ferguson of the Empire Coal Mining Co., of Denver, who will immediately install a complete modern equipment for operation of the mine. He expects to have the property in shape for the extensive production of coal by next fall, and to employ about 200 men.

Illinois

Marissa—The tipple of the White Oak mine, belonging to the Egyptian Coal & Mining Co., of St. Louis, was seriously damaged, Mar. 26, when a portion of the structure gave way under the weight of a quantity of coal which had been piled up against it. A number of pit cars, containing the tools of miners who were leaving the workings, were buried in the débris.

Taylorville—The main shaft of the Peabody Coal Co.'s new mine at Kincaid has been sunk to a depth of 342 ft. and a 7½-ft. seam of coal has been disclosed at this level. The air shaft still lacks about 20 ft. of reaching the coal. Both shafts are being lined with concrete. When this work is completed, two more shafts, for a second mine, will be put down at a point about one mile distant. In connection with the large electric power plant which the coal company

proposes to build at Kincaid, an immense reservoir will be constructed. Water will be diverted to this from the South Fork of the Sangamon River, by means of a dam.

Collinsville—One man was crushed to death, another perhaps fatally injured and three others seriously hurt, Mar. 26, by falling slate and coal in Mines No. 2 and 3 of the Lumaghi Coal Co. Three of the men were injured by a fall of slate in Mine No. 2, while the other two were caught by separate falls of overhead coal in Mine No. 3.

Bloomington—Following an inspection trip over the Toluca & Rutland branch of the Chicago & Alton R.R., by officials of the Chicago, Milwaukee & St. Paul, it was announced that the latter road may purchase the branch road and extend it 60 miles south in order to reach the central Illinois coal field.

Indiana

Brazil—The Brazil Block Coal Co. has declared its intention to discontinue the operation of its mines after Mar. 31. This company practically made Brazil. It has opened and operated 45 mines in this vicinity and has been in operation for forty years. The company, which is practically identical with the Chicago & Eastern Illinois R.R., has a score of mines in Clay, Vermilion and Sullivan Counties. Recently, the railroad was leased to the Frisco system and this latter concern will now also lease the coal company's interests.

The German Coal Company's mine southeast of Brazil caved in Mar. 27, obstructing the mouth of the shaft and putting the cage out of commission. The miners all escaped through another shaft. The accident was costly, since the company was working hard to fill a large number of orders prior to the suspension which if it lasts ten days or more will force the factories in Brazil to close down.

Iowa

Davenport—C. M. Moderwell & Co. and the Sunnyside Coal Co. have each filed petitions against the Milwaukee railroad, alleging that the defendant company refused to accept certain cars of coal for shipment. Moderwell & Co. ask damages of $357 and the Sunnyside company a judgment of $396.

Kentucky

Whitesburg—It is reported here that an Eastern syndicate has bought 20,000 acres of coal and timber lands along the Kentucky River, Line Fork and Kings Creek in the southern part of Letcher County, at a price said to be the largest ever paid for mountain coal lands in this region. About two-thirds of the property lies along the new extension of the Lexington & Eastern R.R. It is said that development of the property will be started this year.

Lexington—A number of coal companies in the Big Sandy district recently had cause to complain of a serious lack of cars. They also declared that many cars which should have been sent into the Big Sandy section were taken into the Kanawha and New River fields. The companies affected by the shortage were: the Northeast Coal Co., the Pike Colliery Co., the Greno Coal & Coke Co., the Elkton Consolidation Coal & Coke Co., the Mitchell Coke Co., the Kewanee Coal Co., the W. K. Steel Coal Co., the Wagner Coal Co., the Little Creek Coal Co., and the Colonial Coal & Coke Co. The Interstate Commerce Commission promised that in so far as lay within its power, it would take steps to relieve the situation.

Louisville—The stockholders of the Louisville Property Co., a holding corporation of the Louisville & Nashville R.R. Co., have ratified the recent action of their directors in selling coal and timber land to Thomas Cairns, of Pineville, at $1,800,000, and Mr. Cairns states that the coal and timber property consists principally of holdings in the counties of Bell, Whitley and Knox, Kentucky, amounting to 46,000 acres, and containing the best coals, as a whole, in the southeastern Kentucky coal field. There are 12 large going coal operations already under lease. His intention is to sell in groups of from 3000 to 5000 acres.

Missouri

Bevier—All the coal mines in this district resumed operations on Apr. 3, by authority of an agreement between the operators and miners of the Southwest district, which provides that work will be continued for a period of 30 days, while a new scale is being negotiated.

Ohio

Steubenville—Fire broke out in the Robert Hill coal mine here, Mar. 23, and 12 men, who were in the mine, had a narrow escape from suffocation. A remarkable discovery was made, when it was found that apparently, a fire, which broke out in the same mine 12 years ago, had eaten its way through a mile of coal and slate. Experts are investigating the matter on the theory that the fire had been burning for 12 years and that the recent blaze came about when the last of the wall was consumed and the fire given access to the main shaft of the mine.

Cleveland—The joint conference of bituminous operators and miners, in session here, agreed on a compromise, Mar. 29, whereby all the original demands of the miners are withdrawn and the following increases in pay are to be granted: Five cents a ton for mining lump coal, 3c. for all other coal and 5.26 per cent. for men paid by the day. These terms still have to be submitted to a referendum vote of the miners and although no dissension is anticipated, it will take about two weeks to secure the necessary ratification. Meanwhile, a suspension is in effect throughout the organized bituminous fields, which will probably last from two to three weeks, pending an adjustment of the several wage contracts.

Cleveland—Owing to the extremely heavy ice in the upper lakes it is announced by the railroads that it will be May 15 before the season of lake navigation opens, instead of a month earlier as usual. In addition, it is said that the amount of coal remaining on the upper lake docks is the smallest ever known at this time of the year and the demand for coal will be unusually heavy.

Pomeroy—Some trouble was experienced recently by operators in this field on account of the high water which prevailed. A number of the mines were flooded and the production was somewhat curtailed.

Oklahoma

Muskogee—Affairs of the Sans Bois Coal Co., at McCurtain, in one of whose mines 74 miners lost their lives, Mar. 20, were placed in the hands of receivers recently by order of Judge Campbell in the United States District Court. The receivers were appointed on the petition of the Superior Savings & Trust Co., of Cleveland, Ohio, holders of a $250,000 mortgage, secured by the properties of the company at McCurtain. The banking company alleges that $55,000 in interest on the bonds is past due and that the company has other debts which it is unable to pay.

Pennsylvania

Bituminous

McKeesport—Three hundred coal miners returned to work, Mar. 27, in the Camden mines, after an enforced layoff of about two weeks. It is reported that water overflowing from the Monongahela River caused the mines to be closed down, and it was impossible to resume work until the river had receded.

Greensburg—The Lacolle Coal Mining Co. has awarded contracts for the construction of 7000 ft. of railroad, a steel tipple and an electric power plant, and expects to have a production of 300 tons of coal a day in the course of the next three or four months. It is announced that a contract has been made for the sale of the entire output of the mine, up to 1000 tons a day, for a term of five years. The Lacolle company owns 174

acres of ground and the coal under 1500 acres, located one and a half miles from Bolivar. Over 1000 ft. of headings have been driven, which show the thickness of the seam to be something over 6 feet.

Monongahela—Preparations are being made to sink a new shaft for the Catsburg mine, on the Sampson farm, near here. A large ventilating fan will be installed and other improvements made.

Johnstown—The Sunnyside Coal Co. expects to reopen the upper vein of the Sunnydale mine within a week or ten days and employ an additional 100 men, in order to supply the demand for coal. The plane is being extended from the lower vein, heavier rails being put down.

The Valley Smokeless Coal Co. has posted a notice to its employees, which states that, beginning Apr. 1, an advance of 10 per cent. on present prices will be paid as long as existing market conditions continue. When the market fails, the company agrees to pay the same scale of prices as then obtains at other mines along the Somerset and Cambria division of the Baltimore & Ohio R.R.

Rumors to the effect that the Berwind-White and Merchants' Coal companies would grant a raise in wages in the Windber and Boswell fields have been officially denied.

Uniontown—The H. C. Frick Coke Co., on Mar. 30, announced a general advance in wages, effective Apr. 1. The present scale is the highest ever paid in the region, amounting as it does to $1.44 per 100 bu. The advance on room and rib coal is 6⅔ per cent., on heading coal, 5⅓ per cent., and other advances range from 5¼ to 10 per cent.

Ebensburg—S. L. Reed and Webster Griffith have about finished securing options on 8000 acres of coal land in this vicinity. The price offered is $110 an acre, and the options expire June 1. It is not known who the intending purchasers are, but the Ebensburg, Lackawanna and Cardiff companies have all been mentioned in this connection. About 5000 acres of the tract lie along the Cambria & Indiana R.R. in the Blacklick Basin and 3000 acres lie near Vetera and Colver. The land adjoins the properties of the Vinton Colliery Co. and the Commercial Coal Mining Co. Shipping facilities are good, as in addition to the Cambria & Indiana R.R. the New York Central also taps the field.

Anthracite

Scranton—The People's Coal Co., owner of the Oxford colliery, in West Scranton, has offered a bonus of 10 per cent. to its mine workers if they will remain at work during any suspension that may take place in the anthracite region, and also the right to participate in any victory that may be won by the striking miners. This is similar to the course taken by the Pine Hill Coal Co. The Oxford mine, employing 300 men, was the only large anthracite colliery that worked steadily during the 1902 strike, when its whole output was sold at a premium, prices of $25 a ton being secured in some instances.

Underground settlings in the workings of the Capouse colliery of the Scranton Coal Co. threaten to wreck the big plant of the Graff Furnace Co., in the Keyser Valley section of West Scranton. Property damage to the extent of $12,000 was done, Mar. 25. Eight buildings, on ground embracing an entire city block, were so seriously affected that the company was unable to resume operations.

Shenandoah—The Madeira Hill Co., of Philadelphia, operating in this city, has struck the Buck Mountain vein, at its West Bear Ridge workings at Mahanoy City Plane. The vein shows a thickness of 10 ft. This adds new life to the Stanton colliery and means much for the Gilberton Valley.

Pottsville—Forty timbermen at the Hammond colliery of the Philadelphia & Reading Coal & Iron Co. went on a strike recently because the officials endeavored to compel them to use safety lamps without giving them any additional pay. The miners claimed they were entitled to extra compensation when forced to use this style of lamp.

Tamaqua—Because a number of men at work in the Lehigh Coal & Navigation Co.'s mines near here, refused to wear union buttons, nearly 1000 union miners quit work, Mar. 26. Officers of the coal company declared that unless the men returned to work all the collieries of the company, employing 9000 men, would be closed down.

Wilkes-Barre—Mayor Kosek, of this city, in an effort to avert a strike, recently issued an invitation to the executive heads of the cities and boroughs in the anthracite region to meet and formulate a plan whereby a strike or suspension might be avoided. This meeting was held, Mar. 28, and an appeal for intervention was sent to President Taft.

West Virginia

Bluefield—A powder explosion in the mines of the Thomas Coal Co. at McComas, near here, resulted in the injury of eight men, four of them seriously but none fatally. The men were entering the mine carrying cans of powder when a torch set fire to a bag in which the cans were carried.

Morgantown—A 20-year contract has just been closed by the Elkins Coal & Coke Co., of Morgantown, with the Lehigh Coke Co., involving 9,000,000 tons of coal, to be supplied at the rate of 1200 to 1500 tons a day, for the by-product coke ovens of the Lehigh company at South Bethlehem, Penn. Another contract just closed by the Elkins company, involves 96,000 tons of coal to be delivered to the Lackawanna Steel Co. To fill these and other contracts, a new mine will be opened in addition to the two mines already in operation in the Bretz field, on Deckers' Creek. The company is advertising in local papers for 600 workmen. Plans for the new mine have been prepared, and work on the shaft will be started early in April.

Fairmont—An announcement of vital importance to West Virginia operators was made recently by the Baltimore & Ohio R.R., to the effect that its rate on coal from the Fairmont regions to the Great Lakes would be reduced from 96¾c. to 90c. This action was the result of the further reduction of the rate from the Pittsburg field to the lakes from 88c. to 78c., thus giving the shippers in the last-named district an advantage over companies operating in the Fairmont district of West Virginia. Heretofore the Pittsburg district has enjoyed a differential of over 8c. and cutting this rate an additional 10c. was not to the liking of the West Virginia people.

Virginia

Wise—The Interstate Commerce Commission decided, Mar. 25, that through routes and joint rates for the transportation of coal and coke from mines in Wise and Lee Counties, Va., to destinations in Ohio, Kentucky and other states, must be established by the carriers operating from those mines. While no definite order was made by the commission, the case brought by the Stonega Coke and Coal Co. and others, will be held open to await for a reasonable time the voluntary action of the carriers.

Washington

Seattle—The Issaquah coal mine, a commercial landmark of the Northwest, has passed into the hands of a German syndicate for a consideration of approximately $200,000. One-half million dollars will be invested at once in improvements. The mine is owned by the Seattle, Lake Shore & Eastern and has been closed for 15 years. The name of the new company will be the Issaquah & Superior Coal Co. Before the investment was made the mines were fully explored.

Spokane—It is reported that $12,000,000 will be expended by the Northern Anthracite Syndicaate, in eastern Canada, in developing 12,800 acres of coal lands in the Groundhog Mountain district of British Columbia, 150 miles north of Hazleton. This work, which will occupy three years, includes the building of a railroad from the forks of the Skeena and Stikine Rivers to the mouth of the Nass River and Nasoga Gulf, also bunkers at points on the Pacific coast.

Personals

John Ridgney, Jr., has been appointed division engineer of Pratt No. 2 division, Tennessee Coal, Iron & R.R. Co.'s coal mines, to succeed George W. Postell, resigned.

J. J. Marshall, formerly chief engineer of the Loup Creek Collieries Co., is now in charge of extensive development work for the Gauley Mountain Coal Co., Ansted, W. Va.

Robert Fairbain, of Streator, Ill., has purchased the property of the Star Coal Co. at Galesburg and will take charge of its operations. Charles Rathbun is thus relieved of his connection with the company, which is in accordance with his desires for several years past.

A. R. Brown, who is in charge of the West End rescue station of the Bureau of Mines at Birmingham, Ala., recently made a tour of the larger coal-mining camps in the vicinity for the purpose of organizing and training rescue and first-aid corps among the miners.

Charles T. Harther, manager of the Powhatan Coal Co., of Toledo, has been made president and treasurer of the newly organized Central State Coal Co. of that city. Mr. Harther was formerly connected with the Johnson Coal Mining Co., the New York Coal Co. and the Lorain Coal & Dock Co. in Columbus.

F. R. Wadleigh, fuel engineer and assistant general manager of the Chesapeake & Ohio Coal & Coke Co., attended the recent meeting, in New York, of the American Society for Testing Materials. Mr. Wadleigh is a member of the coal specifications committee of the society. He had just returned from Cincinnati where he testified in the famous McKell case against the Chesapeake & Ohio.

A party of Colorado School of Mines students, with Professor Allen in charge, recently spent several days inspecting the Trinidad coal field. The itinerary was arranged by James S. Thompson, division engineer for the Colorado Fuel & Iron Co., and was most interesting and instructive to the students. F. P. Bayles, of the Cokedale mine, and William McDermitt, division engineer for the Victor-American Fuel Co., guided the boys through the properties under their charge.

Frank A. Prendergast, for the past ten years general manager of the Baltimore & Ohio Coal Co., of Columbus, has retired in favor of F. B. Lockhart, formerly connected with the United Coal Co., of Pittsburg. Mr. Prendergast has been anxious to be relieved of his official duties for some time. He will, however, continue to give some attention to the affairs of the company. Mr. Lockhart, the new president, is an experienced coal man and will continue the previous policies of the company.

Obituary

Wade Hampton Echard, aged 26, one of the prominent younger business men of Fayette County, Penn., died at his home in Uniontown, Mar. 11. He was educated at the Iron City Business College, Pittsburg; Grove City College, Grove City, Penn., and West Virginia University, Morgantown, W. Va. Mr. Echard was president of the Unity Coke Co., the Northern Coke Co., the Peerless Coke Co., and the Franklin Coke Co., all of Connellsville, Penn.

Construction News

East Liverpool, Ohio—The West Point Coal Co. will establish large coal-storage yards at this point. J. L. Francis is general manager.

Monongahela, Penn.—A new shaft will be put down and ventilating equipment installed in connection with the Catsburg mine near here.

Lonaconing, Md.—It is reported that the Maryland Coal Co. will expend $200,000 in extending its mining developments in this vicinity.

Morgantown, W. Va.—Plans have been prepared by the Elkins Coal & Coke Co. for opening a new mine in the Bretz field on Deckers Creek. Work on sinking the shaft will be started early this month.

Duluth, Minn.—It is reported here that C. J. Farrar, acting for the Pittsburg Coal Co., has purchased property at Ashland, Wis., on which the company will build and equip a large coal dock, at an expense of $250,000.

Pittsburg, Penn.—The Lily Coal & Coke Co. has prepared plans for a new operation at West Brownsville, to have a daily capacity of 3000 tons. The plant is to be electrically equipped, and will cost about $300,000.

Wheeling, W. Va.—The McAlpin Coal Co., operating in Raleigh County, has increased its capital from $100,000 to $200,000, and is planning extensive development of its property. John Laing is president of the company.

Bolivar, Penn.—The Lacolle Coal Mining Co. has awarded contracts for the construction of 7000 ft. of railroad, a steel tipple and electric-power plant. Offut & Bennett, of Greensburg, were given the contract for the railroad work at $17,000.

Oak Creek, Colo.—W. C. Ferguson, of the Empire Coal Mining Co., Denver, has secured a 20-year lease on the property of the Junction City Coal Co., near here, and will spend about $30,000 installing modern equipment preparatory to starting mining operations next fall.

Clinton, Ind.—Edward Shirkie, former president of the Oak Hill Coal & Mining Co., has purchased a tract of coal land along the Chicago, Terre-Haute & Southeastern R.R., and will sink two new mines. It is understood that tipples will be ordered in a short time.

Seattle, Wash.—A new company, composed of German and British capitalists and known as the Issaquah & Superior Coal Co., Ltd., has acquired the Issaquah coal mine and will spend several hundred thousand dollars on improvements and equipment. The company is represented by Albo von Alvenshaben, of Vancouver, B. C.

Publications Received

JOURNAL OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, March, 1912. 120 pages, 6x9 in., illustrated. 35c. per copy. Publication office of the Society, New York.

Some of the papers presented in this issue of the journal are: "Some Tests on Carbureters," by George W. Munro; "Some Refractory Substitutes for Wood," by Charles L. Norton; "Power System of the Pacific Mills," by F. A. Wallace; and "Electric Propulsion of Ships," by W. L. R. Emmet.

METHODS OF ANALYZING COAL AND COKE. By Frederic M. Stanton and Arno C. Fieldner. Technical Paper No. 8, U. S. Bureau of Mines. 22 pages, 6x9 in., illustrated.

The fuel investigations being conducted by the Bureau of Mines had their inception in the work done at the government coal-testing plant, erected in 1904, at the Louisiana Purchase Exposition, St. Louis, Mo., and the analytical methods originally used by the chemists at that plant have been followed, without much change, in the subsequent chemical work of the fuel-testing plants at St. Louis, Norfolk and Pittsburg. The paper describes the original methods (which were those recommended by the committee on coal analysis of the American Chemical Society), and such modifications and changes as experience has shown advisable.

Industrial Notes

The Eastern Manufacturing Co., of Elmira, N. Y., reports that it has just filled several large orders of maple pipe for the Lackawanna and Erie railroads. During the past month the company has been busy supplying pipe for the coal mines. Three carloads of wood pipe, which were recently shipped, will be used for siphon purposes.

The announcement is made that the corporation which has existed for 15 years under the title of the Eureka Tempered Copper Works was, on Apr. 1, succeeded by the Eureka Co., with an increase of capital stock from $100,000 to $250,000. The personnel of the new corporation remains the same as heretofore. Their established line of business will be continued, and with the addition of enlarged facilities and modern equipment the company hopes to aggressively maintain the enviable reputation which it has enjoyed for almost a score of years.

The Bury Compressor Co., of Erie, Penn., announces that it is putting on the market a line of "variable volume" air compressors. These are power, steam or motor driven. It is maintained that the variable volume feature of these machines will fill a long felt want and offers an opportunity for effecting a great saving in air compressor service.

The Cross Engineering Co., Carbondale, Penn., is putting on the market a fireproof mule stall for mines. This is of concrete and steel construction and has already been adopted as standard by several of the larger anthracite mining companies. This new type of construction is made necessary throughout Pennsylvania by the recent enactment compelling all underground buildings to be made of incombustible materials.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The appearance of some tangible evidence of a settlement being reached in the bituminous scale has caused a general easing off in the coal markets. The trade immediately responded to the announcement that a tentative agreement had been effected between the delegates of the miners and operators, by a general softening of prices in all grades. That the present arrangement is only tentative and will not, in any event, become effective for some time has prevented a heavy slump in prices, which still range well above normal. It is hoped in trade circles that the suspension will be of sufficient duration to insure the heavy accumulations of strike supplies being worked off, so that on resumption of work at the mines there will be, at least, a normal demand.

In the Eastern markets, prices have fallen off appreciably, but a feeling of uncertainty pervades the soft-coal trade and there is still a strong demand in that branch, although it is not thought prices will again reach the high level of two and three weeks ago. The situation is more acute in anthracite. While a few more cargoes are still due in the coastwise trade, these are all sold ahead and will mark the completion of the hard-coal shipments until work is again resumed at the mines; the supplies on hand at the large distributing centers will be cleaned up by Apr. 10.

Heavy tonnages have been acquired in the Pittsburg district for speculative purposes, which will, no doubt, be easily worked off during the suspension. The notice of a general advance in wages, as given out by the Frick company, occasioned considerable surprise in trade circles and the market generally is erratic and entirely unsettled. There is great activity in the Ohio trade, due to a freer movement on the railroads and an unexpected demand from consumers short in supplies. Preparations are also being made for an active lake trade as supplies at the head of the lakes are known to be abnormally low. There is an urgent demand for the West Virginia product for shipment to tidewater where cargoes for foreign destinations are being loaded almost daily; at present writing there are vessels at Hampton Roads demanding 300,000 tons of coal. The coal business in Kentucky last month broke all previous records.

The unexpected announcement at the last minute, on the part of a number of the Middle West roads, that they were confiscating fuel, has caused some uneasiness there. However, there has been considerable coal accumulated on speculation and prices are soft, the market breaking Saturday when it was heard that an agreement had been reached in the labor controversy.

The markets in the far West are entirely unaffected by the Eastern situation and the trade is normal and quiet.

Boston, Mass.

Press reports of an agreement in the soft-coal regions knocked the bottom out of what was an active bituminous market all-rail, the only delivery of importance here under present conditions. The volume of spot coal bought during the week, in anticipation of a tie-up, was the heaviest for a long while, and prices well up to $3.25 at the mines were realized in some cases, on ordinary Pennsylvania coals. It is hard to foresee what quotations will be during the next week or two, but it looks as if "strike prices" had once more gone into history, so far as concerns soft coal.

If anthracite barges are put into the bituminous trade, it will mean a largely increased tonnage of the Pennsylvania grades out of New York and Philadelphia. During the flurry we have been going through, very little was heard about quality. The anthracite companies have now practically closed the gate, and after a few more cargoes are shipped, there is no hard coal expected to be available until after mining is resumed. Premiums up to $2 have been paid for coal alongside Boston, but part of this covers the extra water freight on outside tonnage. All-rail, from $1.10@1.75 extra, has been paid for stove and chestnut. The Boston dealers advanced screenings to $3.50 on the first.

Wholesale prices have been as follows:

Clearfield, f.o.b. Philadelphia....	$3.75@4.00
Clearfield, f.o.b. New York	3.75@4.25
Clearfield, *en route*, f.o.b. mine basis	2.35@3.25
Pocahontas, New River, f.o.b. Hampton Roads	4.75@5.00
Pocahontas, New River, Boston, on cars	6.50@7.00
Pocahontas, New River, Providence, on cars	6.00@6.75
Anthracite, stove, chestnut, alongside Boston.......	7.25@7.75
Anthracite, chestnut, all-rail, mine basis.....	4.55@5.30

Water freights from New York to Providence slumped to 75@80c. during the week, on account of the lack of hard coal at the piers. The old figure of $1.40 is still the rate from Hampton Roads to Boston.

New York

Prices on bituminous in the New York market have eased off further, although still considerably above normal. Quotations are nominally about $2.90@3.65 alongside, although there have been some figures named as low as $1.05 at the mines. Most of the bituminous mines shipping this trade are continuing at work and the supplies are good. The large corporations here have facilities for storing a 90-day supply and no serious results are anticipated from a short suspension at the mines.

Considerable surprise and consternation were caused in shipping circles here by the announcement on the part of the Cunard and White Star steamer companies of their proposal to insert a strike and war clause in all contracts. The ocean liners are now obliged to coal for the round trip and each extra ton of fuel thus carried means a ton less of freight.

The situation in anthracite is somewhat more urgent. The hard-coal mines are now definitely closed, the arrivals have ceased and by Apr. 10 all supplies in the hands of the large distributing companies will be cleaned up. It is believed that any consumer caught short after that date will be obliged to pay a high price. Supplies of the steam sizes available at this time are estimated at about 50 or 60 thousand tons, while under normal conditions they are usually about 100 thousand.

Domestic sizes of anthracite sold up as high as $6.50 last week, but wholesale prices f.o.b. New York now, are about as follows:

Broken	$5.50@6.00
Egg, stove and nut...........	5.50@6.00
Pea	4.50
Buckwheat	4.10@4.50
Rice	3.10@3.50
Barley	2.25@2.50

Philadelphia, Penn.

The first week of the suspension of anthracite mining operations finds the trade in this vicinity a little flat. Of course, this is in a measure due to the fact that there is practically no coal for sale by the wholesalers, but notwithstanding this fact, the dealers report that the demand is not abnormal, nor in any way insistent. As a matter of fact, the op-

timistic views expressed by the newspapers regarding a prompt settlement of the trouble between the miners and operators, has probably had the effect of causing householders to postpone any purchases of coal that they really do not require for immediate consumption, feeling that there is a possibility of getting it at the reduced circular prices.

There probably is some ground for the supposition that the suspension will not be of long duration, at the same time there is a feeling that an adjustment of the difficulty is not so near as many are led to believe. This city went into the first week of the suspension not very well supplied with fuel, except in isolated cases. It is understood that the street railway and gas companies are in fairly good shape to stand a prolonged siege, but the majority of other industries, being handicapped for stocking space, have comparatively short supplies on hand, and a month, or six weeks at the most, will find numerous manufacturing establishments seriously embarrassed. It has resolved itself into a waiting game, and the most optimistic do not predict any settlement for a month at least.

Pittsburg

Bituminous—The entire trade, probably, was surprised that the operators and miners reached an agreement at Friday's meeting in Cleveland, though the terms of settlement are approximately what has been expected for some time. Undoubtedly the acute scarcity of coal, as accentuated by the strike in England, had a great deal to do with the settlement. The mines were idle the first day of the week, but the referendum vote will probably result in the great majority starting in between two and three weeks.

There is a large quantity of coal held speculatively, but as the mines are to be idle for some time yet the holders will make every effort to realize on it, and there has been no drop in prices thus far. While the large consumers had stocked up, the smaller ones as a rule have been carrying no important stocks, and there will probably be demand sufficient to liquidate the speculative stocks.

The market is entirely unsettled, but we repeat last week's quotations as representing nominally the market, coal being easier to secure at the figures than was the case a week ago: Mine-run and nut, \$1.50@1.60; ¾-in., \$1.65@1.75; 1¼-in., \$1.90@2; slack, \$1.40@1.50, per ton at mines, Pittsburg district.

Connellsville Coke—To the entire surprise of the trade and the workmen, the H. C. Frick Coke Co. late Sunday night posted notices of an immediate general advance in wages at all its plants. The other operators will follow suit, as usual, and the extras paid at various operations, particularly in the Klondike, where coal is harder to mine, will be continued. The advance was probably prompted by the advance granted in the union districts, the Connellsville coke trade being anxious to keep its industry unorganized.

The coke market has been very unsettled, with light demand and very scant supply. Late last week prompt furnace coke advanced again, and sold at \$2.40, against our quotation a week ago of \$2.25. There were sales on last Saturday at this figure, although it was known that an agreement had been reached in the union bituminous districts, and the same figure is asked today.

Baltimore, Md.

Prices of coal in the Baltimore market have been easier than during the previous week, but the demand continued heavy. Practically all grades of fuel, have dropped from 20@25c. per ton, due to the free movement on the railroads, and a substantial increase in the output. Weather conditions have favored mining operations, and the railroads have handled the traffic in good shape throughout the week. The car supply improved considerably, and there was little delay in getting the product to market.

Although it appears that the strike situation in England will be cleared shortly, the demand for coal abroad still continues brisk. The Consolidation Coal Co. closed contracts during the week for 18,000 tons of fuel destined for Buenos Ayres and Naples, 12,000 going to the South American port, and 6000 to Italy; more shipments are to be made as soon as the loading can be completed.

Local companies are intensely interested in the situation. While the majority of operators here employ nonunion men, there are others who have on their payrolls between 8000 and 10,000 union miners, and if there is a strike, they will feel it.

Buffalo, N. Y.

The bituminous trade is slowing down very fast, and consumers are mostly well supplied, some of them having laid in a six-months stock. There has been a large amount of coal moving and the fact that it has sold at from 50c. to \$1 over the price of a month ago has not kept many from buying. So eager were buyers to get out of the trade as soon as it was safe, however, that it was the regular thing to cancel all orders on the receipt of news from the Cleveland conference that an agreement was virtually in sight.

The selling plan for several days has been to fill orders the moment they were given. Most jobbers have kept in telephone connection with the mines and were able to furnish car numbers often within an hour or two after the order was received, for it was known that the coal would have to be sold again if there were reports of an agreement between the operators and the miners.

Bituminous coal has advanced anywhere up to \$1 over regular prices, which are \$1.60 for Pittsburg three-quarters, \$1.50 for mine-run and \$1.25 for slack, with Allegheny Valley running about as high. Coke has not advanced more than 75c., being regularly \$4.25 for best Connellsville foundry. All will be back to former prices at once if mining is continued.

The anthracite trade has been suspended, according to the reports of shipping agents, who say that they expect no further supplies now. They are inclined to believe that the suspension is to be short, for the supply is by no means equal to the bituminous. Not a ton has been received here for lake shipment and none can be spared now. A little will go West by rail for awhile, but if the suspension should last till June 14, as it did in 1902, there will be much distress the coming winter in isolated sections.

Cleveland, Ohio

The market at this time is practically at a standstill. People who have coal on track and *en route* are laying low for the final settlement, in anticipation of a suspension, which is expected to be from three to four weeks.

There is considerable high-priced coal *en route* from the mines to Michigan, and the shippers' hope is that there will be a suspension. It is feared that with the great amount of coal on track and *en route*, and because of the fact that the larger manufacturers and railroads have made preparations for a strike, with at least from 30 to 60 days' supply on hand, prices will slump heavily unless the suspension occurs.

Columbus, Ohio

Great activity characterized the coal trade in Ohio during the past week as nearly every one connected with the industry believes that a suspension is bound to come and every effort was made to get in the clear. But nevertheless a softening in prices resulted from the abnormally high quotations of the previous week and not many prices of \$2 were paid for steam grades.

It is generally believed that a suspension of from three weeks to a month will have the effect of cleaning up the trade in good shape. It is also believed that a short suspension will not cause any great hardship to any one, but operators do not want the good market to get away from them at this time and for that reason agreed to the small advance in the mining scale which has been tentatively accepted by the miners. The new scale provides for an advance of 5 per cent. for lump, 3c. per ton for all other grades

and 5.26 per cent. in the wages of day men.

The strongest point in the market has been the small sizes which are in demand in every quarter. The mechanical stokers, which are used pretty generally, require the small sizes and thus the strongest grades were nut, pea, slack and coarse slack. Mine-run is also in good demand and prices on grades between mine-run and the small sizes are about the same.

Preparations are being made for an active lake season as reports show that little coal will be carried over on the docks in the Northwest. The indications are good that navigation cannot be resumed as early as usual the coming season; some all-rail shipments will be made to the upper lake region.

There is little demand for domestic grades and the season in that trade is about over. Considerable domestic lump is tied up in the transportation congestion and this will cause a surplus at many points.

Prices prevailing in Ohio fields are:

Hocking Valley	
Domestic lump	$1.75
¾-in.	1.65
Mine-run	1.50
Nut	1.50
Nut, pea and slack	1.40
Coarse slack	1.35
Pittsburg No. 8	
¾-in	$1.70
Mine-run	1.70
Slack	1.65
Pomeroy Bend	
Domestic lump	$2.00
¾-in	1.75
Mine-run	1.75
Nut, pea and slack	1.70
Coarse slack	1.65
Kanawha	
Domestic lump	$1.75
¾-in	1.60
Mine-run	1.60
Slack	1.50

Louisville, Ky.

As a precaution, in the event of a strike of the coal miners, the Illinois Central Coal Co. has purchased thousands of tons of coal which is being stored in the yards at Paducah, for use if the supply runs short.

Coal which can be utilized for steam purposes is in such great demand at present that Kentucky operators are overwhelmed with orders for it. This demand caused the price to jump from $1 to $1.25 a ton in the last few days. Dealers say that, due to the prospective labor trouble, last month broke all coal records in Kentucky. Not only the larger manufacturing concerns and the railroads, but dealers and smaller consumers have been stocking up. While steam coal, is in particularly heavy demand, all kinds of coal are wanted.

Charleston, W. Va.

Except for the observance of Mitchell Day, no time has been lost in the districts along the Chesapeake & Ohio, the Virginian and the Kanawha & Michigan roads and their branches. Along these lines in West Virginia there are about 31,000 miners, out of the 69,000 in the entire state; except for a few thousand in the northwestern portion of the state, practically all the men that would be affected by a strike are in the Kanawha district. Last Saturday the indications were that some of the locals would not respect the instructions of the union officials to remain at work until all differences were settled. When many of the mines did not operate on Monday, further belief was lent to the rumor that some of the men in the Kanawha district were out, but later developments showed that the men were at work and would respect the instructions of the union officials. Of the 31,000 men in this section of the state, only between 9000 and 10,000 or 11,000 at the most would be affected by a strike.

The car supply last week was poorer than the week before. This situation is to be relieved, however, before the end of the present week, by an arrangement between the Chesapeake & Ohio and the Ohio Central, whereby a thousand cars will be sent over to the C. & O., in addition to five engines; in fact, the engines are already in the Kanawha field. While these cars will mean less than a day's allotment for the Kanawha district alone, it will, nevertheless, mean a considerable help to the present car situation. The allotment for the two districts takes about 2000 cars a day, but with only enough cars to run two and one-half or three days a week, the addition of a thousand more from another road will assist greatly in relieving the situation. A large number of cars are expected from other lines, and if these expectations are realized, there will be enough in the two districts to keep the mines running six days a week.

Hampton Roads, Va.

With vessels at Hampton Roads demanding approximately 300,000 tons of coal, a good idea can be obtained of the activity at this port. By actual count there are at the Virginian Railway Terminal and off Sewalls Point 11 steamers and 7 schooners and barges; at the Norfolk & Western R.R. piers and off Lamberts Point 8 steamers, 14 schooners and 10 barges; at the Chesapeake & Ohio Ry. piers at Newport News 26 steamers and 11 schooners and barges.

It is obvious that several of these vessels will be delayed some days, as the mines have only been receiving about a 50 per cent. car supply on an average since the first of March. Almost daily one or more steamers take a cargo of coal for foreign shipment from this port; the British steamers "Weardale" for Montevidio, Uruguay, and the "Llanwern" for Madeira cleared recently with cargoes of steam coal. Earlier in the week the British steamer "Leitrim" sailed for Montevidio, making two cargoes for that port during the past week.

The demand for coal here is prodigious, although the greater portion of the output has been loaded to tidewater. The heavy rains west of this city during the past week have caused considerable trouble; some six washouts have been reported on the Virginian R.R. alone, and, although repairs will be rushed, they probably will consume two or three days at least.

The bids for furnishing the Panama R.R. with coal, in which shippers through this port are vitally interested, were opened in New York last Friday, but up to the present writing no award has been made. The bids this year on New River-Pocahontas smokeless coal average 30c. a ton higher than last year and 50c. a ton higher than two years ago.

Indianapolis

The anticipated failure of the coal supply, due to the impending strike became evident in Indianapolis and throughout the state recently, when the larger coal dealers received notice from the railroad companies that they had begun to confiscate coal shipped over their lines. The coal dealers and large consumers say that this means they will be forced to face the expected coal famine with the supply that has been stored in the last few weeks. Several of the railroads deny that such a notice had been issued, but the dealers say the best evidence is the notification at hand and the fact that the railroads are already taking coal by the carload. Several companies operating in Indiana cities are said to be in the midst of a fuel famine.

The situation in Indianapolis is much better. The opinion prevails that Indianapolis is in good shape to stand a siege, notwithstanding its enormous manufacturing interests. The coal movement has been heavier within the last two months in Indianapolis than ever before. For two months or more the railroads, dealers, manufacturing concerns and the public utility corporations have been expecting a strike Apr. 1, and have been getting ready.

Inquiry of local dealers brought out the information that the retail coal yards are well supplied. The price of steam coal that jumped to $2.50 a ton last week when coal of all grades sold to the highest bidder, is now selling at $1.50. Men who keep an eye on the coal situation expect important developments within a few days, but do not believe the situation is as serious as some would have it appear.

Chicago

There has been a drop ranging between 25 and 35c. per ton in the price of coal

in the Chicago market; declines of 50c. a ton have been recorded.

The chief cause is said to be speculation among middlemen, and the large amount of delayed coal which has arrived. A considerable amount of anthracite has reached Chicago and been stored by dealers closely associated with the producers. Producers of furnace and foundry coke report a strong demand for their product. There has been a great deal of contracting for smokeless mine-run; in the majority of instances the price is $1.10 and $1.25 before and after the first of August, respectively.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.50@2.75
Steam lump	2.50@2.75
Screenings	2.50@2.75
Springfield:	
Domestic lump	$2.75@2.82
Steam lump	2.50@2.75
Mine-run	2.50@2.75
Screenings	2.50@2.75
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.50@2.75
Mine-run	2.50@2.75
Screenings	2.50@2.75
Pocahontas and New River:	
Mine-run	$4.25@4.50
Lump and egg	4.25@4.50

Coke—Prices asked for coke are: Connellsville and Wise County, $4.85; byproduct, egg and stove, $4.95; byproduct nut, $4.75; gas-house, $5.

Minneapolis—St. Paul

Coal men in the Twin Cities look for two or three weeks more of inactivity in coal circles, even though difficulties have been practically fixed up with the miners in the bituminous fields. Local newspapers have been giving considerable attention and space to the prospect of a suspension in mining operations which has stirred up the steam market, and manufacturing plants have been buying heavily during the past week.

The dealer in the country has not been in the market for the past month and he will not be buying any stocks until along during the summer months. Coal that was shipped to them a month or two ago has been coming in, but as a whole their stocks are generally low. Tax assessors in the Northwest seem to have the same opinion as elsewhere that coal dealers are legitimate prey against whom assessments should be put up to the limit. This condition always results in the dealer trying to reduce his stocks to the minimum along about May 1.

The announcement Saturday morning of the settlement between the bituminous miners and operators has had a tendency to make a slight drop in prices, although coal on the market is very scarce and very little is coming into the Twin Cities unsold.

Dockmen say they are very busy cleaning up and repairing the docks and will be putting in repairs and improvements from now on until the lakes open up.

St. Louis, Mo.

With the suspension on in Illinois there is practically no market, inasmuch as there is no demand at this time. The market was glutted the latter part of last week with several hundred cars of Kentucky coal at East St. Louis, which proved valuable to those who had failed to lay in a supply. Kentucky mine-run coal sold for 40c. at the mines, with a $1.10 rate to East St. Louis, and something like 150 to 200 cars were sacrificed at this price.

What little market was left was pretty well broken up Saturday, when it was generally known that the operators and miners had reached an agreement for Illinois, Indiana and Ohio. The coal that was mined Saturday was kept on track, and in one or two instances certain mines in the Illinois field worked Sunday; this coal is being held on track and will be gradually worked off at any price the operators may consider good.

Indications are that the suspension here will last about 30 days or six weeks. This, however, will depend upon whether certain operators in Illinois, who, it is thought, may start up right after Apr. 1, will agree to stay out. It is understood that if one whistle blows for work, other mines in the southern Illinois field will start up the next day, regardless of whether it is May 2 or Apr. 2.

There is no anthracite coming in, but a fairly good tonnage of smokeless is arriving on orders previously placed. Coke is in good demand at $4.75@$5, St. Louis. The market opened up on coal held at the mines about as follows:

Franklin County	
Lump and egg	$1.85@2.00
No. 1 nut	1.85@2.00
No. 2 nut	1.60@1.75
2-in. screenings	1.30@1.40
Carterville	
Lump and egg	$1.75@1.85
No. 1 nut	1.50@1.60
Screenings	1.30@1.40
Mine-run	1.25@1.35
Standard	
2-in. lump	$1.50@1.60
Screenings	1.20@1.30
Mt. Olive	
6-in. lump	$1.75@1.85

Portland, Ore.

There is absolutely no change in the coal-market conditions here since last report, prices being unchanged and the demand light on account of favorable weather conditions. While the East and Middle West have had cold weather with snow, according to reports received here, Oregon is having ideal spring weather. The chief topic of discussion now in commercial circles is the coming opening of the Panama Canal and ship tolls, the Pacific Coast standing solidly for free tolls to American bottoms in coastwise traffic.

San Francisco

Deliveries for the past week have been light, nothing coming in from Australia. Shipments from British Columbia aggregated 8200 tons; receipts from the Rocky Mountain district were normal and it is safe to say that more coal was put out to the consumer than was received.

At the present time the wholesalers are carrying about 30,000 tons of Australian. On the other hand, there are no arrivals of this coal due in the near future with the exception of one steamer with a carrying capacity of 5000 tons.

There has been no change in rates and present prices are as follows:

Wellington, British Columbia	$ 8.00
Pelam Main, Australia	8.00
Rocky Mountains	8.50
Cumberland	12.50
Anthracite, Penn	15.00

Financial Notes

The Pittsburgh Coal Co. declared regular quarterly dividend of 1¼% on preferred stock, payable Apr. 25 to stock of record Apr. 13.

The Delaware, Lackawanna & Western Coal Co. has declared the regular quarterly dividend of 2½%, payable Apr. 15 to holders of record Apr. 1.

The directors of the Island Creek Coal Co. have declared the regular quarterly dividend of $1.50 per share upon the preferred capital stock of this company, payable Apr. 1, 1912, to stockholders of record at the close of business Mar. 23, 1912.

The board of directors of the Reading Co. has declared from the net earnings a quarterly dividend of 1% upon the second preferred stock of the company, to be paid on Apr. 11, 1912, to stockholders of record at the close of business on Mar. 26, 1912.

On Jan. 1 bank deposits in the eight districts of Pennsylvania, which will be most seriously affected by the anthracite strike on Apr. 1, amounted to $118,069,951. Eight years earlier, or on Jan. 1, 1904, deposits in banks of the same districts totaled but $66,419,001.

Last February the Reading Coal & Iron Co. realized $4,031,000 from the sale of anthracite, while in February, 1911, its sales amounted to only $2,306,000. The company has not been receiving any higher prices this year, although many of the retailers have been getting an advance of $1 a ton, but with the larger output the Reading has evidently been able to reduce its cost of mining per ton. Last year the February operations resulted in a deficit of $25,000, but this year's sales showed a profit of $287,000. Total sales for the eight months of the fiscal year have amounted to $26,097,000, as compared with $22,490,000 in the corresponding part of last year. The net earnings this year have been $1,014,000, as against $287,000 last year.

Index of Coal Literature

Monthly list of the world's best articles on coal and coal mining

The following is a list of abbreviations used below:
A.E.G.-Ztg. = A.E.G.-Zeitung.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Berg-Hüttenmänn. Rdsch. = Berg- und Hüttenmännische Rundschau.
Bull. Am. Inst. Min. Engin. = Bulletin American Institute of Mining Engineers.
Bull. Assoc. Ing. Liège = Bulletin de l'Association des Ingenieurs sortis de l'Ecole de Liège.
Bull. Ass. Sucr. = Bulletin de l'Association des Chimistes de Sucrerie et de Distillerie de France et des Colonies.
Canad. Engin. = Canadian Engineer.
Chem. Engin. = Chemical Engineer.
Colliery Guard. = Colliery Guardian.
Compt. Rendus Acad. Sciences = Comptes Rendus de l'Académie des Sciences.
El. Engineering = Electrical Engineering.
El. Jl. = Electrical Journal.
Engin. Contract. = Engineering Contractor.
Engin. Min. Jl. = Engineering and Mining Journal.
Engin. News = Engineering News.
Geol. Mag. = Geological Magazine.
Giess.-Ztg. = Giesserei-Zeitung.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
JB. Berg-Hüttenw. Sachsen = Jahrbuch für das Berg- und Hüttenwesen im Königreich Sachsen.
Jern. Kont. = Jern Kontorets Annaler.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Gasbeleuchtung = Schilling's Journal für Gasbeleuchtung und Wasserversorgung.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. South Afr. Inst. Engin. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Mines Minerals = Mines and Minerals.
Min. Scient. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mitt. Ver. Moorkultur = Mitteilungen des Vereins zur Förderung der Moorkultur im Deutschen Reich.
Mon. Ind. Gaz = Moniteur de l'Industrie du Gas de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Tonind.-Zeitung = Oesterreichische Tonindustrie-Zeitung.
Oesterr. Z. Berg- Huttenwes. = Oesterreichische Zeitschrift fur Berg. und Hüttenwesen.
Rev. Noire = Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Rock Prod. = Rock Products.
S. Afric. Min. Jl. = South African Mining Journal.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle = Stein und Braunkohle.
Techn. Rdsch. = Technische Rundschau.
Tiefbohrwes. = Tiefbohrwesen.
Transact. Inst. Mining Eng. = Transactions of the Institution of Mining Engineers.
Transact. Manchester Geol. Min. Soc. = Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. El. Machb. = Zeitschrift für Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

I—GENERAL

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Mining Mathematics. S. N. Forrest, Cr., 8vo., 7½x4¾, 312 pp., E. Arnold, London, $1.12 net.

The World's Minerals. L. Ja. Spencer, 8vo., 11+272, 40 illus., 21 diag., N. Y., Stokes, 1911, $2.

Potts' Mining Register and Directory for the Coal and Ironstone Mines of Great Britain and Ireland. 1911, 8vo., 7½x4¾, 470 pp., Railway Gaz., London, 85c. net.

The Finance of a Mine. M. H. Burnham, Min. Mag., Vol. 5, 1911, 6, pp. 444-8, 6 fig., 1 tab. (The growing importance of engineers in dealing with the financial side of mining.)

The Price of Coal. H. Brighthouse, 18mo., Gowans & G., London, swd., 12c. net.

Mining Operations in General. (Le règlement général des mines.) Rev. Noire, Vol. 14, 1911, 367, pp. 332-35; 368, pp. 356-61; 369, pp. 387-88; 370, pp. 415-17; 371, pp. 437-40. (Installations at the pit head and adits, staple shafts; haulage inclines; haulage in roads; engines and ropes; work at the face; ventilation; special precautions against dust; lighting; explosives; pit fires and sudden outbursts of dangerous gases; use of electricity in ground operations; hygiene in the workings; plans and records; various arrangements.)

Modern Coal Mining Plant of Concrete Construction. Cement Engin. News, Vol. 23, 1911, 9, pp. 301-3, 5 fig. (The construction of the Bunsen Coal Co.'s Universal Mines, Clinton, Ind.)

Report of Mission to England and Germany with Reference to the Distribution of Energy in Colliery Districts. F. Leprince-Ringuet. (Rapport de mission en Angleterre et en Allemagne sur la distribution de l'énergie dans les regions houillières.) Ann. Mines., Vol. XX, 1911, 10, pp. 245-355, 24 fig., 5 illus., 3 plates. (State of the question. Distribution in Durham, Northumberland, Westphalia, Rhenish Prussia, and the Saar district.)

Progress in the Coal and Iron Industry in India. Ol. Favarney. (Progrès des Industries du charbon et du fer dans l'Inde.) Rev. Industrielle, Vol. 42, 1911, 50, pp. 494.

Situation of the Mining and Metallurgical Industry of Belgium in 1910. Jos. Libert. (Situation de l'industrie minière et métallurgique de la Belgique en 1910.) Circ. 4316. Comité Central Houillères France, pp. 1-12.

Extensions in Rhenish-Westphalian Coal Mining. (Die Betriebserweiterung im Rheinisch - Westphaelischen Steinkohlenbergbau.) Ernst Juengst, Glückauf, 1911, 51, pp. 1996-2001; 52, pp. 2037-47, 2 tab.

Binley Colliery. Iron Coal Trade Rev., Vol. 83, 1911, 2282, pp. 839-41, 9 fig. (Plan and equipment of a South Staffordshire Colliery.)

II—GEOLOGY

Experimental Geology (2nd series), Part 2. Application of the experimental method to the study of the phenomena of sedimentation; Part 3, Application of the experimental method to the study of orogenic phenomena (formation of mountains.) R. Lecointre. (La Géologie experimentale (2 serie), 2, partie, Application de la méthode expérimentale à l'étude des phénomènes de sédementation; 3, partie, Application de la méthode expérimentale à l'étude des phénomènes orogéniques (formation des chaines de montagnes.) 8vo., 28 pp, Paris, G. Vitry, 1911.

Relation between the Serial Order of Seams and Quality of Coal in the Ostrau-Karwin District. (Beziehungen zwischen Floezfolge und Eigenschaften der Kohle im Ostrau-Karwiner Reviere.) W. Petraschek, Montan. Rdsch., 1911, 11, pp. 482-92, 3 fig. (Gas content and caking power of the coal are important for the identification of the seams. Changes in the properties of the coal proceed in accordance with certain laws and stand in simple relation to the succession of seams.)

The Coals of the East. (Les charbons de l'orient.) Circ., 4329. Comité Central Houillères France, pp. 1-12.

III—MINING TECHNOLOGY

Coal Cutting Machinery. W. B. Shaw, Iron Coal Trades Rev., Vol. 83, 1911, 2283, pp. 879-82, 19 fig. (Paper read before Manchester Assoc. Engin.)

Coal Cutting Machinery. W. B. Shaw, S. Afric. Engin., Vol. 16, 1911, 6, pp. 109-12, 6 fig. (Advantages and difficulties of the use of machines.)

Coal Cutting Machinery. W. B. Shaw, Electrician, Vol. 68, 1911, 11, pp. 420-2. (Various types of machines in use, considered and compared.)

Jeffrey Short Wall Coal Cutter. Brit. Columb. Min. Engin. Rec., Vol. 16, 1911, 11, pp. 331-3, 3 fig. (A new room-and-pillar machine which cuts across the face of the coal.)

Methods of Driving by Gas Engines for Collieries. A. E. L. Chorlton, Iron Coal Trade Rev., Vol. 83, 1911, 2285, pp. 961-4, 4 fig.

Advance in Air Compression. Mines Minerals, Vol. 32, 1912, 6, pp. 339-40, 3 fig. (Single-cylinder, two-stage, electric driven air compressor, with Rogler-Hoerbiger valve.)

Small Bar Mill with Mechanical Cooling Bed. J. Schmitz, Iron Coal Trades Rev., Vol. 83, 1911, 2280, pp. 770-1, 4 fig.; 2282, pp. 844-5, 12 fig. (A cooling bed 400 ft. long.)

On Stone Drills. (Etwas ueber Steinbohrer.) Steinbruch, Vol. 6, 1911, 31, pp. 368-69.

IV—WORKING OF MINERALS

Working Steep, Thin and Gassy Coal Seams. (Abbausteilgelagerter, wenig maechtiger und schlagwetterreicher Steinkohlenfloetzel.) Kohle Erz., 1912, 2, pp. 39-42, 1 fig. (Height of pillars in pillar and subsidence working.)

The Rill System of Stoping. J. B. Wilson, Engin. Min. Jl., Vol. 92, 1911, 21, pp. 1000-2, 2 fig. (A Western Australian method of stoping in narrow deposits.)

Mine Working in Prussia during 1910. (Der Bergwerksbetrieb im Preuss. Staate während des Jahres 1910.) Z. Bergwes. Preuss., 1911, 2, Stat. Lieferung, pp. 71-139.

V—BORING, SHAFT SINKING AND TUNNELING

Novelties in Drills. (Neuerungen in der Bohrtechnik.) Bauwesen, 1911, 21, pp. 159-60. (Hammer Drills by Kummer, Dresden; Driving head by Frankignoul, Liège; New Percussion Drills.)

Deep-boring Hand-Book. Vol. 4. Rope-Drilling (Drilling Wells.) Revised by B. Baak. (Handbuch der Tiefbohrkunde, 4 Bd., Das Seilbohrsystem Brunnenbohren.) Neu bearb. v. B. Baak, Th. Tecklenburg, Lex, 8vo., VII, 132, pp. 54, illus., 27 tab., Berlin, W. & S. Loewenthal, 1911, $3.35.

Deep Boring. (Das Tiefbohrwesen.) Hans Bansen. (Unter Mitwirkung von A. Gerke and L. Herwegen bearb.) 8vo., XX, 517, pp. 688 illus., Berlin, J. Springer, 1912, $3.80.

The Action and Control of Differently Constituted Coal Roofs. W. H. Hepplewhite, Iron Coal Trade Rev., Vol. 83, 1911, 2285, pp. 970-1.

The Freezing Method of Sinking. W. B. Wilson, Colliery Guard, Vol. 102, 1911, 2659, pp. 1181.

Impregnating the Coal Face. (Stosstraenkeverfahren.) Glückauf, 1911, 46, pp. 1908. (Experiments at the Consolidation 3-4 pit. Success attained in only a few instances. Small economic advantage.)

VI—BLASTING, EXPLOSIVES

A Contribution to the Examination of Dynamite Glycerine. (Ein Beitrag zur Beurtheilung des Dynamitglycerins.) F. Hofwimmer, Chemiker-Ztg., Vol. 36, pp. 41-2, 1 fig. (Estimation of glycerine (glycerolin) by nitration and determination of the nitroglycerine obtained, in a specially constructed apparatus.)

Experiments and Alterations of the Charge Limits of Explosives in Accordance with the Sectional Area of the Experimental Gallery. (Untersuchungen ueber die Veraenderungen der Grenzladungen von Sprengstoffen mit den Querschnitten der Versuchsstrecken.) V. Watteyne and J. Bolle, Z. Schiesswesen, Vol. 6, 1911, 17, pp. 321-23; 18, pp. 344-48; 19, pp. 371-2, 2 fig. (Various causes influencing the charge limit. Experimental determination of the charges igniting firedamp and coal dust in galleries ¼, 1 and 2 sq.m. sectional area.)

Contribution to the Knowledge of Explosives. A. Rzehulka. (Zur Kenntnis d. Spengstoffe.) Montan. Rdsch., 1911, 22, pp. 1056-61; 23, pp. 1110-3; 24, pp. 1154-6. (Discussion of the most important explosives and their valuation in practice.)

VII—TIMBERING, PACKING, ETC.

Various Kinds of Pipes Used in Hydraulic Goaf Packing. (Die verschiedenartigen Spuelleitungen im Versatzbetriebe.) Lueck, Ungar. Montan. Ind., 1911, 23, pp. 3-5. (Unlined and wood-lined pipes.)

Timber Used in Mining Operations. H. R. MacMillan, Canad. Min. Jl., Vol. 32, 1911, 21, pp. 685-91. (The Canadian supply of round and sawed timber.)

Mining without Timber. R. B. Brinsmade, 8vo., 309 pp., illus. N. Y., McGraw-Hill, 1911, $3.

Brattices of Wire and Brattice Cloth in Goaf Packing. (Steckenverzug im Bergversatz mit Draht und Versatzleinen.) DC. Glückauf, 1911, 42, pp. 1656-7, 5 fig. (Description of the conditions at the Lothringen colliery, Gerthe.)

VIII—WINDING AND HAULAGE

On Pneumatic Mine-Locomotives. Franz Koneczny. (Ueber Druckluftlokomotiven.) Montan. Rdsch., 1911, 20, pp. 955-7; 23, pp. 1113-5. (Types built by Rud. Meyer, the H. K. Porter Co. in Pittsburg, and L. Schwartzkopff in Berlin.)

Weight and Equipment of Mine Locomotives. G. Bright, El. Jl., Vol. 8, 1911, 11, pp. 986-98, 2 fig., 2 tab. (Locomotives with motor equipment.)

Economical Winding from Great Depths. (Wirtschaftliche Schachtfoerderung aus grossen Teufen.) Moldenhauer, Glückauf, 1911, 51, pp. 1981-92, 37 fig.

Mechanical Haulage in Mines. (Maschinelle Streckenfoerderung.) Ernst Blau. Kohle Erz., 1911, 51, pp. 1289-98, 52, pp. 1313-20, 7 illus., 6 fig. (Chain and rope haulage.)

Electric Main-Shaft Hauling Machines. Alfred Strauss. (Elektrisch betriebene Hauptschacht-Foerdermaschinen.) Bayer, Ind. u. Gewerbebl., Vol. 97, 47, pp. 461-5, 5 illus.

Modern Hauling Problems. R. W. Hutchinson, Cassier's Mag., Vol. 40, 6, pp. 556-60.

The Whitmore Brake and Overwind Prevention Gear. Colliery Guard, Vol. 102, 1911, 2658, pp. 1125, 1 double plate.

IX—SIGNALING

Pit Shaft Signaling. E. E. Beardsmore, Iron Coal Trades Rev., Vol. 83, 1911, 2283, pp. 899, 4 fig. (Read before Assoc. Min. El. Engin.)

X—LIGHTING

Lighting in Fiery Mines. (Die Beleuchtung in den Schlag. wettergruben.) Montan. Rdsch., 1911, 24, pp. 1158-9. (The Friemann & Wolff flat-wick lamp.)

Device for Electric Ignition of Mine Safety Lamps. Chavy, Jean, Liévin, Pas de Calais. Marcel, Delage u. Paul Woog, Paris. (Einrichtung zum elektrischen Zuenden von Grubensicherheitslampen.) DRP. 241, 306, 30 Juli, 1909.

XI—VENTILATION

Ventilation and the Prevention of Dust on the Rand. H. S. Martin, S. Africa Min. Jl., Vol. 9, 1911, 453, pp. 333-4. (The inverted cone system.)

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Some Features of the New Mining Regulations. S. Afric. Min. Jl., Vol. 9, 1911, 455, pp. 409. (Ventilation, water and underground supervision.)

XII—MINE GASES, TESTING

The Escape of Gas from Coal. Colliery Guardian, Vol. 102, 1911, 2657, pp. 10,072.

The H. W. C. Apparatus for Instruction and Research in Gas Testing. Colliery Guard., Vol. 102, 2659, pp. 1177-8, 2 fig.

XIII—COAL DUST

Experiments on Liquid Mixtures for Laying Coal Dust. W. M. Thornton, Iron

Coal Trades Rev., Vol. 83, 1911, 2285, pp. 966-7. (Continuation of discussion of paper read before N. Eng. Inst. Min. Mech. Engin.)

Sudden Outbursts of Gas in Belgian Coal Mines 1892-1908. (Die ploetzlichen Gasausbrueche in den belgischen Kohlengruben während der Jahre 1892-1908.) W. Schulz, Glückauf, 1912, 2, pp. 60-9, 20 fig. (Distribution of fiery pits in Belgian coal field. Relation of tectonics to gas outbursts.)

Automatic Watering Valve (Selbsttaetiges Ventil fuer Berieselungszwecke.) Glückauf, 1911, 49, pp. 1927, 1 fig. (The fitting-ball sprinkling valve at Rheinpreussen colliery. Valve opens automatically when the hose pipe is screwed onto main supply pipe, and shuts automatically when pipes are disconnected.)

Dust in Mines. (Les poussières dans les mines.) M. Lemaire, Rev. Noire, Vol. 14, 1911, 372, pp. 459-61. (Indication du procédé; estimation des quantités de poussières nécessaires; essais en présence de poussières de charbon; essais en présence du grisou.)

Present State of the Coal Dust Problem and its Prevention. (Ueber den heutigen Stand der Kohlenstaubfrage und Kohlenstaubbekaempfung.) Hugo Spiel, Montan. Rdsch., 1911, 23, pp. 1104-10, 3 fig.; 1912, 1, pp. 1-11, 3 illus., 3 fig. (Experimental station for testing the various remedies against coal dust. Wet methods; watering and steaming; soaking the coal face; wet zones Kruskopf apparatus;) hygrosopic salts. Dry methods; facing the surface on which dust is formed. Addition of inert mineral dust.)

Experiments on Liquid Mixtures for Laying Coal Dust. W. M. Thornton, Colliery Guard., Vol. 102, 1911, 2659, pp. 1181-3.

XIV—EXPLOSIONS

Accidents in Mines. W. Hanauer. (Die Unfaelle im Bergbau.) Oesterr. Z. Berg-Huettenwes., 1911, 51, pp. 706-7.

Radiations in Explosions of Coal-Gas and Air. W. T. David, 4to., 24 pp., Dulau; London, swd., 25c.

XV—MINE FIRES

Dry Fire-Extinguisher (Trockenfeuerloescher.) H. Wiesenthal, Stein-Braunkohle, 1911, 24, pp. 326-7, 1 illus. (Demonstration of the Theo extinguisher at the Templehof trial ground.)

XVI—RESCUE AND AMBULANCE

Liquid Air Rescue Apparatus at the Makiewka Donety Rescue Station. D. Lewitsky. Compressed Air Mag., Vol. 16, 1911, 12, pp. 6261-4.

Investigation of Self-Contained Breathing Apparatus for Use in Mines. The Report of a Committee of the South Midland Coal Owners, etc. Ryl., 8vo., 10¼x6¼, 102 pp., Cornish Bros., London, $1.25 net.

The New Oxygen-Rescue Apparatus Built by the Draegerwerk-Luebeck. (Die neuen Sauerstoff-Rettungsapparate d. Draegerwerks-Luebeck) Ernst Silberstein, Sozial-Techn., 1912, 2, pp. 25-9, 2 fig., 2 illus.

The Tartsch Cycle Track for Rapid Aid in Pit Accidents. (Das Grubenrettungsrad nach W. Tartsch zur raschen Hilfeleistung bei Unglückfällen, Grubenkatstrophen u. a. m. in Bergwerken.) R. Penkert, Kohle Erz., 1911, 52, pp. 1319-24. (Construction of the cycle; tandem for two members of rescue corps. Equipment; two Draeger apparatus, worn by the riders; two pulmotors, each with two reserve oxygen bottles; Hardtmann box bandages.)

Improvements in Rescue Work. (Neuerungen auf dem Gebiete des Grubenrettungswesens.) Eugen Liewehr, Montan. Rdsch., 1912, 1, pp. 11-5, 1 fig. (Chiefly the arrangement of underground shelters.)

XVII—DRAINAGE, PUMPING, ETC.

Turbine Mine Pumps. Mines Minerals, Vol. 32, 1911, 5, pp. 287, 1 fig. (Comparison from experience with ordinary steam pumps.)

Rateau Pumps for New Pumping Plants. (Rateau-Pumpen fuer neuere Wasserhaltungsanlagen.) Ernst Blau, Kohle Erz., 1911, 49, pp. 1241-8; 50, pp. 1265-73, 10 fig.

Device for Unwatering Pits by the Siphon Principle. (Vorrichtung zum Entwaessern von Grubenfeldern nach d. Hebersystem.) J. Salzmann, Braunkohle, Vol. 10, 1912, 41, pp. 650-53, 1 fig. (Description of new process. Length of time required for unwatering. Cost.)

Sealing off Mine Water. E. B. Kirby, Engin. Min. Jl., Vol. 92, 1911, 21, pp. 986-8, 4 fig. (The mud process by which fine material is forced into the crevices. Elaborate machinery required.)

XVIII—PREPARATION

Mechanical Devices for Quenching and Loading Coal. A. Than, Iron Coal Trades Rev., Vol. 83, 1911, 2280, pp. 763-5, 19 fig. (Translated from "Glückauf.")

A New System of Screening and Loading Coal. Iron Coal Trade Rev., Vol. 83, 1911, 2284, pp. 291-3, 7 fig.

Coal Washing Plant at the Cramlington Colliery. Engineer, Vol. 112, 1911, 2921, pp. 648, 2 fig., 1 plate.

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Conveying and Cooling Coal by Aspirated Air. (Zum Kohlenfoerder- und Kuehlverfahren mittels Saugluft.) Schlauf, Braunkohle, Vol. 10, 1912, 40, pp. 634-5. (Cooling the dried coal with aspirated air. Calculations.)

New Check Picking Belt. (Ein neues Kontrollesseband Weise.) Glückauf, 49, pp. 1917-8, 2 fig. (For checking the second picking. Cost small. The new belt has increased the output 265%, the cost being reduced by 46%).

Taylor Breaker near Scranton, Penn. M. A. Walker, Coal Age, Vol. 1, 1911, 11, pp. 334-6, 1 fig. (A new breaker and washery combined, with electrically operated machinery.)

XIX—BRIQUETS

New Dust Removing Appliances in Rhenish Lignite Briquette Works. (Neuere Entstaubungseinrichtungen auf rheinischen Braunkohlenbrikettfabriken.) G. Polster, Braunkohle, Vol. 10, 1911, 38, pp. 597-603, 1 illus., 5 fig.; 39, pp. 613-21, 5 fig., 4 illus.; 1912, 41, pp. 645-8, 1 illus. (Plants introduced during the last three years.)

New Briquetting Presses. G. Hagemann. (Neuere Brikettpressen.) Z. El. Maschb., 1911, 52, pp. 561-62, 2 fig. (Description of various types.)

XX—COKE OVENS

Development of a Byproduct Coke Oven Gas Plant. W. S. Blauvelt, Progressive Age, Vol. 29, 1911, 22, pp. 955-7, 3 fig.

Coke-quenching Device with Portable Hose Truck (Koksloescheinrichtung mit fahrbarem Schlauchwagen.) Feldmueller, Glückauf, 1911, 51, pp. 2001, 2 fig. (Device used at the Mansfield Pit, Langendreer.)

New Coke-Quenching Devices. (Neuere Koksloescheinrichtungen.) Goehrum, Jl. Gasbeleuchtung, Vol. 54, 1911, pp. 1169-78, 1 fig., 3 illus., 2 tab. (Survey of the history and objects of coke quenching. Chief methods in use: Rings, trucks, towers.)

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XXI—FUEL TESTING

Deterioration and Spontaneous Heating of Coal in Storage. H. Porter and F. K.

Ovitz, El. Rev., Chic., Vol. 59, 1911, 25, pp. 1239-41.

The Determination of Moisture in Fuel. J. A. P. Crisfield, Jl. Frankl. Inst., Vol. 172, pp. 495-502.

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Simplified Apparatus for Testing Smoke Gases. (Vereinfachter Rauchgas-Untersuchungs-Apparat.) Chemiker-Ztg., Vol. 35, pp. 1388, 1 fig.

Specifications for the Purchase of Fuel Oil for the Government with the Sampling of Oil and Natural Gas. J. C. Allen, Jl. Ind. Engin. Chem., Vol. 3, pp. 730.

A Chemical Study of Lignite. Part II. The Volatile Constituents. G. B. Frankforter and A. P. Peterson, Jl. Am. Chem. Soc., Vol. 33, pp. 1954-63, 4 fig.

On the Determination of Sulphur in Pyrites. A. Heczko. (Zur Schwefelbestimmung in Pyriten.) (I. Mitt.) Z. Analyt. Chem., Vol. 50, pp. 748-53.

On the Determination of Heating Values. Karl Kessler. (Ueber Heizwertbestimmungen.) Mitt. Thuering. Bez. -Ver. D. Ing., 1911, 10, pp. 98-101, 2 illus. (Execution and results of experiments.)

Mechanical Laboratory Sampler. Mines Minerals, Vol. 32, 3, pp. 139, 1 fig. (A coal sampler which may be adopted for making near analyses of coal by means of specific gravity.)

New Apparatus for the Analysis of Coal and Combustibles from the Point of View of their Byproducts. (Nouvel appareil pour l'analyse de tous charbons ou combustibles au point de vue de leurs sous-produits.) A. Ferla, Rev. Polytechnique, 1911, Vol. 12, No. 288, pp. 154-8, 1 fig.

Is Peat an Important Fuel in the U. S. A.? C. A. Davis, Page's Wkly., Vol. 19, 1911, 381, pp. 915-7, 1 map. (13 billion tons in 11,200 sq.miles of peat beds. The best runs as high as 11,100 B.A.v. per pound.)

Suction-Gas Plants for Lignite, Lignite Briquets, Wood, Peat, Coal and other Fuels, with Byproduct Recovery Plant. (Sauggasanlagen mit Gewinnung der in den Gasen enthaltenen Nebenprodukte, für Braunkohle, Braunkohlenbriquetts, Holz, Torf, Steinkohle und andere Brennstoffe.) ,A. Koch, Braunkhole, Vol. 10, 1911, 33, pp. 518-21, 1 fig. (Byproducts recovery plant for suction-gas plant; Meuller, Ruhrwerken. A. G. and Ehrhardt & Sehmer. Description of plants. Instances of their great utility).

XXII—STEAM ENGINES AND BOILERS

A New Smoke-Burning System for Industrial Purposes. (Ein neues Rauchverbrennungsverfahren fuer die Industrie.) Clemens Doerr, Gesundheit, 1911, 19, pp. 570-6.

Exhaust Steam Turbines at Mines. J. C. Cunningham, Mines Minerals, Vol. 32, 1912, 6, pp. 370-4, 10 fig. (Read before the Australasian Inst. Min. Engin.)

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Conveying Boiler Coal with Robins Belt at the Valerie Pit, Schwaz. (Transport der Kesselheizkohle m. Robins-Gurtfoerderer am Valerie - Schachte in Schwaz.) Gustav Ryba, Oesterr. Z. Berg-Hüttenwes, 1911, 48, pp. 655-8; 49, pp. 674-7; 50, pp. 692-5, 10 illus. (Details of Robins belt boiler coal conveyor at Valerie Pit.)

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Central Station Generation of Power at Mining Centers. J. V. Hunter, Proc. Am. Inst. El. Engin., Vol. 30, 1911, 12, pp. 2493-502, 1 fig., 1 tab.

Overhead Electrical Practice in Mines. G. H. Bolus, Mines Minerals, Vol. 32, 1911, 5, pp. 284-6, 6 fig. (From the Ohio Brass Co., Bull. Details of construction and installation affecting the economy of operation.)

European Explosion-Proof Motors for Mines. Jansen, E. W., El. Rev. (Chic.), Vol. 59, 1911, 26, pp. 1295-7, 6 fig. (Trials of various types of motors.)

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New French Regulations on the Use of Electricity in Mines. Iron Coal Trades Rev., Vol. 83, 1911, 2283, pp. 896-7.

The Electrification of the Shelton Mills. W. H. Lake, Iron Coal Trades Rev., Vol. 83, 1911, 2286, pp. 1007-10, 9 fig. (Paper and discussion before Staffs. Iron Steel Inst.)

Electric Hoists at Collieries. C. A. Tupper, Coal Age, Vol. 1, 1911, 9, pp. 270-4, 11 fig. (Characteristic features of eight systems described.)

Electric Hoists for Mines. D. B. Rushmore, Engin. Min. Jl., Vol. 92, 1911, 25, pp.1177-8, 1 tab. (Discusses four systems and how to avoid peak loads.)

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Electric Main-Shaft Hoisting Plants. E. Schulz. (Elektrisch betriebene Hauptschacht - Fördermaschinen.) Montan. Rdsch., 1911, 24, pp. 1149-54, 4 illus., 1 fig. (Advantage of electric hoisting plants. Description of various systems, especially the A. E. G. Ilgner System.)

The Application of Electric Energy in English Mines. (Die Verwendung elektrischer Energie auf englishchen Bergwerken.) El. Z., 1911, 47, pp. 1186-89, 3 fig., 5 illus. (Details of various plants.)

The Electric Hauling Machine in Mines. W. Weber. (Die elektrische Fördermaschine in Bergwerken.) El. Maschb., 1912, 3, pp. 52.

Improvements in Electric Locomotives Used on Lines in Course of Construction, Especially at the Entrances of Mines. Roan, J. M. (Perfectionnements aux locomotives electriques utilisées dans les voies en formation, notamment à l'entrée des mines.) Fr. Pat. 425, 371, 9, June, 1911. (Motor haulage rope and winch; conducting cable and winch; each winch can be uncoupled from the motor or operated by same.)

Electric Hoists on the Rand. R. Gascoyne, Engin. Min. Jl., Vol. 92, 1911, 21, pp. 982-3, 2 fig., 2 tab. (The Ward-Leonard and the three-phase system contrasted.)

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COAL AGE

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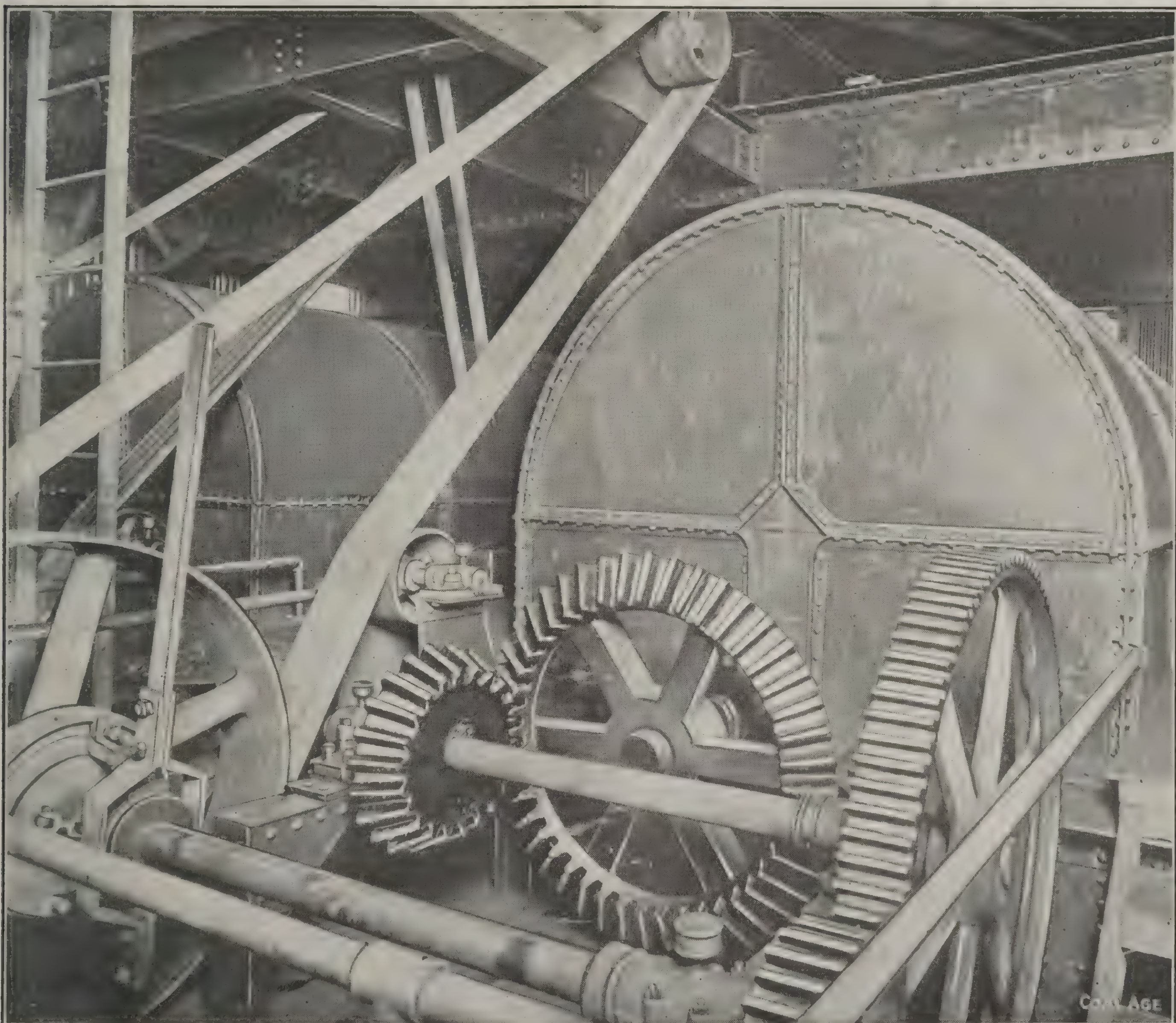

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COAL AGE

Vol. 1 NEW YORK, APRIL 13, 1912 No. 27

IT is surprising how few coal companies have realized fixed standards of operation. Too little attention is paid to efficiency as a basis of working.

For example, let us assume that in one particular department of a concern, the actual power expenses are $10,000, and that a predetermined calculation indicates they should be but $5000. A power specialist must get busy and effect the change. Less coal and less power must be used for the same output.

If the present expense is $65 a year per horsepower of 3000 hours, every item of cost must be analyzed, and an expense based on standardized conditions must be ascertained. If it is proved the figure should not exceed $48, this standard cost should be set up for the superintendent of power production to aim at.

The foreman who is in charge of the work where power is consumed is not particularly concerned whether it is furnished him at $65 or $48, but it is his business to prevent wasteful use. It is here, then, that another expert must scrutinize items of power use, and determine what reduction can be made in the total annual consumption by the elimination of leaks, wastes and frictional losses, due to such things as lack of alinement and too tight belts. Right here a saving of at least 30 per cent. can be effected in nine out of ten coal-mine power plants today.

It is absolutely essential in perfecting such an efficiency system, to have the item of power, as to production, distribution and use, set up monthly in two parallel columns, one giving the actual, and the other standard results. The officials must then co-operate until facts and theory agree. Other items of expense, such as maintenance, should be treated in the same way, and can well be placed under the direct supervision of a staff specialist.

In the near future, when attention has turned from the task of reforming capital, to the no less important work of correcting labor, the more difficult act of standardizing coal-mine pay rolls will be accomplished. There will be standard time and cost for every task. As conditions change, standard times will be revised, so as always to conform to the highest personal efficiency of the worker. Co-operation of the employee in surpassing standard output will be secured by providing a wage incentive and by permitting *ambition and hope to have full play.* In addition, the workman will be impelled from behind by fear of discharge.

The mine official who doesn't make constant reference in a comparative way to carefully prepared statements of standard costs and daily wastes is surely running a race without a stop-watch, and on an unmeasured track. Only by the use of predetermined costs can we know that our methods are producing results.

If a mistake occurs in the wages of an employee, and he is over-paid, no time is lost in correcting the error. But how about the same man destroying material or killing time? We do not believe that attention to labor charges should be any less persistent or careful, but efficiency losses should receive closer supervision.

The necessary basis for an effective efficiency system includes the rule that "no material shall be issued without a complete requisition, nor shall any special work be permitted without a service order." Some officials object to full requisitions on the ground that they increase "clerical expense." This is not true, for tabulated information, built up from these requisitions, will cost less than an incomplete record secured along independent lines. A requisition is not a requisition when it calls for "as many lamps as the bearer wants," instead of specifying the precise number required to be given.

It is also possible to extend the use of service cards to machines, so as to compare the time and cost of different ones on the same work. The man in charge should not be satisfied if a runner operates one machine for five hours at 100 per cent. efficiency, and then handles another machine for three hours at a like high efficiency. The equipment boss should immediately concern himself with the fact that, *owing to idleness, the first machine only operated at 62½ per cent. efficiency, and the other machine at 37½ per cent.*, assuming an eight-hour day. It is in such cases that economies can and should be effected.

The Sheridan, Wyo., Coal Field

By Jesse Simmons*

A description of one of the largest producing fields in the West. The coal is classed as a sub-bituminous and there are numerous seams of more than ordinary thickness. The field is characterized by the modern equipment installed at the mines. This is the first of two articles on this district.

*Deadwood, S. D.

The Sheridan, Wyo., sub-bituminous coal field is one of the largest in the West. J. E. Stout, state mine inspector, in his report for 1909 says: "I believe it contains more tons of coal than any coal field in the United States west of the Mississippi River, so far as known at this time."

There are 13 seams of coal developed at various points in Sheridan County, three of which are the producers of more than nine-tenths of the tonnage of the district. Geologically, there are but two seams known to exist in the district in the lower horizons. That portion of the field within Sheridan County is about 36 miles east and west by nearly 20 miles north and south. In the adjoining state of Montana, along the Tongue River, these beds outcrop for at least 60 miles. From this it will be seen that Mr. Stout's deductions are no doubt well founded, as here is a vast area underlaid by excellent coal.

Townsite at Monarch, Wyo., a Typical Western Coal-Mining Village

Geology

According to Bulletin 341, U. S. G. S. the 13 coal beds aggregate 144 ft. of coal in seams ranging from 32 ft. down to 5 ft. in thickness. The principal seams worked, the Carney, Monarch and Dietz No. 2 have an average thickness of 14, 30 and 10 ft., respectively.

The main transcontinental line of the Chicago, Burlington & Quincy R.R. passing northwesterly through the center of the district, gives shipping facilities enabling the coal to find a market in Iowa, Nebraska, South Dakota, Colorado, Montana and even as far west as Idaho and Washington. During the year 1910 the mines of this district produced 1,263,657 tons of coal. According to *Mineral Resources* 1909 during the year 1908 the coal was marketed at the mines for an average of $1.52 and during 1909 $1.27, per ton.

The coal is classed as sub-bituminous, since it contains less moisture and ash than lignites and more than bituminous or semibituminous. It has a conchoidal fracture, differing from the bituminous coals, and a bright, black lustre which distinguishes it from lignite. It burns to a clean white ash, making very little clinker and almost no soot. It contains on the average only a trifle more than a trace of sulphur. These properties make it an ideal domestic coal, and although it is lower in heat units than the higher grade fuels, it is extensively used as a steam coal. For the successful consumption of this coal under boilers it is necessary to provide more grate surface and the grate bars must ordinarily be set closer together as the coal has a tendency to break into small pieces while burning. One slight disadvantage that the railroad has encountered in the use of this coal is in dealing with the sparks. This is largely overcome by using stacks with very fine screens. A great many locomotives are equipped with bell and diamond stacks similar to those used on old fashioned wood burners.

The three varieties of mines, drift, shaft and slope, are represented in the district. The seams are thick, as compared with the ordinary coal bed, and the absence of water and freedom from gas simplifies the mining. During the 20 years that the mines of this district have been in operation there has never been an explosion that resulted fatally. The problem of ventilation is reduced prac-

tically to supplying enough air to remove the powder smoke. The only danger which must be guarded against is that of fire. It has been found that the coal is liable to spontaneous combustion and to guard against the large damage which might result it is a usual rule in the district to work the mines by a panel system which enables the operator to close up any portion of the mine completely and effectively.

During the fiscal year ended Sept. 30, 1911, according to State Mine Inspector W. E. Jones, the mines of the district produced 1,744,593 tons of coal, employing 1771 men in the work.

Monarch Mine

One of the largest mines in the district is the Monarch, 10 miles north o Sheridan. It is the property of the Wyoming Coal Mining Co. This property includes drift openings on the Monarch seam and a shaft 85 ft. deep to the Carney seam. The former seam is 30 ft. in thickness and the latter 14 ft. The present workings are confined entirely to the Monarch bed, although the Carney is opened so that within a short time it would be possible to get it in shape for a large production. However, the company has an immense body of coal exposed in the upper seam so that it will probably be some years before the lower is touched. The measures dip to the southeast on a grade of about 2%. The mine and camp are in the Tongue River valley, the main entry being a drift into the coal in the bluffs on the southerly side of the stream.

Main and cross entries are driven 12 ft. wide in the clear to a height of 10 ft. from the bottom of the coal. The panel system is used, rooms being driven 22 ft. wide, 10 to 12 ft. high and 250 ft. long, leaving a 20-ft. pillar between rooms. In drawing the pillars some of the roof coal is recovered as the seam is ordinarily a clean merchantable grade of coal for 18 to 24 ft., and it is endeavored to secure about this thickness. Goodman electric chain-machines are used for undercutting the coal and electric locomotives for hauling, an illustration herewith showing a trip on the way to the tipple.

Monarch's Preparation.

Monarch is quite proud of its preparation, and justly so. After the coal is weighed it is dumped into a conveyor and hoisted to the top of the tipple, dropping into a hopper which holds about 200 tons. This hopper has chutes leading into railroad cars on either side. Through these chutes can be loaded lump or mine-run on each side, or lump on one side and mine-run on the othe. Lump coal is screened over 5-in., diamond-bar shaker-screens, and all coal going through the bars is carried by a conveyor to two revolving-screens, where the different grades, egg, nut, pea and screenings or any mixture may be made. The meshes of these screens are first 2½-in., second 1-in., and third ⅜-in. All coal going over the 2½-in. is egg, everything through the 2½-in. and over the 1-in. is nut, everything through the 1-in. and over the ⅜-in. is pea, and everything through the ⅜-in. is screenings. A chute in the conveyor having 2½-in. bars make it possible to make a product known as "2½-in. slack."

Trackage includes two tracks for loading egg, and one each for the nut, pea, screenings and 2½-in. slack, or eight all told, counting those for the main hopper. The object of the 200-ton hopper is two-fold. In the first place if there should be any delay at the mine it is aimed to have enough coal in the hopper to keep the tipple going until the mine trouble is remedied; on the other hand if there is any trouble at the tipple end, the hopper provides space for dumping coal pending the overcoming of this trouble. The tipple has a capacity of handling 3500 to 4000 tons in an 8-hour shift. The tipple and plant are driven by electricity secured from the Sheridan Electric Light & Power Company.

Monarch as the camp is known, is unquestionably a model coal miners' village. A stranger's first impression is that of a pretty country town, rather than a mining camp. The town, with a population of about a thousand people, has its own system of water-works, is lighted with an arc lamp on each corner and each miners' home has its fence enclosed yard, electric lights and running water. The company offers prizes for the best kept lawns and gardens, and this feature, together with the laudable ambition of its citizens, has made Monarch one of the neatest coal camps in the United States. It includes a modern brick church, a two-story school house, a new brick hospital, a union hall, etc. The officers of the Wyoming Coal Mining Co. are: Mrs. E. M. Holbrook, president and W. G. Birkhaeuser, vice-president and general manager.

Sheridan Coal Co.

The mines of the Sheridan Coal Co., located at Dietz, 5 miles north of Sheridan, are the oldest in the Sheridan field, having been opened in 1897. The earliest opening known is No. 1 Mine, and during 14 years of operation 220 acres of coal have been worked out. At the present time it is not being worked, as the coal is more readily accessible in Nos. 2, 4 and 5, and naturally can be mined much cheaper. These mines can be pushed to produce 5000 tons per day.

The coal is mined on the block system, a method original with these mines, and which has proved to be a complete success. This system requires the expenditure of considerable money in order to develop a given area to the point of production, but, on the other hand, when once in operation it makes cheap mining possible. Another important advantage is the possibility of securing the workings against danger from fire, a menace that threatens occasionally in the mines of the district as has been noted.

Equipment.

The No. 2 mine is worked through a shaft 175 ft. deep, the coal being hoisted in self-dumping cages to the top of the tipple, by an Ottumwa hoist having two, 7-ft. drums and 24x36-in. cylinders. The power plant includes a 500-hp. Corliss engine belted to two, 200-kw. Goodman direct-current generators, rated at

Views of Opposite Sides of the Monarch Tipple

275 volts, and giving 250 volts at the mine for driving Goodman haulage motors. The steam plant includes 3 Kewanee water-tube and 4 Murray boilers, the latter furnishing steam for the air compressor and hoist. A Norwalk air compressor furnishes power for the puncher machines.

Other surface equipment includes a machine shop, which is fully equipped. A feature of this shop is a 15-ft. lathe. A well supplied electrical repair shop is also maintained, where motors are rewound, and other small repairs made to the electrical equipment. Ventilation is accomplished by a 20-ft. fan, having 5-ft. blades, driven at 75 r.p.m. It is direct connected to a steam engine.

The seam, which is known as No. 2, averages 10 ft. 6 in. in thickness, of which 2 ft. of roof-coal is not mined. The coal is undercut by Harrison punchers. Rooms are driven 275 ft. and are on 45-ft. centers, the rooms themselves having a width of about 22 ft., thus leaving a pillar approximately the same width.

The No. 4 Mine

The No. 4 Mine is also working on No. 2 seam. It is a slope mine, the slope extending 300 ft. at an angle of 20°. From the end of this slope the workings extend horizontally out into the coal. The coal is hoisted out in 6-car trips by an Ottumwa single-drum hoist having 24x44-in. cylinders; the drum has a diameter of 5 ft., and 1¼-in. cable is used. The boiler room contains one Murray and two Wilson boilers, which furnish steam for the hoist and fan. Electric energy and compressed air for this mine is secured from the plant at No. 2, a quarter of a mile distant.

One of the features of this mine is the tipple, which is completely equipped for making the various grades produced in the Sheridan field. The mine cars are dumped on a well-planned dump, evolved and manufactured at the mine, and named the "Sheridan dump," or are carried farther to a Phillips crossover dump. The Sheridan dump is used for dumping into a hopper from which the mine-run is drawn, while the Phillips dump is used when it is desired to prepare other grades. Perforated shaker screens are in use in this tipple.

The Sheridan Coal Co. owns 6000 acres of coal land and in addition the coal rights of 800 acres. On this land there are known to exist 5 workable seams, the deepest of which, the Monarch, is 842 ft. below the surface. There are also two seams not classed as workable coal. The drill hole disclosing this coal showed the thickness of the various seams, beginning at the bottom: 22 ft. 6 in., 15 ft. 8 in., 9 ft., 8 ft. 6 in., and 8 ft., a total of 63 ft. 2 in., of workable coal, besides two seams, not workable, of 5 ft. and 4 ft. 8 in. respectively.

The officers of the company are G. W. Megath, president; W. B. McCormick, vice-president, both of Omaha, Neb., H. S. Hopka, Sheridan, Wyo., general manager and Louis Cake, superintendent.

Following is an analysis of the coal, which, by the way, is typical of the product of the Sheridan field:

Moisture	19.63
Volatile matter	35.08
Fixed carbon	39.87
Ash	5.42
Sulphur, Trace	
	100.00
B.t.u.	10,047

Electric Haulage System at the Monarch Mine

Explosion at Sans Bois Mine No. 2

By W. H. Fursman*

More or less dangerous conditions have prevailed in this mine since it was opened in 1902. The practice of driving low crosscuts probably had much to do with the explosion. Board brattices were used. A week prior to the accident, the mine and fan had been shut down for seven days, during which time gas was allowed to accumulate.

About nine o'clock, Wednesday morning, Mar. 20, 74 miners lost their lives as a result of a gas explosion at the Sans Bois Coal Company's Mine No. 2, McCurtain, Oklahoma. Chant No. 2, as the ill fated working is known locally, is a slope mine. The seam pitches about 12 deg. and averages 7 ft. in thickness. There is a dirty band in the middle of the seam, about 24 in. thick, so that in reality there is but 5 ft. of coal. The coal is shot from the solid with Monobel. It has been the custom in driving crosscuts between rooms not to shoot down the top coal. This practice in all probability had much to do with the explosion which occurred Mar. 20.

Previous Explosions

In order to convey some idea of the dangerous conditions which have always existed in these workings, the following list is given of the explosions which have occurred here since the opening of the mine in 1902:

Dust explosion, killing two shot firers	1903
Gas explosion, killing one fireboss	1904
"Windy shot," killing two shot firers	1905
"Windy shot," killing one shot firer	1906
"Windy shot," killing one shot firer	1909

The first day on which work was resumed following the last mentioned explosion, a second shot firer was killed, making two explosions during the year 1909, each of which killed one shot firer. The significant point about this list of disasters is the fact that in the case of all the explosions, the men mentioned above as being killed were the only ones in the mine at the time. Had any one of these explosions occurred during the day time when the mine was filled with its usual working force, the result would have been similar to that of Mar. 20.

When the slope was first opened, the brattices were built of brick or concrete, but of late years this practice has been discontinued and board brattices built instead. As is the case with nearly all board

*Dewar, Okla.

stoppings, the vibration from the shots soon caused them to leak, impairing the ventilation. Such was the condition last fall when the state mine inspector closed the mine for 16 days until proper ventilation was restored. The mine is equipped with an 8-ft. diam. Capell fan, which should have given ample ventilation, had the mine been in first-class condition.

Helmet Men Entering Mine after Sans Bois Explosion

The Tipple of the Sans Bois Coal Co., Chant, Okla.

A Gas Explosion

On the morning of the explosion, the firebosses had "dead lined" several places, among which was the 11th South. At the time the explosion occurred, one of these men was building a brattice from the last crosscut to the face of the entry mentioned. He was found dead near this place with his safety lamp hooked in his belt, and it is supposed that as he worked his lamp came in contact with the gas and exploded, igniting the gas in the face of the entry. Or, it is possible that the gas was driven down the heading to a point where several diggers were waiting for their places to be cleared and was ignited by their open lamps. Several miners were found in this entry, still wearing their coats, as though, when the explosion took place, they had been sitting there, waiting for the fireboss to pronounce their places safe.

The only working places in the mine were the 12th and 13th North and 11th, 12th and 13th South. Although the mine was in a very dusty condition, it is not believed that a dust explosion took place, as there is no evidence of the dust having been burned in any place except near the face of the 11th South. The men recovered from this entry and from the 12th North were all badly burned, some of them beyond recognition, while those in the 12th and 13th South and 13th North were not burned at all, but perished apparently from the effects of the afterdamp.

There is a pump located in the 13th North which was operated by compressed air. Fourteen of the miners found their way to this pump and succeeded thereby in getting enough air to keep them alive until rescued. I talked with one of these men and he stated that he was in the 13th North at the time of the explosion; he did not see any flame, but knew from the concussion of the air that a violent explosion had taken place; he rushed to the main entry, and there met with extreme heat and smoke, through which he knew it was impossible for him to make his escape. With several other men, he rushed back to the pump, found a roll of brattice cloth and built a little room, so to speak, around the pump, and there the men remained about 20 hours. There were 11 men working outside of the 11th entries who made their escape unaided immediately after the explosion. All others, with the exception of the 14 who sought refuge around the pump, lost their lives.

The Rescue Work

Immediately after the explosion, the Government Rescue Station located at McAlester was called upon. Their car and most of their paraphernalia was at Lehigh, Okla., and it was believed could not be brought to the scene of disaster in time to do much good. Mr. Burgess, the only member of the crew remaining at McAlester, was taken to McCurtain by special train with such paraphernalia as he had at hand. However, he was unable to accomplish much until assisted by the rescue corps from Iowa, which was sent for as soon as it was found impracticable to get the crew from McAlester.

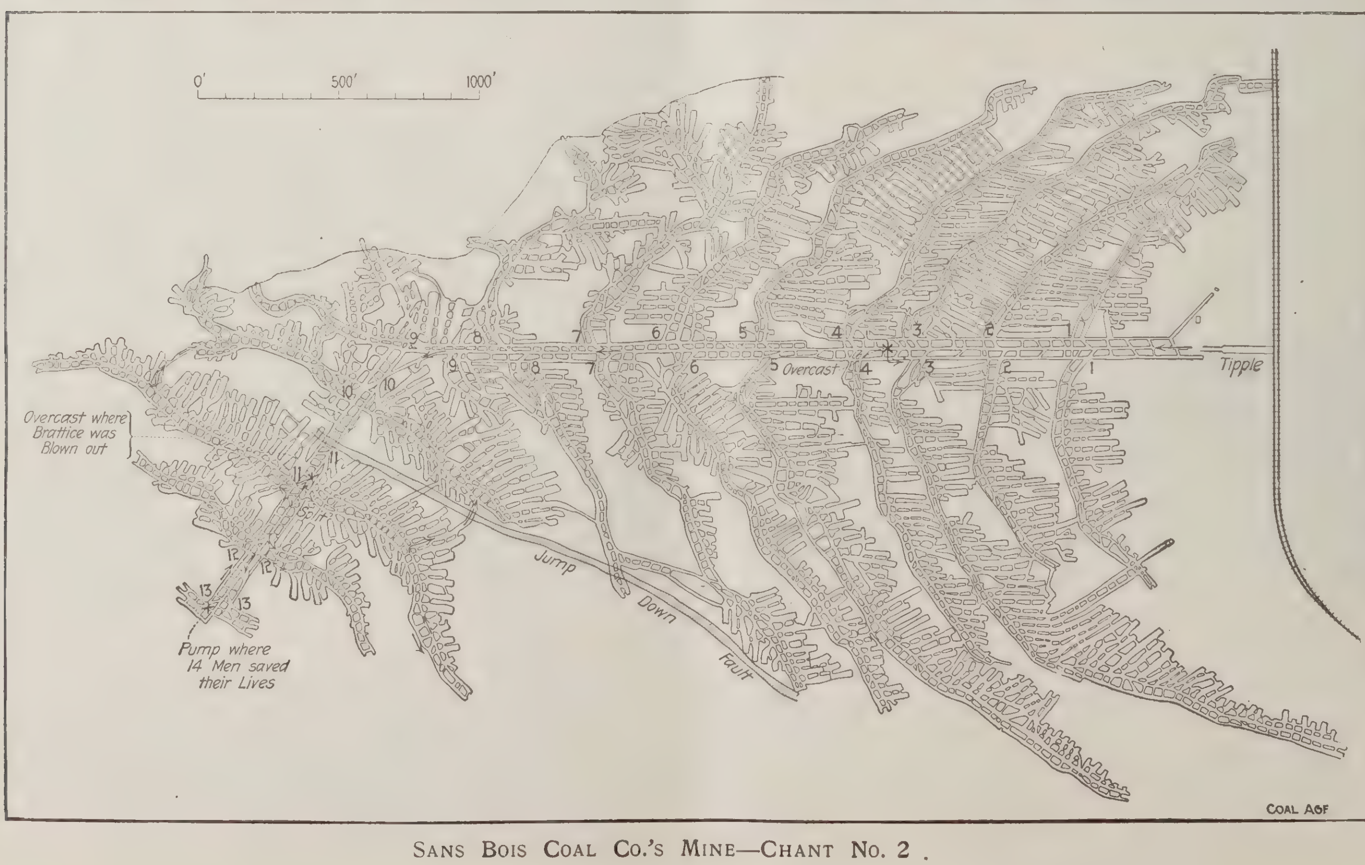
The work of recovering the dead began immediately after the explosion, with practically no one in charge, as the mine manager and his assistants were all in the mine at the time of the explosion. Frank Haley, deputy mine inspector of District No. 3, arrived on the scene at six o'clock Wednesday night and took charge of the work until Chief Mine Inspector Boyle arrived. By that time, Thursday afternoon, ventilation had been established as far as room 12 of the 11th South. On entering the mine, he found the rescue party returning. The men stated that both entries from the 11th South to the face were full of gas and that they were unable to clear them any farther.

After a short consultation, Mr. Boyle ordered the entire party out of the mine with the exception of one man. He gave instructions that they were to remain on top and under no consideration to allow anyone to enter the mine until he came out. This happened about 6:30 Thursday evening.

The Hitch in the Rescue Work

Mr. Boyle and his companion explored the air courses and found that a brattice built in a disused overcast, just outside the 11th entry, had been blown out by the explosion, causing a short circuit of the air. This accounted for the explorers being unable to clear the entries any farther than mentioned. On his return to the surface about 11 o'clock, he found the men greatly agitated over his continued absence. Some of them, believing

Plan Showing Location of Chant Mine



Sans Bois Coal Co.'s Mine—Chant No. 2 .

that he had met with an accident, were in favor of organizing a party and going to his rescue, while others insisted upon obeying his orders and remaining outside until he put in his appearance. Had he remained inside a half hour longer, in all probability a fight would have taken place between the two factions.

Mr. Boyle immediately returned with a party of workmen and rebuilt the brattice over the overcast. As soon as this was completed, they went back to No. 12 room and found that the entry had been cleared for quite a distance inside this place. From that time on, it only required the rebuilding of brattices to establish ventilation all over the mine. As this work continued, other members of the party were removing those dead who were found in the entries, while the crew from the government rescue station with their helmets, explored the rooms and carried out such dead bodies as were found at the working faces.

Not a Violent Explosion

At the present writing, Mar. 27, all the bodies have been recovered except three, which are believed to be under falls of rock in the rooms. These bodies cannot be recovered until the rock has been cleaned up. The explosion brought down the roof in a few places and blew out most of the brattices, but otherwise little damage was done to the mine. The greatest danger with which the first rescuing party had to contend was the possibility that a fire might at any time ignite the gas, causing a second explosion. As they reached the 12th North entries, they found a door partially burned and several cars charred. These fires probably had been smothered by lack of air before ventilation had been established to this point. At this place they found several bodies badly burned, which led them to believe that all others beyond had met the same fate and they gave up the idea that anyone might still be alive at the pump. So instead of pushing forward they began to remove these bodies.

This mistake made it necessary for the survivors at the pump to remain there several hours longer than necessary. In fact it might be said that they were not rescued at all, but remained hovering around the air pipe until their leader, John Kokoski, was sure that he saw a light down the entry. A couple of the strongest of the party, feeling that they were able to reach assistance, made the attempt. Shortly after, those who were unable to get out by themselves were carried out by the rescuers.

Fan Did Not Work When Mine Was Idle

A week prior to the accident, the mine had been shut down as the boilers were undergoing repairs. This necessitated shutting down the fan; so for a week gas was allowed to accumulate throughout the mine. It can be seen readily that on account of the pitching seam, the last gas to be driven out would be that in the face of rooms going to the rise. Of course, before the men were allowed to enter the mine for work, all the working places had been examined by the firebosses and, as previously stated, several of them had been "dead lined." It is quite probable, however, that some of the abandoned workings still contained considerable quantities of gas which it would have been impossible to clear for several days to come, on account of the low crosscuts it had been the custom to drive. It is believed that when the gas was ignited at the face of the 11th South, the concussion forced the gas out of these abandoned workings, thus bringing it in contact with the flame, and thereby greatly increasing the force of the explosion.

By referring to the map it will be noticed that the mine was ventilated by two splits, the main air current entering the slope and passing down to a point just inside the 11th South. From this point, one split ventilated the 11th South, passing out of No. 12 room through the old workings to the air shaft. The other split ventilated the 12th and 13th South, 12th and 13th North and the old workings on the north side of the slope, crossing the slope at an overcast between the third and fourth lifts. It can readily be seen, when the brattice was blown out of the overcast just outside the 11th South, why it was impossible to ventilate the mine any farther than the 11th South until this brattice had been rebuilt.

There is considerable feeling among the miners and the townspeople against the mine officials. It is claimed by some that those who were in charge of the mine showed indifference in carrying on the rescue work. Superintendent Brown's apathy might possibly be accounted for by the sorrow and suffering which he witnessed around the slope mouth after the explosion, as it was enough to unbalance any man who might in any way feel that he was responsible for the suffering. Too much credit cannot be given Chief Inspector Boyle and his deputies for the heroic manner in which they carried on the rescue work.

Another Description of Jed Explosion

By J. H. Williams*

The Jed mine is operated by the Jed Coal & Coke Co., and is situated on Tug River, in McDowell County, W. Va., about 2½ miles from the town of Welch. It is one of the oldest shaft mines in this section of the state, having been opened about 1907.

The hoisting shaft, measuring 32x14 ft., is lined for 85 ft. with concrete. The air shaft is 18x14 ft., with a compartment, 4x14 ft., cased off for stairway and second opening. The shafts are 285 ft. deep and the hoisting shaft is located 200 ft. from the airshaft, where a 24-ft. diam. Guibal exhaust fan is used for producing ventilation.

The Coal and the Methods of Working

The celebrated No. 3 Pocahontas seam is mined at this operation. It has a thickness of about 5 ft. 3 in. and is overlaid with from 12 to 16 in. of fireclay slate. This slate underlies a seam of coal running about 3 in. thick with a stratum of black slate 4 to 8 in. thick above it. The fireclay slate is taken down in all the main and butt entries and propped thoroughly in all rooms and airways.

The mine produces about 700 tons per day and about 100 men are employed on the day shift and 20 during the night. The mine is developed on the panel system with three separate splits for the ventilating current, there being a double intake and a double return. The coal is known to produce marsh gas in small quantities and a line of brattice has to be conducted from the last crosscut up to the working face. Mule power is used for gathering the coal from the face and hauling it to the sidetracks, but from these sidetracks to the shaft it is hauled by electric power furnished to the motors by two 150-kw., 250-volt, direct-current generators. The coal is cut by the night shift with undercutting machines which also are driven electrically.

Precautions Taken to Protect Mine Workers

There were employed at this mine one mine foreman and four men with fire-boss certificates, one of the latter having charge of the night shift. This man was instructed to make an examination of the mine before the day shift came on. The other three men were employed as shot firers. The shots were fired entirely by electric batteries and clay was furnished for tamping, all the miners being instructed to use no other material for the stemming of their shots. Three shots were required for each working place. A center- or breaker-shot was

*Chief engineer, Jed Coal & Coke Co., Welch, W. Va.

placed near the center of the working face and after the coal from this shot was loaded out, two rib shots were fired in succession.

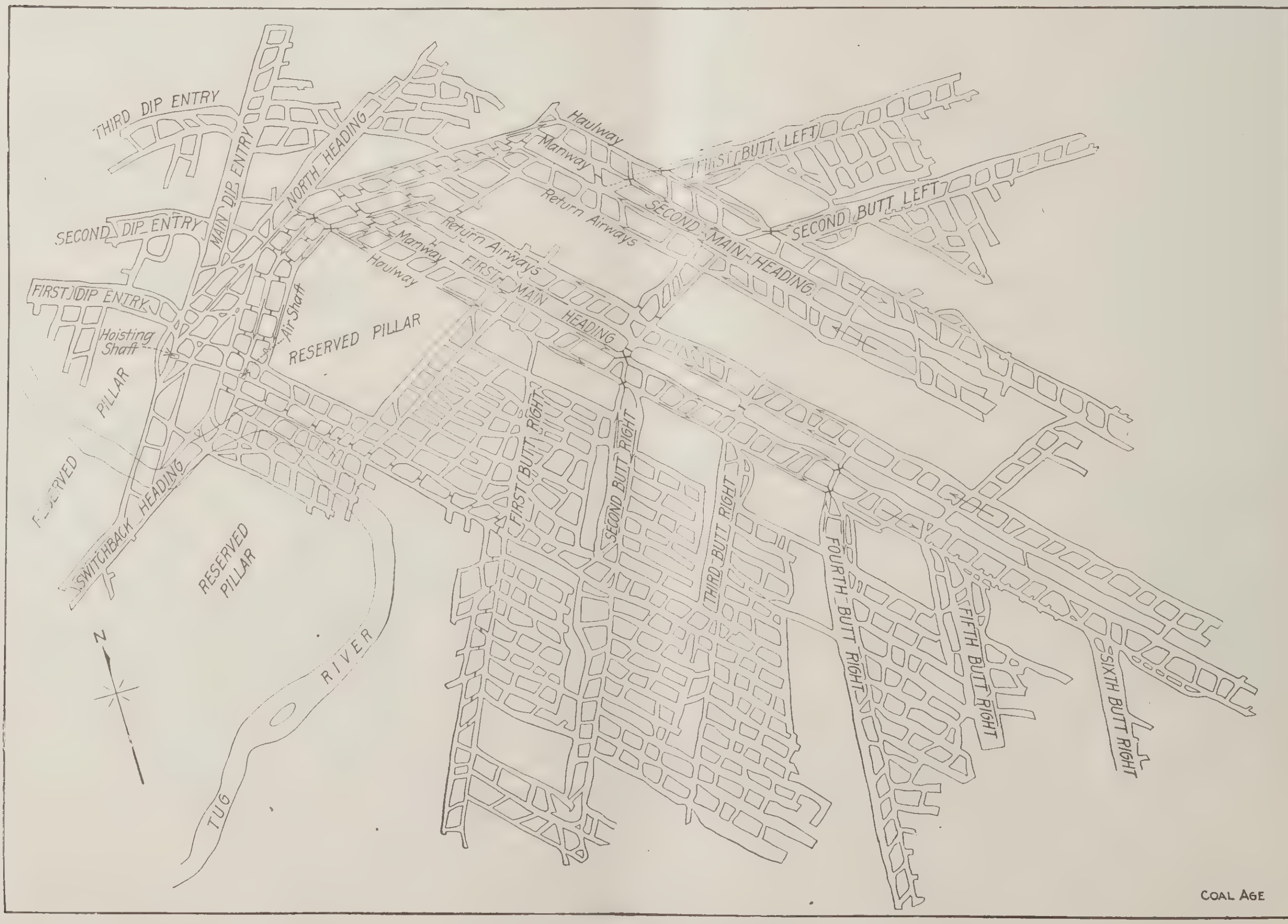
On Mar. 22, 1912, Wm. Leckie, general manager for the company, and Mr. McKent, inspector for the Fidelity & Casualty Co., went through the mine and reported favorable conditions. On the 25th I was through the No. 2 main section and noted that the moisture and ventilation were at least normal.

The Explosion

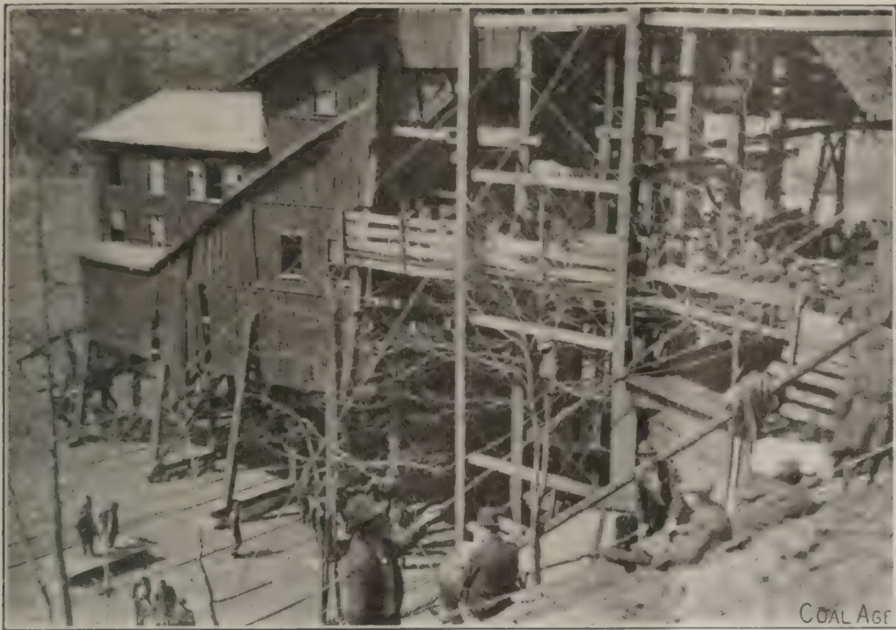
At 8:15 a.m., Mar. 26, 1912, after the fireboss had marked the board stating that the condition of the mine was "O.K.," and 93 men had descended, a gust of smoke shot up through the head frame over the shaft, producing a sound like steam blowing off through a huge pipe. This lasted for about one minute. Coal was being hoisted at the time of the explosion and the car on its way to the cage went into the sump on the right side. The mine foreman, who was at the bottom of the shaft, gave orders over the telephone to the top man instructing him to remove the loaded car from the left-hand cage and landing and to send the cage down. His orders were obeyed and when the car was removed, Supt. O. M. Knauff and F. C. Hendrichs descended with safety lamps.

Jed Tipple and Power House

The cage came up again with ten men aboard who were in the immediate vicinity of the shaft at the time when the explosion occurred. The names of the ten men are as follows: J. S. Henry, Steve Chine, Frank Brudeski, George Savenski, C. F. Woodward, J. Klemens, Joe Egeski, Grant Herndon, Richard White, William Baker and John Owens. By this time some of the outside employees had secured three rolls of brattice cloth, nails, hatchets and safety lamps, and descended into the mine, going 9 ft. north to the door of the mouth at the first main heading, which was reached without bratticing. The doorboy was found at that point still living, but he died shortly after on being brought to the surface.



Mine Workings at Jed Shaft



CROWD AROUND THE TIPPLE SHORTLY AFTER THE ACCIDENT OCCURRED

A short time after the explosion, three men came out through an old airway from the face of the Second butt right off the First main entry. This gave reason for belief that other men were still living in the section ventilated through that entry, but a final exploration of the mine proved the contrary, and it seems improbable that any of the men in that section lived for more than a few minutes after the explosion.

RESCUE WORK

State mine inspectors Nicholson and Grady were on the ground about two hours after the explosion occurred and took charge of the rescue work. Meanwhile a general call was sent out for assistance. Many responded and with a corps of from 50 to 100 men, headed by various mine inspectors, including the chief of the state mining department, John Laing, and able mining men from the surrounding collieries, the work of recovering the bodies was hurried with all possible dispatch, but this work of recovery has nevertheless been comparatively slow on account of the heavy falls of slate resulting from the explosion.

Up to the present writing, Apr. 1, 72 bodies have been recovered. This includes the door-boy who died after being brought from the mine. The remaining eight or nine bodies are believed to be under the heavy falls of slate and it will be, in all probability, several days before all of them are removed.

The cause of the explosion is not yet known, and the State Mining Department will make an investigation next week to determine what was the origin of the disaster. William Leckie, general manager for the company, was in Williamson, W. Va., on the morning of the explosion, and there was no passenger train by which he could get to Jed before 10 o'clock. He boarded a coal train at 6 p.m., and on his arrival immediately went down the shaft. He has been working and directing the recovery of the bodies since that time. Mr. Leckie desires to thank the operators and other individuals in the field for their prompt assistance.

The Problem of Mine Timbering

By R. B. Woodworth *

Interesting cost data in connection with a number of installations of steel mine supports in various sections of the country are here presented in proof of the greater economy of steel as compared with wood. Preservative measures necessary to adequately protect steel in the mines are discussed. The fifth of a series of articles on mine timbering.

After all, does the use of steel for timbering purposes within the mines mean ultimate economy in expenditure, or will its use reduce the cost of production? A few typical examples will suffice to show what has been accomplished in this country up to the present time.

In 1908 at their Maxwell colliery the Lehigh & Wilkes-Barre Coal Company timbered a double-track gangway with 20 in. 65-lb. I-beam collars 17 ft. long between supports, and 8 in. H-beam legs 10 ft. 6 in. high in the clear, weighing, with base plates, 1,720 lb. per set. These took the place of wooden sets made of 24 in. round yellow pine timbers, the cost of which erected was $15.00 per set, weight 5,040 lb. and the life of which was two and one-half years. In view of their probable durability, the steel sets were erected on concrete bases and this added to the cost of installation, which reached a total of $40.00 per set.

PROVEN ECONOMY IN USE OF STEEL

Capitalized at 6 per cent. interest, the value of the steel sets at the end of 15 years will be $95.86 each, while the capitalized value of the six wooden sets needed in that time will be $153.56. At the end of the 15 years, the steel will have a scrap value per set of $12.03, while the wood will be worth nothing, a saving by the use of steel of $69.73 per set or $4.65 per year. The use of steel in English mines has effected a saving of 2c. per ton of coal mined.

The pump house at the Dodson colliery, of the Plymouth Coal Co., is 100 ft. long, 8 ft. high in the clear and 18 to 22 ft. wide. The roof is exceedingly tender and has caused all kinds of trouble in the pump house, especially in connection with the pipes. Before retimbering with steel, 18 in. to 22 in. round timbers were used, on 2-ft. centers, practically skin to skin. It is estimated that the pump room was retimbered once a year. Beginning with Apr. 16, 1910, the 70 sets of wood timbers were replaced by 48 sets of steel. The last steel set was placed Dec. 15, 1910. According to figures furnished by Mr. John C. Haddock, president of the company, the relative costs were:

1. Wood—70 sets; weight per set 4,150 lb.; cost per set f.o.b. cars at mine, $12.00; cost, erected in place, $34.50; total cost, $2,415.00; life, one year.

2. Steel—48 sets; weight per set 1,483 lb.; cost per set f.o.b. cars at mine, $31.47; cost erected in place, including concrete footings, $61.47 per set; total cost $2,889.09, or not quite 20 per cent. more than wood.

Based on its life, the cost per month of a wood set without interest was $201.25. The steel sets have now been in place 16 months; on which basis, their cost without interest has been $180.57 per month. They have shown no signs of

*Engineer with the Carnegie Steel Co., Pittsburg, Penn.

Note—Paper read before the Kentucky Mining Institute, Lexington, Ky., Dec. 11, 1911.

failure at last accounts; the concrete footings, where weakness would first make itself known, are intact, and the pump room troubles seem to be over. Any length of time the framing now stays in place means money saved.

Costs in Kentucky Mines

Development work is now in progress at the mines of the West Kentucky Coal Company, Sturgis, Ky. The seam mined is the No. 9 coal, West Kentucky coal measures, 4 ft. 10 in. thick. At the No. 8 mine, steel timbers are used in the new slope, both for the main entry and air course. The sets in use are composed of a 10 in. 25-lb. I-beam collar and 4 in. H-beam legs. They are spaced 3 ft. 0 in. on centers and lagged with oak plank 3 in. thick on top, and 2 in. thick on the sides. Between the sets, concrete is placed up to a height of 4 ft. This makes a solid reinforced concrete slope from the entrance to the point where the ribs are hard and top good. According to figures furnished by Mr. W. H. Cunningham, general manager of the company, the comparative costs of wood and steel for this mine were:—

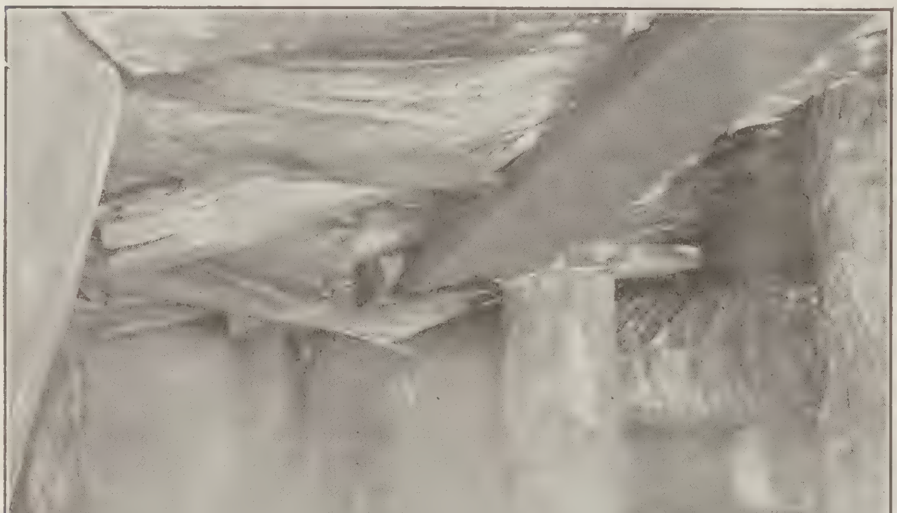
Wood—Yellow pine creosoted; size 12 x 12 in., 264 ft. b.m.; cost at Sturgis, $10.56 per set; cost in place, $15.70; weight 1,575 lb.

Wood—Native white oak; size 12 x 12 in., 264 ft. b.m.; cost at Sturgis, $7.92; cost in place, $13.06 per set; weight 1,340 lb.

Steel—Cost of steel at Sturgis, $9.75 per set; cost of placing $1.00; cost of concrete per panel $5.16; total cost in place per set, steel alone $10.75, steel concreted $15.91; weight of steel sets 425 lb.

Saving in the use of steel without concrete, over native white oak, $2.31 per set, over yellow pine $4.95. Excess cost of steel with concrete, over white oak $2.85 per set, over yellow pine $0.21. This favorable comparison is due to the high unit cost of the wood and to the elimination of waste. The safe uniformly distributed load on the wood collar is 1,200 lb., on the steel collar 26,000 lb. The safe compressive strength of the steel leg is 43,200 lb., while that of the wooden leg is 105,100 lb.; in the one case more than ample, in the other case out of all proportion.

Pump Room, Dodson Colliery, Plymouth, Penn.



Pipeway Leading from Pump Room, Dodson Colliery

It is not easy to obtain cost figures on the use of plain beams for roof supports, although they have found wide and satisfactory application in the bituminous mines of western Pennsylvania, southeastern Ohio, central Illinois and elsewhere. On Feb. 28, 1910, for example, the H. C. Frick Coke Co. had timbered with steel in this way 23 pump houses, 5 stables, 14 engine, motor and locomotive rooms, 10 shaft bottoms, 1 main butt haulage and 3 foremen's offices. Five of these structures were each over 300 ft. in length.

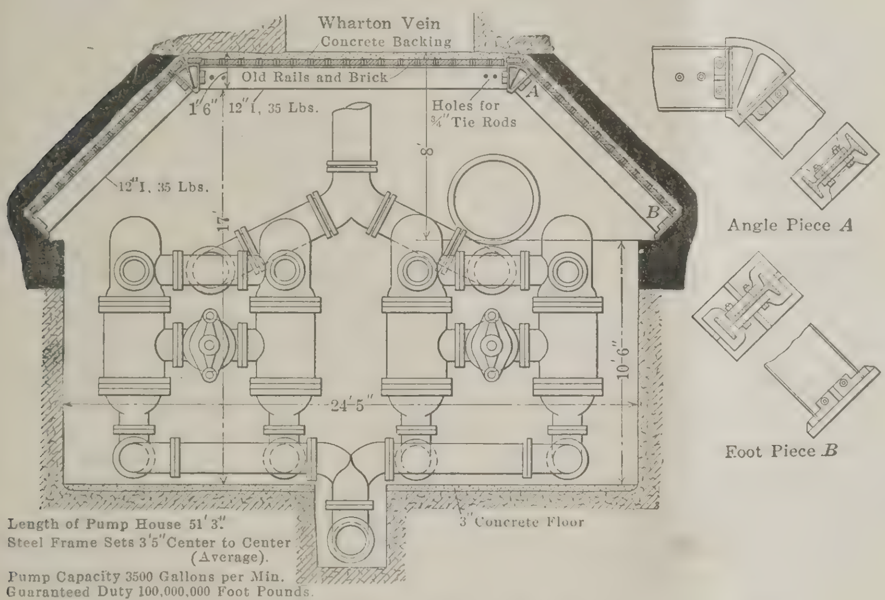
The mines of the Roby Coal Co., Adena, Ohio, have tender roofs, and at one time the haulways were considered the most dangerous in the district. Up to Dec. 31, 1909, as a result of systematic retimbering on a scientific basis, 2,133 steel I-beams and 1,032 8 x 10 in. oak timbers had been placed in Drift No. 1, and 1,490 steel beams and 943 oak timbers in Drift No. 2. The thirty-fifth annual report of the Chief Inspector of Mines for the State of Ohio thus comments on this work. "Even with all this timbering which has been done in the last two or three years

the management informs me that the cost of production is a great deal less than when they attempted to operate without properly timbering the haulways and taking the risk of no one being there when a fall occurred. This demonstrates that in keeping a mine up to a high standard of safety the efficiency is increased and the cost of production decreased."

Secondary Benefits

Apart from the mere question of cost, the collateral benefits which either accompany or proceed from the use of steel in the mines are not unimportant. They are:—

1. Reduced excavation: In the Lehigh & Wilkes-Barre installation the same clear space inside was obtained with steel which required an excavation 4 in. less in height and 32 in. less in width than that needed with wooden timbering.



Steel Timbering in Pump Room, Hazleton Shaft Colliery

In the Dodson colliery the space saved was 2 in. in height and 28 in. in width; in the West Kentucky installation 2 in. in height and 16 in. in width. This does not mean much when the heading is through solid coal, but it does mean a real gain when timbering a mine shaft or in driving main haulage ways where the coal seam is thin, say less than 6 ft. in thickness.

2. Better ventilation: The presence of all stages of decay in wooden mine timbers means vitiated air and discomfort, possibly ill health to the miners. One but needs to walk through a steel-timbered heading to note how much better the air conditions are made; not to mention the smaller resistance that steel offers to the passage of the air currents.

3. Less dust catchment area: Everyone knows now that coal dust is explosive and its accumulation on mine timbers a constant menace. The smaller area of the steel timbers and the ease with which they may be cleaned adds to their value in this direction.

4. Fireproof character: If there were no other considerations favoring the use of steel within the mines, this one would be sufficient. Fire zones underground, shafts, pump houses, powder magazines, locomotive rooms, mine-boss shanties and stables, need protection by the use of fireproof materials of construction. Fire-proof structures underground mean safety and mine insurance and therewith incalculable reduction of expense in maintenance and replacement.

Preservative Treatment of Steel

Like wood, steel is subject to deterioration in the course of time but the process takes much longer than in the case of wood. This action may, moreover, be prevented and the durability of steel, on which its economic advantages are based in part, may be much enhanced by simple means.

The corrosion of structural steel within the mines is not so serious a problem as it is above ground. The standard objection, based on what is alleged to have happened in the case of rails exposed to acid mine water, has no real validity as concerns the use of structural steel for mine timbering. Rail steel is not structural steel. Rails are laid naked, as a rule in contact with the sulphur in the debris which usually covers the track, and frequently wet by running water; moreover, their tops are polished by passing wheels and thus kept in the best condition for the attacks of corrosion. Far better than *a priori* reasoning on this subject are the facts of experience. The steel mine timbers installed by R. V. Norris in 1897 at the foot of Stearn's Shaft, Susquehanna Coal Co., are in use to-day practically unharmed by the lapse of time; so also are those installed in the same year by S. D. Warriner and W. A. Lathrop in the pump room at Hazleton Shaft Colliery, No. 40 Slope, Lehigh Valley Coal Co., and likewise those installed in 1896 by J. A. Ede at No. 1 Shaft of the Spring Valley Coal Mines, of the Spring Valley Coal Co. in the northern Illinois bituminous coal district. Surely 16 years of service suffices to give steel a just claim to permanence.

Steel for mine timbering should not go into the mines unpainted, unless it is to be covered with cement. No one would think of using it unpainted above ground unless so protected; and the principles of right use are the same in both cases. But if well painted before installation, there is no real reason why the timbering should not outlast the life of the mine without renewal.

A paint which will chalk, or peel, or blister, or alligator and go to pieces on the outside of a house, will stand up on the inside and look well until it gets so dirty or so old one is tired of it and wants a change, and even then the work underneath is just as good and fresh as when the coat was first put on. Now, conditions within the mines are analogous to those within the house. The causes which destroy paint films above ground are not here operative, and that is the reason why paint put on beams in the mines 16 years ago is still there and doing its work of protection to-day; and why we may be quite confident that when we put painted steel in the mines, it will do service, without renewal, as long as needed.

Effect of Mine Water

The effect of mine water has been much exaggerated. Laboratory and service tests show that the prevention of its deleterious action on steel mine timbers requires only the careful selection and application of good paints; an inhibitive first coat with an excluder second coat well rubbed in on clean surfaces. The first coat should be preferably red lead or natural iron oxide, the second coat a good graphite. The graphite should be made from the ore, for paint purposes, not from the refuse left in other processes of manufacture. Just as it is an economic crime to use wood in timbering permanent mine headings, so it is an economic crime to trifle with poor paint on surfaces of prospective permanence, not readily accessible for repainting. After all, the main cost of painting is the expense for labor and it does not pay to scrimp the paint.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Nonfreezing Concrete Mixtures

The following data are taken from two recent issues of the "Quarterly" of the National Fire Protective Association:

The amounts of salt and calcium chloride required to keep water from freezing at different temperatures are tabulated below. The salt should be thoroughly dissolved or the results will not be satisfactory. Calcium chloride is said to be superior to sodium chloride in that it does not corrode steel tanks and the hoops of barrels. Where calcium chloride is used the wooden barrels should first be well coated inside with asphaltum, or a mixture of crude paraffin and resin, to prevent the shrinking of the staves and subsequent leakage:

FREEZING POINTS OF SALT SOLUTIONS

Common Salt (Sodium Chloride) Pounds per Gallon	Freezing Point, Degrees Fahrenheit	Commercial Calcium Chloride Pounds per Gallon	Freezing Point, Degrees Fahrenheit
½	24 above zero	½	29 above zero
1	18 above zero	1	27 above zero
1¼	15 above zero	1½	23 above zero
1½	12 above zero	2	18 above zero
1¾	9 above zero	2½	4 above zero
2	6 above zero	3½	6 below zero
2¼	3 above zero	4	17 below zero
2½	1 above zero	4½	27 below zero
3	3 below zero	5	39 below zero
3½	8 below zero	5½	54 below zero

Glycerin is recommended for use in chemical fire extinguishers. It has no effect upon metals, but has a tendency to disintegrate rubber. It has been stated, however, that the continued use of glycerin in water renders it liable to a decomposition that would develop compounds having a corrosive action on metals. When using glycerin it should be remembered that one gallon weighs 10½ lb. The following proportions may be used:

FREEZING POINT OF GLYCERIN

Glycerin, Pounds per Gal.	Temp. Solution Will Withstand
3¼	+10 F.
5¼	—10 F.

Denatured alcohol has advantages over both glycerin and calcium chloride as a nonfreezing element in water solutions, for it has no injurious effect on either metal or rubber. A solution of about 50% is inflammable; however, it would rarely be necessary to have a solution of over 30% alcohol.

FREEZING POINT OF ALCOHOL

A 20% solution freezes at +10 F.
30% solution freezes at — 5 F.
40% solution freezes at —20 F.
50% solution freezes at —35 F.

Gas Engines for Collieries

By Alan E. L. Chorlton

Gas engines are being largely used at British collieries for the generation of power. The gas is either generated in producers or in coke ovens. Producers can be sometimes made to yield such profits from byproducts, where the fuel is of low grade, that even without using the gas produced, the installation will justify its erection.

Paper read before the Midland Institute of Mining, Civil and Mechanical Engineers.

It will be readily granted that gas engines occupy the leading position among all the agencies now used for the generation of power.

The use of gas power in collieries has been already much advocated by far-seeing engineers, because it is more economical than other methods of making use of the stored up energy in coal. Even with the use of such gas generators as have no provision for byproduct recovery, the economy secured is from two to three times greater than can be obtained with the ordinary steam systems now in vogue. And this is even more apparent when the plant works by steam and for only one shift a day. Large banking and radiation losses result from the inactivity of the plant during the night.

In the past, many authorities had doubts whether gas engines could be relied on as power producers. These doubts probably account for their comparatively slow progress in popular favor. But increased experience has now fully succeeded in overcoming former weaknesses.

For Poor Fuel or Economical Use of Good Fuel

The most economical processes of gas generation for power purposes are either those which use mainly a fuel of little or no market value, or such processes as produce a considerable quantity of gas as a byproduct, and yet are complete and commercially profitable in themselves. As an example of the first, the ammonia-recovery producer uses combustible nitrogenous material from belt pickings, tips, etc., mixed, perhaps, with some coal, the whole being of low market value. This produces a large amount of power gas and ammonium sulphate as a byproduct. In the second class is the byproduct coke oven, using fine coal and producing furnace coke, with many byproducts and a considerable residuum of gas available for power or other purposes. There are combinations of the two, but, so far, they do not appear to have been developed practically, although it is possible that still further economies will be secured by their use.

The distinctive features of the two methods are as follows: When operating a byproduct coke plant (1) the coal must be of the coking kind; (2) the percentage return on capital will be high, even when the value of waste gas is not considered; and (3) the free gas for power purposes in proportion to first cost is low. When operating an ammonia producer: (1) Any poor fuel containing up to 40% of ash can be used; (2) the percentage return is high only when the gas is sold or profitably used; and (3) the available amount of free gas for power purposes is great. Table 1 has been prepared from information received from the manufacturers of large plants of both types, and even if the results obtained in practice do not show so favorable a result, the return on capital is still high.

Use Gas Producers If Much Gas Is Needed

Profitable results can be obtained from large Mond gas producers by the use of cheap or refuse coal, but their economies can only be of avail if there is sale or profitable employment for the large quantities of gas produced. This condition might somewhat limit their use to large

power companies or groups of collieries. On the other hand, the byproduct coke plant gives a higher return when the lack of use for the waste gas makes it impossible to set a value on it. From the particular point of view of power production for the single colliery of 3000 hp. and its direct application, Table 2 has been prepared on a horsepower basis.

Most English collieries have enough of such waste products as will yield sufficient nitrogen to render them suitable for use in a byproduct gas producer. Hence the proportion of such waste fuel has been made large in making this comparison. The important point about either scheme is that the gas for power is obtained at a very low cost—that is, at a low running charge for fuel, and obviously at a great economy over the usual plan of burning saleable coal under boilers. The values for the above tables are primarily governed by the load factor.

In development of these plans, a combination gas generator might be employed, having continuous vertical retorts (such as are now used in town gas works) which would feed coke direct into a producer beneath. Suitable regenerators could be added to utilize the waste heat of the escaping gases. The economies that can be secured in suitable cases by combining with other power consumers, or with power supply companies, in the use of these processes, so as to dispose of the excess power or gas at times of light loads, etc., are not here considered.

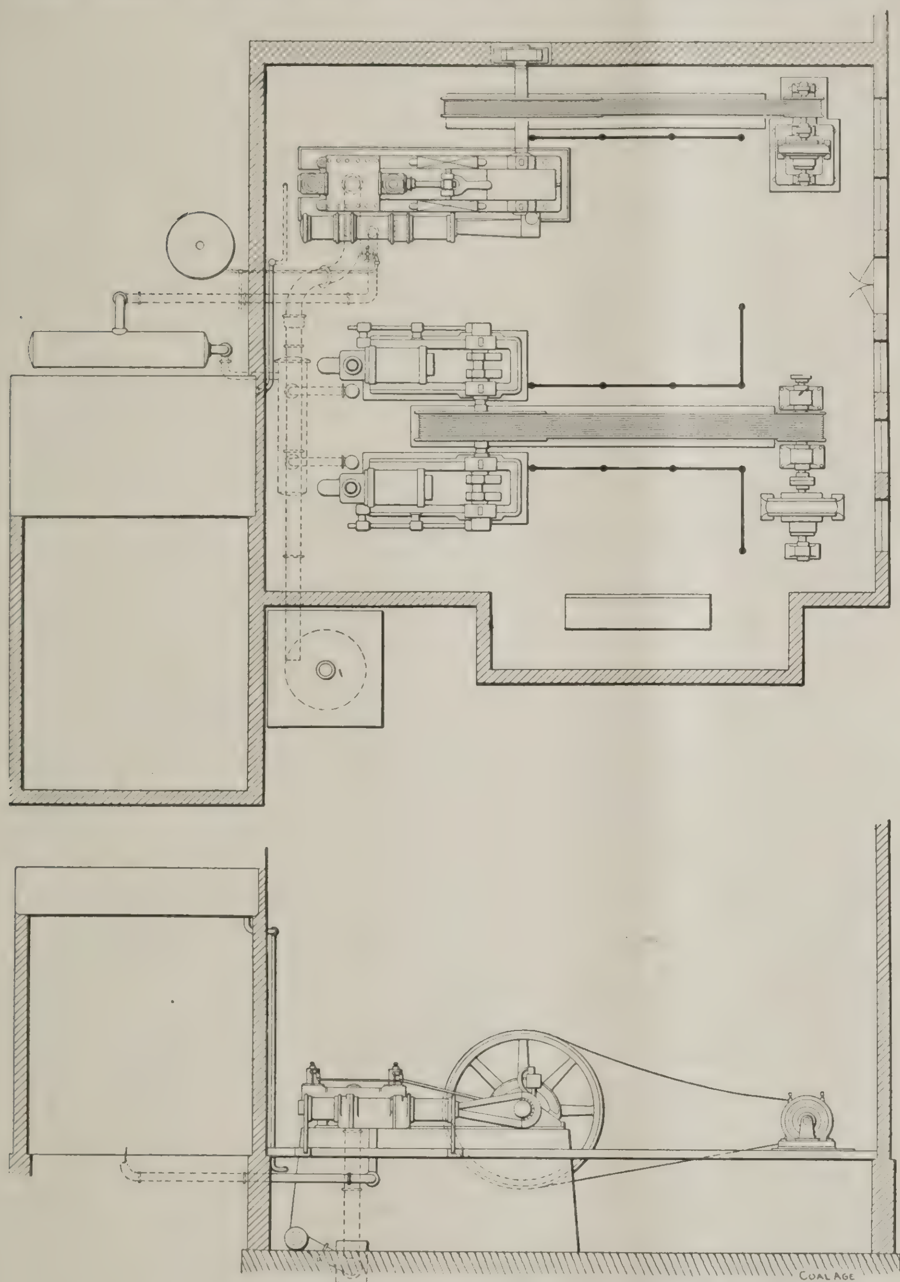


Fig. 1. An Engine Using Gas from Simon Carvés Ovens, Wharncliffe Silkstone Colliery, England

Clean Gas More Reliable

For the satisfactory use of any gas in large engines, be it coke-oven or producer gas, a thoroughly adequate cleaning plant must be provided, which will amply repay its cost in the increased reliability of the engines and in the reduction of cost for upkeep, etc. Great stress must be laid on this point, and it is advisable to lay down a larger plant than is usually offered in competitive tenders.

Continuity of gas supply is, of course, absolutely essential, often rendering advisable the provision of large holders. For producers using poor fuel, these holders, while advantageous, are not necessary, as the producer can be kept at work continuously for long periods, and will respond quickly in output to meet sudden demands.

TABLE I. RESULTS FROM COKE OVENS AND MOND PRODUCERS CAPACITY OF 90,000 TONS OF COAL PER ANNUM (VALUE OF GAS INCLUDED)

(1) Byproduct Coke Ovens	
Capital stock of complete plant...	$219,150.00
Costs	
Coal, 90,000 tons at $1.7045......	$153,405.00
Running charges, including taxes, labor, superintendence, steam power, lime, oil, repairs, stores, etc., at $0.60875 per ton......	54,787.50
Sulphuric acid at $8.52 per ton...	9,238.39
Interest and depreciation at 10%.	21,915.00
Annual cost..................	$239,345.89
Gross Profits	
Sulphate at $58.44 a ton........	$68,374.80
Tar at $4.87 a ton..............	17,532.00
Coke at $2.92 a ton.............	184,086.00
Crude benzol at 8.12c. per gal....	18,262.50
Surplus gas at 0.0812c. per unit..	12,272.40
Gross annual receipts.........	$300,527.70
Net profits....................	$61,181.81
(2) Mond Gas Producers	
Capital stock of complete plant..	$253,240.00
Costs	
Coal, 45,000 tons at $1.7045......	$76,702.50
Coal, 45,000 tons at $0.9740......	43,830.00
Running charges, including taxes, labor, superintendence, steam power, repairs, stores, etc., at $0.60875 per ton............	54,787.50
Bags and packing sulphate......	5,844.00
Sulphuric acid at $8.52 per ton...	30,681.00
Interest and depreciation at 10%.	25,324.00
Annual cost..................	$237,169.00
Gross Profits	
Sulphate at $58.44 a ton.........	$210,384.00
Tar at $3.65....................	13,149.00
Surplus gas at 0.0812c. per electrical unit.....................	79,137.50
Gross annual receipts.........	$302,670.50
Net profits....................	$65,501.50

TABLE II. RESULTS FROM A MOND PRODUCER PLANT FOR A COLLIERY REQUIRING 3000 B.HP., USING A HIGHER PROPORTION OF WASTE FUEL (VALUE OF GAS NOT INCLUDED)

Capital cost of complete plant....	$64,284.00
Costs	
9,600 tons of carbonaceous shale..	nil
900 tons of belt pickings........	nil
1500 tons of waste slack at $0.9740	$1,461.00
600 tons of washed slack at $1.9480	1,168.80
Running charges, including taxes, labor (including packing), steam power, repairs, stores, etc., at $0.60875 per ton............	7,670.25
Sulphuric acid at $8.52 per ton...	3,238.55
Interest and depreciation at 10%	6,428.40
Annual cost..................	$19,967.00
Gross Profits	
Sulphate at $58.44..............	$22,207.20
Tar at $3.65....................	876.60
Gas (not included)	
Gross receipts...............	$23,083.80
Net profits....................	$3,116.80

Low-grade Gas Needs High Compression

If there is any likelihood of considerable variation in calorific value from whatever reason, be it change in fuel or other cause, precautions should be taken in the design of the engines themselves to meet it by excess of capacity, the adjustability of compression, and other provisions.

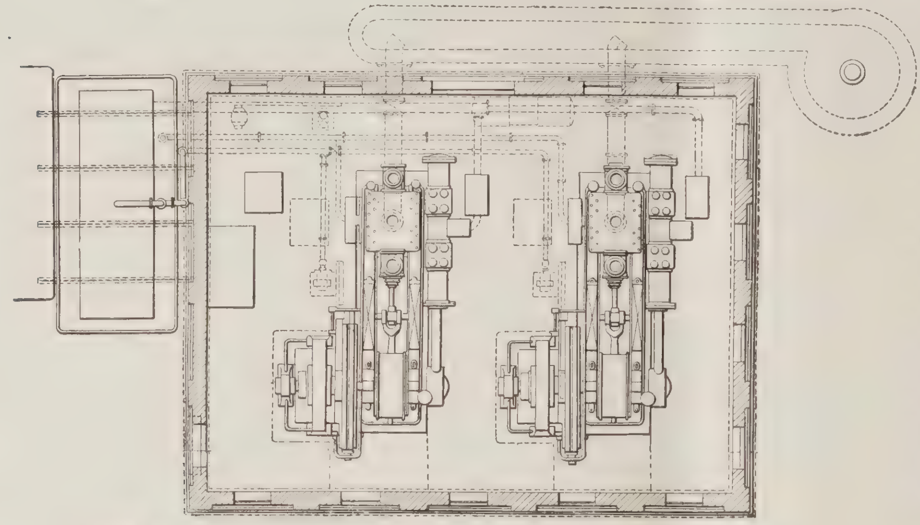
may be stated that for large engine work, the mean pressure effective in the cylinder in order to carry a continuous full load should not be more than 70 lb. per sq.in. when producer gas is used. This pressure may be increased to about 80 lb. for coke-oven gas, and an engine working on such a gas is therefore rather more than 10 per cent. more powerful than when working on producer gas.

in labor, maintenance, etc.; and the writer would propose to adopt the same principle in the design of the various schemes which follow.

The Electric Scheme

The method usually adopted in the utilization of gas power for collieries is to convert the energy at once in a central station into electric power. This scheme has many advantages, of which flexibility is the greatest followed by high efficiency. But the possibilities of other methods should not be overlooked.

A gas-driven electric station is, in general layout, similar to central stations operated by steam engines. The units are laid out generally, so that one side of the station has the inlet gas main and the exhaust-discharge pipes, and the other side the electric connections and the switchboard. An important consideration in connection with the running of a gas station is the cooling water necessary for the engine, although this is much less in quantity than is required for steam turbo-condensing stations in the proportion of 1 to 5. The necessary compressing plant and storage tanks for starting up the engines are installed in the cellar made by



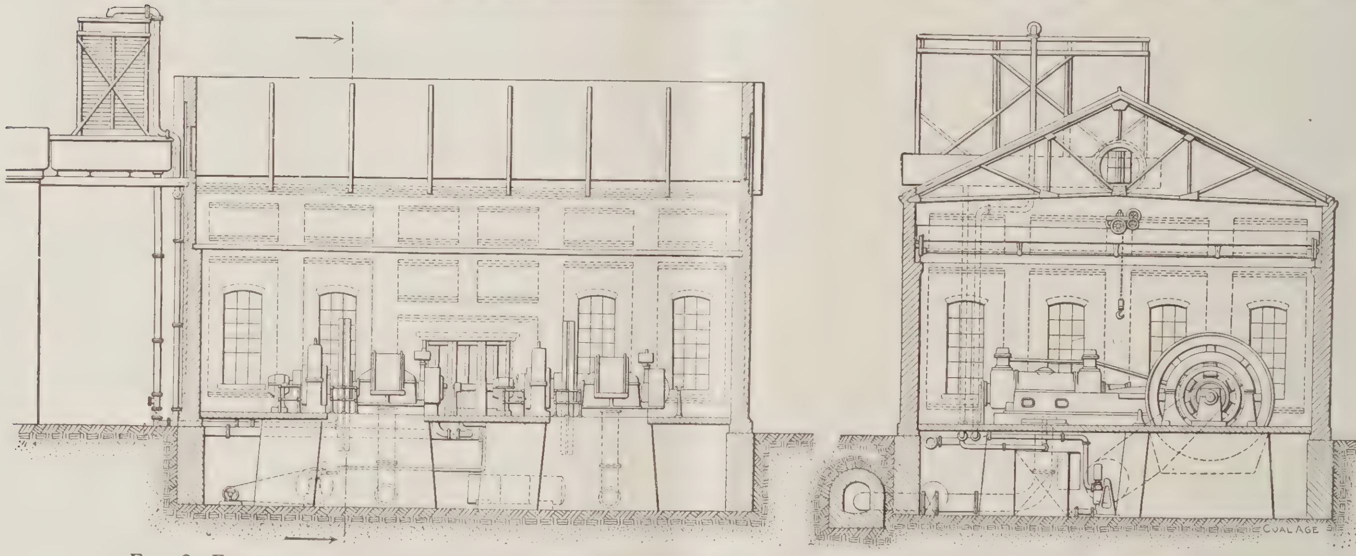


Fig. 2. Engine Installation at Rockingham Colliery. Gas Used Is From Koppers Coke Ovens

Turning now to the engines themselves, the only material change needful to fit them for operating indifferently on high-grade coke-oven gas, or low-grade producer gas, is a provision for regulating the degree of compression. Thus, for a high-grade coke-oven gas, a compression of about 100 lb. would be used, while for low-grade producer gas it might be raised as high as 150 lb. In other particulars the engine will be built in the same manner, although with an intensely active gas, such as coke-oven gas (with its high content of hydrogen), it is advantageous to scavenge the cylinder of air effectively, and to provide additional water cooling so as to minimize the risk of preignitions, with their attendant detriment to the reliability of the engine. It

Five Applications of Gas Power

The possible methods of application of gas engines to the many mine requirements are mainly four in number, namely: (1) Electric, (2) hydraulic, (3) pneumatic, (4) mechanical or direct, and (5) various combinations of these four. Each scheme has certain advantages, and so the greater number of modern collieries use most of them in part in their general layout. Their relative positions in popular favor may have to undergo some alterations, especially if there is any further restriction in the use of electricity underground. In the latest steam-driven collieries all the power units, as far as possible, have been installed in one house on the surface, in order to secure the advantages of the single central station,

the foundations, such a cellar forming in modern practice an effective and well lighted basement to the engine house. Boilers normally heated by the exhaust gases are necessary for the various steam requirements of both the compressing plant and the gas producer.

Suggested Modification of Hoisting Methods

Another arrangement of a gas-driven electric central station has been devised by the writer, whereby considerable economies are obtained in capital expenditure. The *raison d'être* of this scheme is, that where hoisting is the principal absorbent of power in a colliery, it should receive most consideration in a layout. In an all-electric scheme, the use of regener-

ative compensator sets, between the generator and the hoisting motors, accounts largely for the considerably higher first cost of electric hoisting, as compared with steam methods. In this scheme the writer proposes to drive the compensating regenerative sets direct from the gas engine, thus replacing the three-phase motors by ropes and saving the capital cost of these motors, together with that of the main generator in the central station, but adding thereto the cost of the rope drive. The difficulty of running the central-station machines in parallel is a disadvantage, but the machines may be arranged in size to compensate for this, so that one standby or one unit is common to the whole. The station thus consists of a number of flywheel direct-current machines, all rope driven from gas engines. If it is essential to use three-phase high-tension current as well, then such generators must be added. Before proceeding further, a brief description of some such layouts will be given.

Shelton Iron, Steel & Coal Co.'s Power Station

The Shelton station contains two 400-b.hp. two-cycle gas engines, driving directly 500-volt direct-current generators. These sets have been in operation now for over six years; and were, so far as the writer is aware, the first two-cycle gas engines using coke-oven gas. The gas used is that obtained from a battery of Simon-Carvés ovens, and the engines for the most part have used it without any extra cleaning. Experience has shown, however, that an extra cleaning plant could have been installed with many advantages.

The water for cooling is drawn from an adjacent canal, and returned after use, a turbine pump being the circulating agent. These engines are not of recent type, but in general they have worked successfully under the extremely varying load and conditions existing. The use of the current generated is in this case not confined to collieries.

Wharncliffe Silkstone Colliery Power House

At the Wharncliffe colliery the economical advantages of gas-engine driving have been appreciated for many years, and this plant was probably one of the earliest to use the waste gas from coke ovens. Fig. 1 shows a station, which is not the original, but one installed at a later date at this colliery. This plant is of a different type from the preceding one, as the engines drive the generators by means of ropes, thus securing an economy in the capital cost of the generators. The engines shown on the plan consist of a single-cylinder, two-cycle engine, and a twin-cylinder four-cycle engine, both of which operate on the gas obtained from Simon-Carvés ovens. The power generated is led away for use at the surface for air compressing, coal washers and screens, and below ground for hauling, lighting and pumping. The ventilation is at present performed by a steam engine.

Rockingham Colliery Power House

Fig. 2 shows a central power station recently set in operation. It has, up to the present, only one unit, and this is a 600 maximum b.hp. two-cycle engine, driving a direct-current generator. The engine operates on gas of 530 B.t.u. heat value, obtained from Koppers coke ovens, and the current is led away by means of aluminum overhead trunk lines to distant collieries for use in hauling, coal cutting, lighting and pumping.

As an instance of the generation of power by the use of waste fuel in Mason gas producers, mention is made of an all-electric installation at a colliery in South Wales, where the "Bastard" coal, which forms the roof of the seam, is used. By-product recovery is not installed, the gas after being cleaned proceeding to the engines direct. These are of the twin two-cycle type, and are each capable of working up to 800 b.hp. The alternating-current generators of a voltage of 2200, and a frequency of 25, are situated on the crankshaft between the cylinders. A motor-driven centrifugal pumping plant is used for circulating the cooling water. As it is necessary in these producer plants to have the use of a considerable amount of steam, exhaust-heat boilers are fitted to the exhaust of the engine, with the attendant gain in economy. The power from this station is used in the first place for a large haulage engine, then for driving ventilating fans and screens, and for general surface driving. Lighting is provided through a motor-generator, which converts the current to a suitable voltage and provides also for the exciting of the main generators. The fuel used yields a high percentage of ash, and the value of the gas generated is 140 B.t.u. per cu.ft. An effective cleaning plant is necessary, owing to the large amount of tar present in the gas. It has been found advantageous to install a large gasholder, so as to equalize any irregularity in the working of the producer.

I have been connected with the erection of a power plant of a much larger capacity, which has only recently been installed in the Staffordshire district, where the producer plant uses waste fuel with full ammonia recovery.

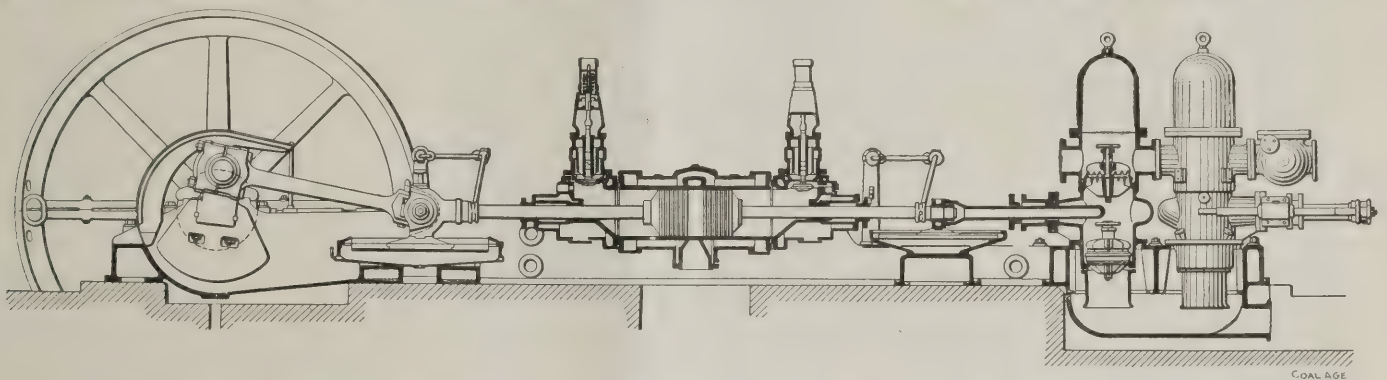


Fig. 3. A Gas-engine-driven Water Pump, Designed for the Hydraulic Operation of a Colliery

The Hydraulic Scheme

This method involves the conversion of the power generated by the gas engine by means of direct-connected pumps working at high pressure. The method was brought to its highest efficiency in Germany. A plant installed at the Herkules pit, near Essen, gave when tested an efficiency of as much as 78 per cent. The high pressure pump on the surface is connected by a main carrying water at high pressure to a special reciprocating water-motor-driven pump in the mine, the discharge being returned to the inlet of the pump at the surface. This system, if intended to perform the various other duties below ground, may be costly both in first charge and upkeep, but its high efficiency is in its favor, and in Germany there are many installations of the kind for pumping only. There is no doubt that this system could be, and perhaps has been, adopted for hauling, etc., and might possibly be applied to hoisting, but with greater difficulty. No installations of this system appear to have been laid down of late years. The hydraulic accumulator offers an excellent method of dealing with peak loads. This system is sometimes used, as in America, to operate water turbines underground. Fig. 3 shows a direct gas engine-driven pump suited to such service.

(To be continued)

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

If the life story of any man engaged in coal mining is calculated to encourage and inspire others to strive for success, then surely the following sketch of Morris Williams, president of the Susquehanna, and all the other coal companies owned by the Pennsylvania Railroad, will accomplish that laudable aim.

Born in Monmouthshire, Wales, in 1855, Mr. Williams was brought to this country by his parents, who emigrated to Pennsylvania while he was still an infant. The family settled in Schuylkill County, and at 13, Morris was attending school in winter and picking slate in a breaker during the remainder of the year.

When 17 years of age, Mr. Williams secured employment underground in one of the near-by collieries, and after serving in the capacity of mule driver, as well as filling other jobs about the pit, he became a full-fledged miner, and dug coal until he was 21 years old.

Having saved a part of his earnings during this period of hard labor, "M. W." went to Millersville, Penn., and attended the normal school for two years, working about the mines during vacation time. At the conclusion of this brief schooling, Morris secured a position on the engineering corps of the Lehigh & Wilkes-Barre Coal Co. near Hazelton, remaining with this latter concern four years.

While thus engaged in mastering the problems of coal engineering, Mr. Williams taught during spare hours, and in addition utilized all available minutes in reading law, it being his ambition at that time to become a lawyer.

The next move he made was to accept an engineering position with Major Stearns, one of the pioneers in the development of anthracite coal. This work provided him much valuable mining experience and occupied three years of his time. This stage of Morris Williams' life is of peculiar interest, as it shows how, "a person who resolves on any great end, has scaled the highest barriers to it." Deprived of a college training, he sought out an educated man (a clergyman by profession and occupation), and tutored under this instructor for three years, completing in that time, solely by night work, the practical equivalent of a university curriculum.

In 1885, Mr. Williams went West and engaged in metal mining, holding the position of superintendent of a gold mine in Wyoming. At the same time he busied himself with geological work in

Morris Williams

Colorado, having become associated with an engineer well versed in geological practice. This training has been of much benefit to him in overcoming many problems in the development of anthracite-coal seams.

Following his sojourn in Wyoming and Colorado, he undertook some special examination work in Texas and Mexico, for the Texas & Pacific R.R. Co. This task completed, he returned to Pennsylvania, accepting a position at Shamokin as engineer for the Mineral Railway & Mining Co., a subsidiary of the Pennsylvania R.R. The year following, 1888, Morris Williams was made superintendent of the last mentioned company, and held this position until the year 1897, when he was made manager of the same concern, succeeding Major Stearns. In 1903, when General I. J. Wister resigned as head of the Pennsylvania R.R.'s combined coal interests, Mr. Williams was made president, and was saddled with the additional responsibility of looking after the selling, as well as the mining end of the business.

Morris Williams differs in one important respect from most men who have tasted the discomforts of hard manual labor—Frequently when an individual rises from the lowliest ranks, he becomes the worst kind of a czar, and seemingly forgets all the bitter happenings and unpleasant moments resulting to him from the autocratic inhuman treatment of petty officials. Not so with Morris, his heart and sympathies are with the fellow who is unfortunate enough to be toiling at the foot of the ladder. You don't have to appear before a notary and make affidavit that you are of sound mind and good character, before you can see the president of the Susquehanna Coal Co. It's this special point that has helped him to the top and endeared him to his subordinates.

After a short acquaintance with Mr. Williams, no doubt remains in your mind as to the one essential that has brought him success. The element in question is "persistence." He has never been known to turn back nor weaken when confronted by adversity. His idea is that persistency of purpose is power. That it creates confidence in others, and that everybody believes in the determined man. When such a person undertakes anything, his battle is half won, because not only himself, but everyone who knows him believes that he will accomplish whatever he sets out to do.

Concerning the question of individual industry, he attributes the greater part of human effort to compulsion from personal need. He would revise the old maxim to read—"Necessity is the mother of *industry,* as well as the mother of invention." His philosophy is that—"Nature masks her own ends in our wants, and this urges us onward over obstacles; that the Creator has concealed highest happiness and greatest good beneath sternest difficulties, and made their attainment conditional upon a struggle for existence."

Governor Tener, of Pennsylvania, recently appointed Mr. Williams to serve on the Pennsylvania Workman's Compensation Commission, and it is certain no more fortunate selection could have been made. The men in the Keystone state who work with their hands, and who have slight opportunity to lay aside a sufficient competence to tide them over difficulties, and provide for their families in case the worst may happen, have a friend in "M. W." who will champion their cause as though it were his very own. He is the type of man in whom reason will always maintain its empire over the mind, but in no case will cold facts so control his actions as to exclude sympathy and callous his heart to the needs of less fortunate humans.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

The Flying Wedge

The British strike rapidly approaches an end. The opportunity, therefore, presents itself to sum up the teaching of this strike which has dealt such a heavy blow to Great Britain.

The suspension could have been made purely local had the miners of England so wished, but with a mixture of gallantry and brutal unthinking cruelty, the English miners concluded to make it otherwise. There was no need for such a long national strike, lasting as it did very nearly a month, for from the first, the greater part of the English operators were ready to concede a minimum wage.

The Scotch and Welsh operators resisted, and it was to aid them that the English miner refused to work. He prepared to enforce his demands by subjecting workers, many of them poorer and more unfortunate than himself, to the most grinding poverty that the pressure of public opinion and of a ministry dependent on his vote, might be compelled to take favorable action on the whole question. If it had not been for large contributions from the benevolent, and money raised by tax collections from those who were not actually concerned, the dèath rate would have been appalling. As it was, many honest people, too proud to accept succor, have been tortured as a result of the thoughtlessness of those who advocated a national strike.

The stand of the English miners has been described as noble, and indeed it had all the cruel gallantry of war. The Welsh operator was receiving about 85c. per ton more than the English. He was better able, therefore, in all probability, to pay a minimum wage, but he refused to pay it. In fact, it is usually the operator who is making the most money, who is best able to withstand pressure of that character. There was no need for the English miner to hold back from work, and he could have protected the public and subsidized the Welsh and Scotch miners and in the end would have realized a greater success. Instead, he preferred to grind the face of the poor, to pauperize the nation, to jeopardize its independence, when work was to be obtained under conditions against which he had no complaint.

Strange to say, the first men to endeavor to return to work were miners living in the counties where their demands were most strongly resisted. This suspension from labor, therefore, did not help the English miner, and it is easy to show that it did not hurt the operators in Wales or Scotland who refused to make any concessions. The suspension from labor of the English miner did not provide a means whereby the liberal operator might enter and seize the market of his rival. It did not help the Englishman to ward off his foreign competitor. It did not furnish the more generous coal owner a chance to profit by his generosity. It put a common penalty on friendliness, indifference and aggressive hostility.

But nevertheless, denying himself the exercise of his reason, John Bull concluded it was a gallant act because it involved a sacrifice. A certain Frenchman said of the charge at Balaklava, "C'est magnifique mais ce n'est pas la guerre," and the same may be said of the present situation—it was gallant, but it was not war.

In college days we thought the most effective move in football was made with the introduction of the "flying wedge," when the momentum of the whole force on the field flung itself on a weak spot of the opposing line. Its very effectiveness broke it up. Nothing could withstand the fierceness of the attack. Today, the miner adopts another and less effective mode of action. He would hurl his whole broadside against the united front of the operators, and make those who would concede, join battle with those who would not. He works valiantly to organize the employers to oppose labor and seems to find delight in penalizing the man who ventures to give him what he asks for.

There has been much opposition aroused to the existence of trusts and it is certain that they must be annihilated or regulated. So far, little has been done or said against a greater trust than any which has been prosecuted in the courts—a trust, open in its methods and almost entirely unrestrained in its actions. We refer to the labor trust. It has been permitted to exist because, the worker being weak, may be safely allowed some privileges denied to capital, which can so easily intrench, and because no human interest can well transcend the living needs of the working classes.

But there is a limit to the combinations of labor, and we think that limit approaches when it combines to refuse the offer of work made by those who concede its demands, when in order to show its strong, unrelenting power, and to paralyze the government, it combines to cease work. A combine to raise wages may be endured and condoned, but a combine to suppress the output when no stock is on hand and when the people must starve without the product, can hardly be described with a more fitting word than crime.

Did any trust ever refuse to sell the output of its mills or mines till *everyone* consented to pay its price, thus bringing ruin on those who were willing to meet its demands as well as on those who were not willing? Has it not been the practice of every great corporation, no matter how arrogant, to sell at any time to anybody who was willing and able to meet its stipulated schedule of charges?

The labor leaders would do well to conclude that their tactics are a violation of national and state laws, and of the absolute rights of the public, and to remember that the courts and people have long winked at labor combinations and pretended to find a distinction in principle where none really existed.

The judicial and legislative bodies have in this matter always had an eye to the defendant and decided that it was not well to compel him to observe a nice adherence to laws of unrestricted commerce because the defendant had too large an interest at stake to be rudely forgotten in the case at issue. But in a matter of paramount importance like that raised by the Britannic strike, if labor will not listen to reason, it must be made to pay heed to law.

Clearly the recent British strike was political, an attack not on the operators directly, but on them through the parliament of Great Britain. As such, it was not merely a restraint of trade—it was an act of treason. As evidence that the purpose was political, we would call attention to the fact that strikes to influence the government have been frequent across the narrow waters of the English channel.

To the great credit of the English workman be it said, however, that he preferred a passive resistance to wanton acts of "sabotage." But it must ever be remembered that Vandal acts of destruction are not so costly as acts of restriction and repression which silently but surely impoverish employer and employee, and bring the proudest people to a condition of mediocrity.

The Industrial Treadmill

We have scarcely yet learned that supply and demand do not regulate wages any more than they regulate the partition of Asian and African lands among the excessive populations of Europe. Wages are determined no longer by economic conditions; in fact, few things salable are any more so determined, both labor and material being controlled by trusts. Consequently there is often no fluctuation in the market prices to correspond with the changes in economic needs and prices for labor usually continue unaltered in an industry until a strike, realized or threatened, makes revision of labor prices necessary.

Such a revision is frequently the result of a change in the cost of the materials which the workingman has to purchase for his daily sustenance. But these materials usually cost more because some other workman has demanded a larger wage for the making or moving of them. So the relation of cause and effect is far-reaching, and frequently back of a needed reconstruction is a rise in the wages of some other artificer.

Thus every strike in an industry involves disorganization in another. Eventually all other industries emerge from the distressing experience with higher wages and an increased cost of product, be that product an actual material or its mere transportation. The cost of living is raised, and a new rearrangement must be made if the workers in the first industry are not to suffer.

Of course other considerations exist—trusts control charges for material, supplies of raw material dwindle or become larger from railroad extension, exploration and development, the stocks of gold vary and the volume of business transacted ebbs and flows. There are many variants, but the wage differential largely changes with these and is the most fluctuating factor of them all. If wages are only to be adjusted by strikes, then contests between labor and capital will frequently recur. A strike holds out an excellent prospect of reward, because the workingman who gets a substantial rise makes his fellow workmen pay more for his product while paying no more for theirs, and the way to succeed is to be learned from David Harum, "Do unto the other fellow as he would do unto you and do it first." The victory is not to the laggard or the unprotected.

Clearly all this is wrong, as bad for business as it is for the workingman. He is placed in an industrial treadmill. He lifts his foot to raise himself, the wheel of prices turns and he is promptly *in statu quo*. If the taking of the step were invigorating exercise, if it made him a happier man, it would be well. But the advance he makes on the treadwheel of industrial progress is taken in rancor and malice and followed by despair. It would be far better for all concerned if prices remained more uniform and wages rose less often, and it is certain that the workingman should receive automatically an increase of wage, proportional to any increase in living cost. If this could be arranged, strikes would be less frequent and when they occurred, would not have the popular appeal they now have.

When, under the present *régime,* a change of wages takes place, it is usually an arbitrary concession bearing reference to the change in prices in sign but not in quantity. Thus wages are raised inordinately and as such raises affect all skilled industries one by one, the cost of living becomes unduly advanced, and another violent labor readjustment is needed. That readjustment would possibly not have been necessary and would certainly have been less disturbing had the initial concessions been figured on a scientific basis.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Strong Roof and a Narrow Working

In answer to T. E. Richard's question on page 685, Mar. 2, I would say that controlling a mine squeeze is a difficult matter even under the most favorable circumstances. I would advise the driving of the last three rooms on the cross-entry to their limit, and the discontinuance of work on the parallel entry. I would then draw back the ribs of the three cross-entry rooms thus extended and at the same time the ribs of the last three rooms in the parallel entry.

I would then draw back the heading stumps and chain pillar as far as the mouth of the third room, taking care that no coal is left in any of the pillars, and that all props or posts are removed as far back as the retreating work is completed. What is wanted is that a sufficient area be taken out to cause a break. After that is secured all trouble is over. Crossbars will not prevent a squeeze nor will any other timbering. The weight will ride over all such supports until a break occurs. The line along which the pillars are worked is that of the best usage but the order followed in extending the rooms of the cross-entry is contrary to good practice. The rooms nearest the old mine should be started first, and the others progressively opened as occasion demands toward the main entry or flat. The line of fracture in the cross-entry should be maintained the same as in the parallel heading.

DAVID FULTON.

Marion, Ill.

Sealing Off Mine Fire in a Gassy Mine

I wish to state I have read with considerable interest the different letters submitted *re* the proper method of sealing off a mine fire that has gotten beyond control, rendering it practically impossible to fight it by the direct method. I have had considerable experience in fighting mine fires in gaseous mines, and have always advised the building of the first stopping on the return side. Although I am aware that this is practically impossible to do in some cases where conditions are adverse, yet I consider it well worth the effort if possible at all.

I have never experienced any explosion so far when the stoppings were built in this way. By closing the return side first, the products of combustion generated by the fire, which are principally extinctive gases, are confined to the region of the fire, enveloping it in a cloud of gases that are capable of rendering inexplosive the otherwise explosive gases that accumulate behind the stoppings, owing to the air being gradually cut off during their construction.

Moreover, the confined gases expanded by the heat of the fire will force back the fresh air and gases onto the intake, and eliminate the possibility of sealing up a large amount of fresh air and gas with the fire. I assume this is a gaseous mine; and unless the first stopping is built on the return side of the fire, these conditions are liable to cause a disastrous explosion.

I had the experience some years ago of seeing a stopping put in on the intake side first, in a very gaseous mine. The result was that, when the stopping was about three-fourths completed, there was a strong explosion, which blew down doors in the mine, and would, no doubt, have resulted in the death of the men engaged in building the stopping had it not been for the recoil that occurred at the downcast of the affected districts. This downcast, or air-and-water chute, was located about 2000 ft. beyond where the stopping was being built, and was very wet, as it was used to convey the ditch water of the upper workings that had been worked out, to the entry below, where it was pumped to the surface. The explosion recoiled at this point, owing to the reduction in temperature of the flame as it passed through the water chute, which was about 300 ft. long.

J. W. POWELL,
Mine Manager.

Coalmont, B. C., Canada.

Timbering a Mine Parting

I note in COAL AGE, March 23, p. 786, a question suggested for discussion by Noah Burton, Anglin, Ky., on the Best Method of Timbering a Mine Parting. Under the conditions named by Mr. Burton, I would suggest that no timber whatever be used as supports; and instead would advise the use of steel girders placed, say 18 in. apart, their ends being supported by walls of reinforced concrete of suitable thickness on either side of the parting. Old discarded mine rails cut in suitable lengths should be placed over the girders for lagging and any open space above these rails should be filled with débris. By adopting this plan of securing a mine parting the work is permanent and if properly executed will last for years. Then, again, if the job is worth doing at all, it is worth doing well.

Mine fires incident to heavily timbered partings are avoided, as is also the great risk of wrecked cars knocking out timbers and causing serious accidents and delays.

EDWIN HUSBAND.

Virginia Mine, Bessemer, Ala.

Thawing by Electricity

Referring to the question of thawing a frozen pipe line by means of a current of electricity, as mentioned on p. 586, COAL AGE, Feb. 10, and further discussed by Thomas Brennan, p. 785, Mar. 23, would say I have used electricity for thawing frozen pipes and believe it to be the quickest and cheapest means that can be employed. With direct current all that is needed is a source of supply consisting of a heavy power cable. To this attach a short length of a similar heavy cable, at the end of which is a bar of iron so arranged that it can be raised or lowered in a barrel of brine. At the bottom of the barrel is another bar of iron attached to the end of a heavy cable that serves to connect this bar with one end of the frozen section of pipe. The other end of the frozen section must have a return wire or be sufficiently grounded to insure a good current passing through the frozen section when the current is turned on.

The current-carrying capacity of the pipe must be less than that of the cable and the other wires in the circuit, so that the pipe will act as a resistance and become heated by the passing of the current. Practically, the heating effect of the current in the pipe line is regulated by raising or lowering the bar of iron suspended in the barrel of brine. The brine, in this case, acts as a water resistance and controls the strength of the current and, incidentally, the heating of the pipe. I have seen a half mile of frozen pipe thawed in five minutes, by this means. In *Engineering News* for Mar. 17, 1904, p. 251, are given data and description of an electric thawing apparatus used by several cities and towns.

F. D. BUFFUM.

Ellsworth, Penn.

Reducing Ventilation when Firing

With regard to R. Z. Virgin's remarks in Coal Age, March 30, page 817, I would say that mining practice and measures for the protection of life, not of general application, must be determined in accordance with local conditions and requirements; and it may develop that a practice considered dangerous in Pennsylvania is a permissible and reasonably safe undertaking in Iowa. The Iowa mines do not generate explosive gas. The shots are fired after the miners have left the mine. The fan is slowed down while the shotfirers are at work and, at new mines, it is frequently stopped entirely. This practice has been in general use for the last ten years, surely a long enough test to bring out any drawbacks or dangerous consequences due to its use. So far, evidence showing the practice to be in any way unsafe has not been developed; while, on the other hand, satisfactory proof of its possible merits and benefits has been established and the practice has now the general approval of the operators, the miners and the shotfirers.

No claim was ever made that slowing down the fan at firing time would stop the occurrence of explosions entirely; but I have suggested the plan and adopted it as a fair makeshift and palliative to minimize the effect of an explosion, should one occur. Judging from the results, it appears that Iowa practice has proved at least as effective in this respect as sprinkling and spraying the dust. What few explosions have occurred in Iowa mines, in the last ten years, have shown comparatively little violence and were of small extent.

It should be understood that dust explosions, in their incipiency as well as in their propagation stage, can receive the necessary supply of air, under favorable conditions, without the aid of an artificially induced draft. In the absence of such favorable conditions, however, the inception of such an explosion depends largely on the assistance of a forced draft; and it is, therefore, evident that in all such cases the velocity of the air as determined by the speed of the ventilator becomes the controlling factor. This is not an opinion but a fact proved by the experiments of Mallard and LeChatelier that the velocity of the air current carrying the dust in suspension has a great influence on the degree of inflammability of the dust.

Mr. Virgin says: "I am of the opinion that slowing the fan increases the danger incident to firing shots." The facts, however, appear to sustain the opposite view. In experiment No. 11 at Altofts, the charge of dust was 400 pounds; in experiment No. 13 the charge of dust was 324 pounds, 76 pounds less. The charge of powder was the same in each case as were also the position of the cannon and the surrounding visible conditions were also identical. There was, however, a marked difference in the velocity of the air. In experiment No. 11 the recorded velocity was 655 ft. per min., while in experiment No. 13 it was 1219 ft. per min. Experiment No. 11 produced a rather mild explosion, doing no particular damage, while experiment No. 13, with a lesser charge of dust resulted in a most violent explosion, destroying part of the gallery, tearing up 43 ft. of the concrete floor and hurling the heavy valve, No. 9, a distance of 426 ft. If the difference in the velocity of the air was not the main cause of the discrepancy in results, what was the factor that brought it about? It will not do to say it just happened that way; for the results of explosions depend on and are determined by surrounding conditions. Like conditions should produce like effects. In the public tests made at the Pittsburg experimental station the results of these tests, which were repetitions of previous experiments, could have been accurately foretold, by those in charge, before the shot was fired in the gallery.

I believe in thorough and efficient ventilation of all mines, but I am not unqualifiedly, like Mr. Virgin, "a strong advocate of fresh air; the more the better, within reason." That has been the slogan of the English miner; for generations he was taught that the presence of a strong current of pure air meant added protection to him, at all times and under all conditions; and by his acts he has shown his implicit belief, even up to the present time, that a mine opening swept by a brisk air current was immune from explosions of any kind. Hundreds of lives have been lost through this mistaken belief, a fact supported by the statement in bulletin No. 425, of the Bureau of Mines, to the effect that "firing shots on the roadways (the reports show they were briskly ventilated when the firing was done) has been a frequent source of disaster in England." For example, the Altofts explosion in 1886, causing the death of 22 men and boys, took place on the principal intake airway 500 yd. from the downcast shaft. Along this airway a current of 40,000 cu.ft. of air per min. was passing. The Elemore explosion in which 28 lives were lost the same year, occurred on the principal intake airway 200 yd. from the downcast shaft. The amount of air passing through this airway was 37,800 cu.ft. per min.

Such instances should serve as a lesson and a warning that the evident beneficial effects of good mine ventilation should not be permitted to obscure the fact that a strong, fresh air current in a mine, although necessary and desirable, may be readily converted into a highly potential agency of destruction.

John Verner.

Chariton, Ia.

Timbering a Mine Parting

In answer to the question asked by Noah Burton, in regard to the best method of timbering a mine parting, Coal Age, March 23, page 786, would say, my plan would be to cut into the coal on both sides of the track so that the legs of the timber frames can be set back in the rib, clear of the track, where they cannot be knocked out in case a car jumps the rail. The headers (crossbars) should then be set close to the roof. This is always a safe system to adopt in timbering partings, because a car cannot trip the timbers in case of a derailment or wreck. Such an accident has often caused the life of a man or a mule.

In case the roof stratum is soft and not very thick, it will generally pay better to take down the soft top to the solid. This work should always be in charge of an experienced mine boss, or timberman who understands the proper method of taking down roofs and timbering.

Red Ash, Va. A. T. Wade.

The Cambria Coal Field in Wyoming

The article by Mr. Simmons under the above title which appears in issue of Coal Age of March 23, 1912, faithfully describes the principal features of the district and the mining conditions and peculiarities of the coal at Cambria, Wyoming.

Mr. Simmons is justified in giving much credit to the enterprise and energy of Kilpatrick Bros. & Collins in opening up and developing the field, for they deserve this credit and whatever profit they have been able to make in operating the property and in disposing of it to the present operating company.

Early Work of the Burlington

To those familiar with the conditions preceding and attending the development of this coal field, it will seem only right, however, that the matter should not be passed over without mention of the part played by Mr. Perkins, former president of the Chicago, Burlington and Quincy Railroad, and by Mr. George A. Holdredge, Manager of the Burlington and Missouri River Railroad which operated the C. B. & Q. lines West of the Missouri River; for it was only through the farsighted wisdom of these gentlemen, and of the Board of Directors of the C. B. & Q. R.R., that the development of this district was accomplished.

During the '80s, when the Burlington and other railroads were building feeders and spurs through the Dakotas, Nebraska and Kansas, gridironing the arable portion of those states with lines of rails, the fuel question began to loom up as one of serious import. This ap-

plied not only to the railways for steaming purposes, but to the rapidly growing population which followed the railroad extensions.

About 1885 the Burlington management began to canvass actively the country tributary to its lines for a suitable fuel supply, and extensive examinations were made of coal in Colorado and elsewhere. But the regions promising coal of suitable quality were not easily accessible and could not be reached except at large cost, involving the building and operation of many miles of railroad with heavy grades, and at high altitudes.

From the outset it had been the policy of the Burlington to confine its activities to those of a common carrier, and not to engage directly or indirectly in coal mining or other industries. But it had also definitely adopted a policy of encouraging the development of local industries, and this, together with its own pressing requirements for a fuel supply from mines on its own lines, naturally led to an arrangement, made some years later, whereby Kilpatrick Bros. & Collins agreed to supply the company with fuel from the mines at Cambria.

The First Explorations

In 1887, Kilpatrick Bros. & Collins, who as contractors, had built many miles of railroad for the Burlington, and who had earned the confidence of the Burlington officials, had their attention drawn to this region. Having determined to spend some money in trying to develop a workable coal they commenced at once to drive a drift in a seam about 4 ft. thick, which was parted at the center by a bed of hard sandstone about one and a half to two feet thick. About this time Mr. Perkins, at the suggestion of Mr. Holdrege, decided to have the whole region explored to learn whether there was any possibility of securing a railroad fuel supply from it, and doing nothing by halves, he decided to extend this exploration from the Black Hills on the Dakota-Wyoming line, westwardly across Wyoming to the Big Horn Mountains. It was of course already known that this was a region of great lignite and lignitic coal deposits, in which beds of great thickness extended over a very large area, but it was not known whether, in addition to the lignites, there might not be some areas or some beds which would yield coal suitable for railway fuel.

I was engaged by the Burlington, to make this exploration, and to advise Kilpatrick Bros. & Collins in the development of the Black Hills region, or other localities where I might advise them to do development work, and I made the first examination in the fall or early winter of 1887. At that time the coal at Cambria was unknown, and the coal at the opening above described being unworkable, I advised them to explore the canons cutting the plateau to the north and east, at the same geological horizon, to see whether an area could not be found in which the coal was workable. A camp was accordingly established and the work entrusted to Mr. Frank Mondell, then an employee of Kilpatrick Bros. & Collins. In this work Mr. Mondell demonstrated the ability which in later years has caused his election and re-election to represent this district in Congress.

Congressman Mondell—Prospector

Mr. Mondell's work resulted in the discovery of the coal where it is now worked at Cambria. His work was at first greatly hampered because along the outcrop and often for a distance of 30 to 100 ft. under cover the coal had been burnt, and the search for coal smut became a search for coal ashes.

Before this condition was discovered and recognized, the exploratory work was most discouraging, long distances along the place where the outcrop should have been found showing no traces of coal, or coal smut, until we learned to look for ashes and not for a coal smut.

Under Mr. Mondell's management, during the summer of 1888, a considerable area of workable coal was proven by drifts driven in on the outcrop in the canons, and by diamond drill holes bored from the surface of the plateau. I was able to report to the Burlington officials that there was practically proven or assured by this work some 12,000,000 tons (if my memory is not at fault) of workable coal of a quality suitable for locomotive use.

The incidents leading up to and following the development of this operation furnish a most interesting example of the part often played by railway corporations and the officials of such corporations, in the opening up of our country to settlement and of the development of its resources. History has since demonstrated the wisdom of the officials of the Burlington in this, and in other directions, as evidenced by the subsequent large enhancement in the value of its securities, and the cordial relations which always have existed between it and the communities which the railroad serves.

I heartily agree with Mr. Simmons' eulogy of Kilpatrick Brothers and Collins and cordially endorse his tribute to their energy and enterprise and to their record as whole souled fellows who never do anything without doing it well. But I think it would be a grave injustice to the officials of the Burlington to permit this matter to pass into history without recording the part played by them in the development of this coal field, and other enterprises in districts tributary to the lines of that company.

H. M. Chance,
Consulting Engineer.
Philadelphia, Penn.

A Successful Type of Rotary Dump

Referring to the article by Mr. Lindrooth, "A Successful Type of Rotary Dump," in Coal Age of Mar. 16, I wish to call attention to the fact that the idea of this dump had its origin in the fertile brain of the late Richard Ramsey, of Braceville, Ill., the inventor of the first box-car loader. His dump was double, the empty car being returned to position by the next load. This dispensed with the back balance, but required a deeper hopper for clearance and caused some breakage of the coal.

In 1897, with Mr. Ramsey's permission, I used his idea in perfecting a dump like the one shown in your paper, and installed three of them for coal and rock cars at our No. 3 mine, in 1898. They remained in service until the mine was abandoned in 1909. Again, in 1904, two more were installed at our No. 6 mine, and are in use today, handling the output of coal and rock successfully. They are the simplest cross-over dumps in use, and in no case have they cost us a dollar for repairs.

We adopted the closed-end car with this dump in 1898. We also adopted the practice of forcing the mine-car wheels onto the axles and thus got rid of the two abominations on pit cars, loose doors and loose wheels, at the same time.

W. Harkes,
General Superintendent, Big Four Wilmington Coal Co., Coal City, Ill.

Preparing Shot Holes

With reference to the question of securing maximum efficiency in firing permissible powders, I desire to say that the charging density and disruptive effects of permissible explosive cartridges may be greatly increased, when the cartridge is smaller in diameter than the drill hole, by slitting them lengthwise and tamping tightly into the holes. Air spacing will give slow action. This is done by placing a plug of tough, soft clay between the explosive and the stemming, and when doing this great care must be taken to tamp firmly the remainder of the stemming. This practice reduces the charging density and the explosive force may be regulated to suit the coal being blasted. Wooden rods which fit snugly into the drill holes should always be used for tamping bars. Tamp the stemming loosely near the explosive and tightly for rest of hole.

Pittsburg, Penn. A. M. C.

Colliery Notes and Comments

Practical hints gathered here and there, and condensed to suit the busy reader

During the year 1910 Nova Scotia shipped $368,146 worth of coal to the United States.

A 3-in. layer of portland cement mortar applied on expanded metal lathe is a good protection for coal bins.

The transmitting lines of electrically driven fans should be independent of trolley lines so that any trouble with the trolley system will not interfere with the ventilation.

Good air-tight stoppings, costing about one-third as much as brick stoppings, may be constructed of "Burkett' lath, plastered with wood fiber, mixed with an equal quantity of sand.

In designing a pumping plant for a mine the capacity of the pump should be 2½ times the amount of water to be handled. The sump of such a plant should accommodate an accumulation of from 36 to 48 hours.

Adjustable loading-booms for loading railroad cars at the breaker are a great factor in the elimination of breakage. When an empty car is being filled the boom is close to the bottom and rises gradually as the car fills.

Experiments have shown, that within certain limits, the strength of mine props is independent of their length. A fairly straight, medium-length prop should be able to withstand a pressure of one ton per square inch of small-end area before crushing.

Wooden mine cars should have their sides and ends built of tongued and grooved boards to prevent the dropping of dust on the roadways. The bottom should be lined with sheet iron for the same reason and this prevents damage while loading; furthermore, it also greatly facilitates dumping, as the coal slides easily from the sheet-iron surface.

The Prussian Firedamp Commission has estimated that from 10 to 13 ft. of flame result from a blownout shot of half a pound of gunpowder in a non-gaseous atmosphere when the hole is stemmed with clay. Where stone and coal dust are used for stemming the flame increases to 16 ft. A pure coal dust stemming results in a flame from 31 to 52 ft. long.

In the coal mines of Durham and Northumberland, England, chambers are not arbitrarily awarded the miners, but they are allowed to draw lots for the same, which gives every man an equal chance of securing the best chamber, thus safeguarding the men's rights. These drawings take place every three months. Each district or colliery adopts rules for the drawing suitable to local conditions.

For fighting fires in the pitching breasts of the anthracite mines, elecric fire-fighting cars are sometimes used. They consist of a truck equipped with an electric pump, hose, insulated wire, fire-extinguishers, axes, saw, hatchet and a first aid supply-box. These cars can be run to any point in the mine which is tracked and a stream of water, drawn from the mine ditch, directed against the fire within a short space of time.

According to the *Engineering and Mining Journal,* the comparative fuel cost at the Port Henry, N. Y., power plant is as follows: 11 tons of No. 2 buckwheat (anthracite) worth $2.65 per ton at the plant, is equal in heating value to 10 tons of bituminous, at $3.92 per ton, or $29.15 worth of anthracite equals $39.20 worth of bituminous coal, thus making the cost of operating with bituminous 1.345 times more than for anthracite.

Some European methods of testing mine ventilation are: (1) The Liveling principle, based on the fact that platinum burns with a brighter glow when CH_4 is present than it does in pure air. (2) The Shaw method, which consists of adding pure CH_4 to a mixture until the explosive point is reached; the difference between the amount added and the amount necessary to produce an explosion is the amount of gas held in the ventilating current.

In working thick seams of coal with several partings the question of impurities in the coal is of great importance. Where the partings are thick, and the coal mined by machine, the amount of impurities may be reduced to a minimum, but where the partings are thin, and the coal shot from the solid, the presence of more or less bone and slate in the mined coal is unavoidable. When a large output has to be handled by one tipple, it is best to remove as much as possible of the impurities at the working face, because the dumping must be done too quickly to permit much inspection.

To fix pencil lines on drawings, rub the drawing with a piece of wax like that used in the manufacture of phonographic rolls. This produces a kind of varnish which protects the lines against rubbing and insures their preservation. Paper as well as tracing cloth can be protected in this manner. Another method is to heat the paper slightly before using it, then spread a solution of warm alcohol and bleached colophone rapidly over the surface so as to thoroughly wet it, after which it is to be dried in warm air. The pencil works easily on the surface of paper so prepared. In order to fix the lines, it is merely necessary to reheat the paper slightly for a few moments. The lines are then covered with a thin coating of transparent varnish, which preserves them in perfect clearness.

To clear firedamp from mine workings provide a liberal volume of air properly conducted to the working faces. Where poor ventilation has allowed a large body of gas to accumulate it should be removed gradually, in sections, as by this method the gas is more easily broken up and the return current does not become so gaseous as when the air current is turned into the whole body of gas. While this is being done withdraw all men from the dangerous parts of the mine and the return side of the gas body. See that only careful, competent men, supplied with a good type of locked safety lamp are employed in the work. Take good care to fix all brattices or air pipes on the intake side and to keep all safety lamps away from the accumulation of gas near the floor. Provide an abundant supply of timber, brattices, lathes, nails and pipes.

The conditions which wiring systems have to withstand in mining work are peculiar and often severe. Everything used in a mine must be designed to endure rough and unskilled handling, and of a nature capable of resisting corrosive and abundant pit water. Sparking must be avoided, or at least confined. Efficient grounding is not easy to effect. Wall and roof movements occur. Extensions of electrical wiring are of almost weekly occurrence, and these have often to be carried out quickly and in a bad light. Dangers from shock are increased, owing to confined space and to working conditions which lower the electrical and vital resistances of the workers. When these special conditions are not studied in design, D. S. Munro is correct in assuming that electricity, which ought to be the safest carrier of power and light, may be actually more dangerous, and, because of unfamiliarity, more dreaded than older methods.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions Selected from Various Recent Examinations

Capacity of Pump To Drain Shaft

Ques.—In the course of sinking a shaft, a feeder of water was met when a porous sandstone was struck. The water rose 300 ft. in the shaft. A pump having a capacity of 300 gal. per min. failed to lower the water more than 62 ft. What would be the capacity of a pump capable of draining this shaft?

Ans.—Assuming that the height to which the water rose in the shaft (300 ft.) represents the natural head of the feeder in the strata, and that the flow increases as the water level is lowered in the shaft, in proportion to the square root of the effective head, we have the ratio of the flow, in gallons per minute, is equal to the square root of the ratio of the corresponding head, in feet.

Therefore, if the flow is 300 gal. per min. under a head of 62 ft. the question is what would be the quantity of the flow for a head of 300 ft., or when the shaft was completely drained. To be safe, call this head 310 ft., which gives round figures. Then, calling the required capacity of the pump, for this head, x,

$$\frac{x}{300} = \sqrt{\frac{310}{62}} = \sqrt{5}$$

$$x = 300\sqrt{5} = 670 + \textit{gal. per min.}$$

Horsepower Required to Hoist Coal

Ques.—What horsepower will be required to hoist 1200 tons of coal up a shaft 525 ft. deep, in 8 hr., allowing 12.5 per cent. for the resistance of rope, pulleys, etc.

Ans.—Adding 12.5 per cent. or ⅛ of the load hoisted to allow for friction the load including friction is

$$1200 + \frac{1200}{8} = 1350 \textit{ tons}$$

Practically, a certain time should be allowed for unavoidable delays, say 5 per cent., making the actual time of hoisting $8 \times 0.95 = 7.6$ hr. each day. But, since it is necessary to calculate the horsepower on the maximum speed in hoisting, and since about one-half the actual time of hoisting is lost in dumping or changing cars between trips and starting and stopping trips, the time of hoisting the full depth of the shaft at such speed might be taken approximately, in this case, as

$$\frac{7.6 \times 60}{2} = 228 \textit{ min.}$$

To do this would require

$$H = \frac{1350 \times 2000 \times 525}{228 \times 33{,}000} = 188 + hp.$$

[The theoretical horsepower, making only the given allowance for friction, and not allowing for loss of time, in delays, changing cars and starting and stopping trips would fall short in actual practice. This theoretical power would be

$$H = \frac{1350 \times 2000 \times 525}{8 \times 60 \times 33{,}000} = 89.5 \; hp.$$

In actual practice more data are required to make this calculation with accuracy, in order to determine the load per hoist and the necessary maximum speed of hoisting. In the above we have assumed a balanced hoist and ignored the weight of the rope hanging in the shaft.]

Discharge of Siphon

Ques.—In a siphon pipe line 4 in. in diameter and 1760 ft. long, the greatest altitude of the pipe is 15 ft. above the intake end and 52 ft. above the discharge end. How many gallons of water will this siphon discharge in 1 hr.?

Ans.—The lengths of the two arms of the siphon are not given, but only the total length of the pipe. Therefore, assuming that these respective lengths are such that the intake end, under atmospheric pressure, will supply the discharge end, which flows under gravity, the quantity of water discharged per hour will be

$$G = 60 \times 4^2 \sqrt{\frac{52 - 15}{\frac{1760}{800 \times 4} + 0.0026}}$$

$$= 7852 + \textit{gal.}$$

Pressure Due to Blasting

Ques.—Give the pressure per square inch on the tamping when 6 lb. of F F powder is exploded in a 3-in. drill hole, in blasting coal.

Ans.—Black blasting powder yields on explosion 360 times its volume of gases, measured at 32° F., barometer 29.92 in. and a solid residue of ⅓ the volume of the powder exploded. When the powder is exploded in a drill hole or other confined space the 360 volumes of gases are crowded into a space that is ⅔ of the original volume of the powder, owing to the solid residue that fills the remaining ⅓ of the original space occupied by the powder. This is equivalent to

$$360 \times \frac{3}{2} = 480 \textit{ volumes}$$

of gas filling the entire space occupied by the powder, or 480 times the volume of the powder; and increases the pressure 480 times the original pressure, which was 14.7 lb. per sq.in.

The pressure at the moment of explosion, however, is very much increased by the rise of temperature due to the combustion of the powder. The theoretical temperature due to the explosion of black blasting powder is 3600° F.; but to obtain this high temperature the combustion must be complete in an instant of time, which is not the case. Black powder burns at a comparatively slow rate, depending on the size of the grain and quality and hardness of the powder. Much of the heat developed is radiated and lost before the combustion is complete. On this account, the temperature in the drill hole, in blasting coal, rarely exceeds 2000° F., in good practice.

This makes the pressure due to the explosion of black blasting powder, in a drill hole, at sea level,

$$\frac{14.7 \times 480}{2000} \times \frac{460 + 2000}{460 + 32} =$$

$$\frac{14.7 \times 480 \times 2460}{492 \times 2000} = 17.64 \textit{ tons per sq.in.}$$

The question asks for the pressure per square inch exerted on the tamping by the explosion of a given weight of powder. The pressure per square inch does not depend on the weight of powder exploded or the size of the hole. It varies with the elevation above sea level.

Pumping Calculation

Ques.—(a) What is the cylinder displacement and theoretical discharge of a pump whose water cylinder is 12 in. in diameter and length of stroke 16 in. when making 90 strokes per min.? (b) Assuming an efficiency of 85 per cent. for the water end of this pump, what is the actual discharge?

Ans.—(a) The piston speed in this case is

$$S = \frac{16 \times 90}{12} = 120 \textit{ ft. per min.}$$

Piston displacement,

$$120\left(\frac{0.7854 \times 12^2}{144}\right) = 94.248 \textit{ cu.ft. per min}$$

Theoretical discharge,

$$\frac{94.248 \times 1728}{231} = 705 \textit{ gal. per min}$$

(b) Actual discharge,

$$G = \frac{705}{0.85} = 828 \textit{ gal. per min.}$$

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The proposed repeal of the Canadian reciprocity act, which has been urged by the Senate committee on finance, in a report rendered within the past few days, is being opposed by President Taft, who expresses the hope and belief that it may still be possible to obtain an adjustment with Canada later on, when that country has had time to reconsider the question of closer trade relations with the United States.

One of the items, in regard to which it is especially desired that there shall be no change so far as the act is concerned, is that embracing coal and slack. For these commodities, a substantial reduction had been arranged in the bill, which was rejected at the polls in Canada last autumn. It is the opinion of the President's advisers that these items are particularly likely to serve as a useful basis for negotiations in the future, and that to repeal the bill now would leave the President without the possibility of authority to include them in a treaty with Canada, should conditions later favor such action.

It is said that in all probability the Ways and Means committee at the next Congress, if the Democrats continue in power, will report a bill in which the President will be given authority to negotiate treaties of reciprocity with foreign countries on a distinctly lower basis of rates than that which prevails in the general tariff, and it is understood that coal will be one of the items on which the Democrats will establish the lower schedule of rates which is to be offered in the proposed bill. It is believed that a large trade in coal may be developed with the aid of the Panama Canal if conditions are made moderately favorable, by securing the abolition of duties in foreign countries through holding out of sufficient inducements in the way of reductions of duty on articles imported into the United States.

Coal Strike Legislation

A general understanding has been reached apparently, to the effect that in the absence of any new and more threatening developments in connection with the impending coal strike, there probably will be no further action taken with respect to the Lee and Townsend bills, providing for an extension of the Erdman act to apply to strikes in the coal industry. Neither does it at present seem likely that any substitute provisions of like character will be taken up. The bills will be left in committee.

If any step of the sort is taken at this session of Congress, it will probably be the reporting and possible passage of a modified form of the Foster bill to create a Commission on Mining Industry. This bill provides that a commission shall be created as follows:

Said commission shall be composed of 11 persons, to be appointed as follows: Two members of the Senate (including the chairman of the Committee on Mines and Mining and one member to be appointed by the President of the Senate), two members of the House of Representatives (including the chairman of the Committee on Mines and Mining and one member to be appointed by the Speaker of the House), two representatives of mine operators, two representatives of miners, two mining engineers and one representative of the Bureau of Mines, to be appointed by the President of the United States.

Duties of the Commission

The portion of the bill which applies especially to the coal industry is as follows:

The commission shall inquire into the general condition of labor employed in the mining industry of the United States, and especially as to the safety of mining and the methods of more efficient mining and the conservation of the mineral products of the United States; into existing relations between employers and employees; into the growth of associations of employers and of wage earners and the effect of such associations upon the relations between employers and employees; into any methods which have been tried in any state or in foreign countries for maintaining mutually satisfactory relations between employees and employers; into methods for avoiding or adjusting labor disputes through peaceful and conciliatory mediation and negotiations; and into the scope and methods and resources of existing bureaus of labor and of mines and into possible ways of increasing their usefulness so far as the mining industry is concerned. The commission shall seek to discover and to point out the underlying causes of dissatisfaction in the mining situation.

Alabama

Birmingham—It has been announced that the Sloss-Sheffield Steel & Iron Co. has agreed to pay the State of Alabama 45c. per ton for coal mined by the convicts employed by the company. This is an increase of 2½c. per ton over the terms of the original contract. The agreement between Gov. O'Neal and officials of the Sloss-Sheffield company was reached only after several conferences on the subject had been held.

Corey—The Tennessee Coal, Iron & Railroad Co. has fired the second battery of its new Koppers byproduct coke-oven plant. This battery of 70 ovens marks the completion of one-half of the large plant now under construction. It is expected that the two remaining batteries and the balance of the plant will be finished by June 1 of this year.

Colorado

Trinidad—After a conference of coal operators of Las Animas, Huerfano and Fremont Counties, the mine employees were allowed a substantial increase in wages, taking effect Apr. 1. Miners will receive an increase of 5c. per ton, run-of-mine, and all other classes of labor will receive a corresponding increase. More than 12,000 men are affected by the increase and these are scattered among the 100 mines at present in operation in the district. The operating companies have decided to increase the price of coal 10c. per ton, so the consumer, and not the companies, will really have to pay the advance. The Colorado Fuel & Iron and the Victor-American Fuel companies took the initiative in the movement. The other companies which agreed to the increase are the Rocky Mountain Fuel Co., the National Fuel Co. and the Consolidated Coal & Coke Co. Small Independent operators are expected to follow the action of the big companies.

Illinois

Peoria—The Peoria District Collieries Co. and the Western Coal Sales Co., two local concerns, were recently incorporated for the purpose of mining and selling coal. The present capitalization of these companies is small, but it is understood their capital will be considerably increased later. The Collieries company will operate the Scholl mines at Bartonville.

Streator—All the properties of the Star Coal Co., of Streator, have passed into the hands of a new company, to be known as the Star Coal Co. of Galesburg. The new company is capitalized at $51,000 with Thomas Fairbain as president. The properties include three mines at Cuba, ordinarily employing about 400 men, and one mine at Fiatt, which has been closed since Dec. 1. The Fairbain

interests own other coal operations in this locality. All the properties lie along the Burlington railroad, about 25 miles south of Galesburg.

Springfield—About 7350 men are idle in Sangamon County and 36 mines shut down during the suspension. Four thousand residents of Springfield alone are temporarily out of employment.

Chicago—Within a month or six weeks, the Chicago & North Western R.R. will begin the construction of its projected line from Peoria, Ill., to a connection with the Macoupin County Ry., a proprietary company, near Girard, in the south central portion of the state. The new line will give the North Western direct access to its extensive coal fields in southern Illinois. At present, this territory is reached over the Chicago & Alton.

Harrisburg—The last semi-monthly pay day for a number of mines in this vicinity was without doubt one of the largest in the history of the field. The O'Gara Coal Co. disbursed about $130,000, while the Saline County Coal Co. and the Wasson Coal Co. paid out practically $50,000 more.

Kewanee—The Kewanee Coal Co., which has been prospecting for some time on its property two miles east of here, recently encountered a 32-in. seam of coal, at a depth of 275 ft. This is known as the No. 3 or Spring Valley seam. Further drilling will be carried on in order to determine whether or not mining operations are likely to prove practicable.

Indiana

Indianapolis—Except for pumpers and other men employed to keep the properties in shape, the bituminous coal mines of Indiana are deserted and will remain idle until the 20,000 miners receive notice that the wage contract, agreed to in Cleveland, has been ratified by a referendum vote.

Brazil—The block coal and clay mines operated in connection with clay factories in Indiana will continue to work pending a settlement of the wage controversy by referendum vote of the miners, according to action taken by the official board of the Indiana Mine Workers. Some of the factories have their own mines for the production of coal. Their output is not sold elsewhere, and the miners' officials decided to allow these mines to continue in operation during the suspension. The factory owners have agreed to pay the mine employees according to the proposed scale. The most radical change in the local block-coal agreement will be the weekly pay to succeed the semi-monthly pay, a change which will be welcomed by miners and merchants.

Evansville—Following an agreement between Indiana miners and operators, two Evansville railroad mines are continuing to work during the general suspension with the understanding that in the meantime the miners will receive the new scale, or in event of failure to settle on a scale, will receive the rates that their officials have demanded.

Kentucky

Louisville—The operators and miners of western Kentucky were in conference here for five days before the miners drew up a proposition that the operators indicated a willingness to accept. The principal departure made by the miners from the Cleveland agreement concerns the percentage of lump coal in the run-of-mine product. This has heretofore been estimated at 62 per cent., but the miners now demand that in paying the men on a "run-of-mine" basis, allowance be made for the presence of 74.25 per cent. of lump coal. Inasmuch as the Cleveland agreement provides for an increase of 5c. per ton for lump coal (pick mined) and 3c. per ton for "run-of-mine," it can be seen that if the pay of the men were based on an estimate of 74.25 per cent. of lump coal, instead of 62 per cent., the effect would be a further increase over the Cleveland scale. The demands of the men, if granted, will establish a scale in the western Kentucky district of 92½c. per ton for lump coal and 67½c. per ton for "run-of-mine coal. The scale demanded for workmen paid by the day is as follows:

Tracklayers, $2.46; trappers, 75c.; bottom cagers, $2.23; drivers gathering with one mule, $2.46; drivers gathering with two mules or more, $2.67; riders, $2.23; water haulers, $2.23; timbermen, $2.46; pipemen, $2.36; all other inside day laborers, $2.23. For outside work the minimum is fixed at $2 a day. For blacksmiths a minimum of 33c. an hour is asked; for engineers, 35c.; for firemen, 32c.; for night watchmen, $2.23.

The demand that the percentage of lump be raised from 62 per cent. to 74.25 per cent. was qualified by an alternative proposition from the operators that if it be refused an actual test be made to determine the exact percentage.

Montana

Butte—The Trail Creek coal mines, which were closed down Apr. 1, throwing 300 men out of work, will be opened again immediately, as arrangements have been made with the Northern Pacific to operate the branch railway from the mines to the main line of the railroad.

Orders have been received from B. B. Thayer to close down the coal mines of the Anaconda Copper Co. These mines have been in operation 17 years and employ 216 men.

Bozeman—There is a persistent rumor current in this city to the effect that the Chestnut mines, near here, will be shut down indefinitely. The mines have been running on short schedule for several years. The property is owned and operated by the Northwestern Improvement Co.

Missouri

Kansas City—Coal operators of Kansas Missouri, Oklahoma and Arkansas met here, Apr. 5, to outline a proposition to be submitted to the United Mine workers of America, at a joint conference, to be held Apr. 8, when an effort will be made to renew the two-year contract that expired Apr. 1. The mines in the Southwest will remain in operation pending negotiations.

Ohio

Columbus—Operators in Ohio expect little difficulty in the adjustment of a mining scale. Some believe that a fortnight's suspension is all that will be necessary, while others think that it may require 30 days to work out the difficulties. Secretary and Treasurer G. W. Savage, of the Ohio division of the United Mine Workers is confident that the referendum vote will be favorable to the ratification of the wage scale. He believes the result in Ohio should be known by Apr. 15. Ballots for the referendum vote have already been sent out. One of the effects of closing down the Ohio mines will be the release of a large number of cars to the West Virginia fields. Operators in West Virginia have been running with a short-order supply for a good many weeks. As soon as the Ohio operators are able to resume work, a large tonnage will be rushed to Lake points and loaded to wait the opening of navigation. It is believed that, owing to the severe winter, navigation cannot be opened until about the middle of May.

St. Clairsville—The transfer of the property of the Rail & River Coal Co., of Pittsburg, to the Grand Trunk R.R., was made here, Mar. 30. The property lies in the southeastern part of Belmont County, and includes three producing mines in the Pittsburg No. 8 seam of coal, mining equipment and 30,000 acres of coal lands. The Rail & River Coal Co. is capitalized at $250,000.

New Philadelphia—Jeremiah E. Reeves has sued the James Mullins Coal Co., one of the largest coal operators in Tuscarawas County, for $38,000 damages, alleged to have been done to Reeves' coal land in the three years' time that the Mullins company leased it. More than 30 charges of carelessness by the defendants are made in the petition.

The property of the Dennison Mining Co., including 550 acres of coal land in Tuscarawas County, will be sold at public auction, Apr. 29, to satisfy the claims of the Union Trust Co., of Pittsburg, Penn.

Oklahoma

McAlester—It was announced here, Apr. 1, that the miners of the southwestern district would remain at work during the adjustment of a new wage scale. About 1500 miners in this locality are affected.

Pennsylvania

Bituminous

Pittsburg—Coal miners throughout western Pennsylvania will remain idle until Monday, Apr. 22, rounding out a three weeks' suspension in accordance with the decision reached Apr. 3, at the convention of district No. 5, United Mine Workers. The delegates decided to await the result of the international referendum vote to be tabulated Apr. 20. The Mercer-Butler-Armstrong field will be excepted, the men continuing at work with the companies paying the increased wages. There was a general agreement that the Cleveland wage-scale compromise would be approved.

Greensburg—Following the announcement of a wage increase at the various workings of the H. C. Frick Coke Co., other leading coal companies in Westmoreland, Fayette, Washington, Somerset, Cambria, Green and Clearfield counties, have taken similar action. The majority of the employees of these concerns are not affiliated with the miners' organization. Among the companies who have agreed to pay their employees an increase in wages averaging 7½ per cent. are the Jamison Coal & Coke Co., the Keystone Coal & Coke Co., Berwind-White Coal Co., United States Coal Co., Penn Gas Coal Co., Westmoreland Coal Co., Consolidation Coal Co., Quemahoning Coal Co., Somerset Coal Co., Pennsylvania Coal Co., Clearfield Coal Co., Rembrandt Peale Corporation, Peerless Coal & Coke Co., Somerset Coal Co. and over a hundred minor coal companies in the southwestern section of the state.

Uniontown—The W. J. Rainey Coke Co., one of the largest independent producers of the region, recently announced that it would install bath tubs, shower baths and other modern conveniences in all its houses occupied by employees. This is an innovation in the coke region. The company also is making about $100,000 worth of improvements to its plants.

Dubois—By a vote of 91 to 69 the delegates representing 40,000 miners of district No. 2, United Mine Workers, decided, Apr. 3, to accept the recommendation of District President Gilday, and continue working until Apr. 15. If a scale agreeable to the miners is framed in the meantime, work will continue without interruption.

Butler—The coroner's jury which investigated the boiler explosion at the mine of the Turner Coal Co. at Evans City on Mar. 23, when five men were seriously burned, one fatally, found the company guilty of negligence. Charged with neglect of duty, L. B. Gaiser, superintendent of the mine, waived a hearing and was bound over to court in $500 bail, furnished by the company.

Anthracite

Scranton—The suspension of operations in this region and around Carbondale is practically complete. Several washeries belonging to the D. L. & W. and D. & H. companies have been kept running to supply boiler fuel, although the mine workers declare their intention of calling out the men and making an effort to close down all washeries. The Oxford mine of the Peoples Coal Co. recently suspended operations to install a gasoline motor haulage system but is expected to keep going during the suspension just as it did in 1902. A number of small independent mine owners are trying to make arrangements to keep operating in order to supply the local trade. Miners employed at the Jermyn colliery at Old Forge are staying away from work, notwithstanding the fact that they have been offered a 10 per cent. increase in wages and any other concessions the operators in general may ultimately grant. No violence has been reported in this region and the guards formerly hired for times like this are not in evidence.

Wilkes-Barre—Recognition of the miners' union is being brought more and more prominently forward as an issue in the present controversy, independent of an increase in wages. At a recent meeting of a thousand miners at Nanticoke, it was strongly declared that they would not accept an increase in pay unless accompanied by recognition of the union.

The West End Coal Co. at Mocanaqua and the W. T. Payne Co. at Luzerne are keeping their washeries running and are shipping coal. The only steps taken to oppose this activity consisted in calling out the union men employed at the plants.

Hazleton—While peace has prevailed generally throughout the coal fields, there was recently an instance of violence at McAdoo, near here. A fireboss, employed in one of the collieries, was probably fatally injured in a fight, the direct outcome of the suspension.

Pottsville—None of the collieries in the Schuylkill region are working. The plants of the Philadelphia & Reading company had steam up, ready for work, Apr. 2, but no men reported. It is not expected that an effort will be made by any of the collieries to work until after the Philadelphia conference, on Apr. 10, although several individual operators claim that they can get enough men to work their plants whenever they make the attempt.

Shamokin—An attempt of the operators to open the Kathryn colliery, Apr. 3, failed, because members of the union personally persuaded all the men who reported for work to go back home. The company officials say they will try again. That the Reading company expects the trouble to be drawn out was indicated recently, when it ordered all of the mules hoisted from the Henry Clay shaft. The district is absolutely quiet.

West Virginia

Charleston—The 30,000 miners of the Kanawha district received notice from their officials, Apr. 1, that they might resume work pending settlement of the final details of the Cleveland scale, because their markets were threatened by the nonunion districts of the state. The policy committee of the United Mine Workers, at its Cleveland meeting, gave this privilege.

The Charleston-Kanawha Coal Co., incorporated recently and backed by Pittsburg capital, has taken over the coal underlying about 60,000 acres in the Kanawha field, immediately in the neighborhood of Charleston. Development will begin shortly and the operations are expected to become among the largest in the state.

Pocahontas—The Pocahontas Consolidated Collieries Co. has recently purchased the lease and properties of the Cirrhus Coal & Coke Co., for about $107,000. This property is at Big Four, W. Va. Both the No. 3 and No. 4 Pocahontas beds are being mined.

Heavy rains in the Pocahontas field recently, have caused much damage and delay of operations. Two mines were completely flooded, and there were 20 landslides along the Norfolk & Western Ry., between Vivian and Williamson.

Elkins—The mines of the Davis Colliery Co., at Junior, have resumed operations after a shutdown of 13 months.

Welch—At the request of the relief committee of the Red Cross Society, Governor Glasscock, on Apr. 3, issued an appeal for aid for the sufferers from the recent mine disaster at Jed.

England

London—The miners' federation, following a long session, Apr. 6, officially declared off the great coal strike, and ordered the men to return to work immediately. If the surface men's grievances can be settled, there seems to be nothing to prevent a resumption of work throughout the coal fields. The protests of the Yorkshire and Fifeshire miners against the decision of the Miners' Federation are not likely to be followed by action. The miners' associations of these counties have already recommended the men to return to work. General activity prevails in all the coal-mining districts.

Personals

Edward H. Coxe, of Birmingham, Ala., has resigned his position as general superintendent of the coal mines and coke ovens of the Tennessee Coal, Iron & R.R. Co., effective June 1, 1912.

C. C. Anderson, general superintendent of the Northwestern Improvement Co., and E. M. Cortright, engineer of the Montana Coal & Iron Co., have recently been elected members of the Montana Society of Engineers.

Howard Elliott, president of the Northern Pacific R.R., in company with a number of the railroad's officials, recently inspected the coal properties of the Northwestern Improvement Co. in the vicinity of Red Lodge, Montana.

John L. Collin has obtained passports to France and Italy. As a representative of the Pittsburg-Buffalo Co., of Pittsburg, he will sail at once for France to negotiate the sale of a large quantity of coal to the French government.

William H. Grady has resigned his position as chief engineer of the coal mines of the Tennessee Coal, Iron & R.R. Co., effective Apr. 1. C. G. Owen, principal assistant engineer, has been appointed acting chief engineer with offices at Birmingham, Ala.

J. M. Page, division engineer, has been promoted to the position of assistant superintendent of the Pratt No. 1 division of the Tennessee Coal, Iron & R.R. Co.'s coal mines, to succeed William L. Martin, resigned. Mr. Page will be located as heretofore, at Pratt City, Ala.

John S. Critchlow, manager of the Western Fuel Co., of Salt Lake City, has been placed in charge of the Western Pacific Fuel Co., of San Francisco, and will take up his new duties shortly after Apr. 1. The Western Pacific Fuel Co. was recently purchased by the Castle Valley Coal Co., of Salt Lake.

F. D. Underwood, president of the Erie railroad, accompanied by Vice-President Stuart and a party of railroad officials, recently made an extended trip through the coal regions in the vicinity of Scranton, Penn., with the idea of obtaining first-hand information in regard to conditions which at present prevail in this section.

Milnor Roberts, dean of the College of Mines, University of Washington, and Prof. Joseph Daniels, recently accompanied a party of 20 senior and junior students on a trip of mine inspection to Texada Island, B. C. The objects of the trip were to study the deposits of iron, copper, gold and limestone, and to inspect the lime kilns, oil-burning smelters and general mining equipment of the region. Headquarters were established at Van Anda, near the north end of the island.

Chronology of Coal Mining for March

Mar. 7—An explosion of gas in the mine of the Diamond Vale Collieries Co., at Merritt, B. C., killed 7 men and injured two.

Mar. 13—Anthracite operators formally rejected the mine workers' demands.

Mar. 15—Officials of the United Mine Workers refused counter proposition of the anthracite operators.

Mar. 16—An explosion in the Italianka coal mine, Uzovka, Russia, killed 45 men.

Mar. 19—The Interstate Commerce Commission ordered a 10c. reduction in the Pittsburg-Lake freight rate.—Strike in German coal fields ended after conference of miners' leaders.

Mar. 20—Explosion in the Chant No. 2 mine of Sans Bois Coal Co., McCurtain, Okla., killed 74 men.—Conference of bituminous operators and miners opened in Cleveland, Ohio.

Mar. 26—Explosion in the mine of the Jed Coal & Coke Co., Jed, W. Va., killed 81 men.

Mar. 29—Compromise agreement effected between bituminous operators and miners in conference at Cleveland.—Suspension of work in anthracite mines of Pennsylvania was ordered by officials of United Mine Workers.—Bill providing minimum wage for miners became a law in Great Britain.

Construction News

Harlan, Ky.—The Wisconsin Steel Co. will erect another battery of byproduct coke ovens at their local plant during the coming summer.

Ashland, Ky.—William G. Eaton, of Cincinnati, and associates will build 100 byproduct coke ovens, at Ashland. Estimated cost, $1,000,000.

Barbourville, Ky.—The Harlan Coal Co. is installing machinery for manufacturing lumber and will begin work this month on opening its recently acquired coal lands.

Birmingham, Ala.—The Roden Coal Co. will erect 20 miners' dwellings and a new commissary, at the Marvel mine; $20,000 is appropriated for this work. B. F. Roden, Jr., is president.

Uniontown, Penn.—The Superba Coal Co., operating at Evans Station, near here, will make a new opening at its mine and undertake other improvements in order to ship coal on the Pennsylvania R.R. I. W. Buttermore will have charge of the work.

Milwaukee, Wis.—The Pennsylvania Coal & Supply Co. has secured options on 10 acres of land along the water front and will build a coal-storage and transfer dock. The company has recently increased its capitalization from $750,000 to $1,000,000. Jesse B. Whitwall is president.

Birmingham, Ala.—With the completion of the merger of the Woodward Iron Co. and Birmingham Coal & Iron Co. properties, it is expected that the contemplated improvements and developments will go forward. These include the construction of a 400-ton furnace and a battery of byproduct ovens.

Publications Received

REPORT OF INVESTIGATION OF TURTLE MOUNTAIN, FRANK, ALBERTA. By Reginald A. Daly, W. G. Miller and George S. Rice. Memoir No. 27, Canadian Department of Mines. 34 pages. 6¾x10 in., 11 illustrations in text, 19 plates, 2 maps. Government Printing Bureau, Ottawa.

The authors of this report constitute a commission appointed by the Canadian Minister of Mines, to determine whether mining operations in the Turtle Mountain are likely to bring about a landslide, and thus endanger the town of Frank. The commission has also reported on natural conditions likely to produce a slide and has made certain recommendations.

STARTING CURRENTS OF TRANSFORMERS. By Trygve D. Yensen. Bulletin No. 55, Engineering Experiment Station, University of Illinois. 45 pages, 6x9 in., illustrated.

The transformer has come to be regarded as one of the most reliable and simple pieces of electrical apparatus. As new material, however, is utilized to increase its efficiency, new problems arise. One of these problems is the momentary rush of current that occurs upon closing the primary circuit of a transformer. In this bulletin, it is shown that while this starting current for old-type transformers may rise as high as four times full load current, it may rise to more than seven times full load current for the new type with silicon steel cores. The phenomenon is fully explained and illustrated by means of oscillograms.

Industrial Notes

The William J. Oliver Manufacturing Co., Knoxville, Tenn., has received an order for 450 mining cars to be used by the Tennessee Coal, Iron & R.R. Co., at its Edgewater mines. The estimated cost of the cars is $30,000. This is a rush order. The Oliver company some time ago made a reputation on a rush order of cars for the Panama Canal.

The Rock Island Coal Mining Co., of Hartshorne, Okla., announces that having sold the output of its Hartshorne group of mines to the Chicago, Rock Island & Pacific Ry. Co., effective Apr. 1, it feels that the territory served with its Alderson coal will not justify the maintenance of sales forces at Oklahoma City, and Fort Worth, and its sales offices at those points will, therefore, be abandoned on that date. Its Alderson coal will be sold to the McAlester Fuel Co., who will distribute it to the trade.

William L. Rickard and Clifford A. Sloan announce the organization of an advertising company, which will conduct its business under the corporate name of Rickard & Sloan. The offices of the company are located in the Evening Post Building, 20 Vesey St., New York. Particular attention will be given to the planning and management of advertising campaigns for concerns engaged in the manufacture of mechanical and electrical apparatus and accessories. The service of the company will include the writing and placing of advertising in trade and other periodicals, and the production and distribution of bulletins, catalogs and circulars.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The panic prices of last month have been liberally discounted during the week, and the market generally has experienced a sharp recession. The movement is confined almost entirely to contracts, there being little or no demand for coal in the open market. Consumers express entire confidence in the belief that the referendum vote of the miners, upon which the bituminous situation now hinges, will be favorable, and that a general resumption in the soft-coal fields will become effective Monday, Apr. 22. The trade has been further depressed by a heavy selling movement on the part of a large number of dealers, who acquired surplus stocks on speculation, for which they are now seeking purchasers.

In the Eastern markets the trade is practically at a standstill, insofar as new business goes. The milder weather, together with the curtailed production at the mines, has removed the last evidence of the railroad congestion, and good tonnages continue to arrive from districts unaffected by the suspension. Prices on bituminous have slumped freely at all points, but are by no means back to the low level prevailing through the early part of the winter. In anthracite it is believed no great inconvenience will be experienced by the consumers before May 1. There are no supplies in the hands of the wholesale dealers and nothing moving in, while requests for prices are met with the reply that there are no quotations, but the consumers generally are well stocked; shipments so far, this month, have been about equal to one day's run under normal conditions.

The trade in Ohio is busy readjusting itself and making preparations for only a short suspension. Prices have softened considerably, due partially to the feeling that there was plenty of the West Virginia and Kentucky product available. It is thought the suspension will be of sufficient duration to work off the surpluses accumulated in anticipation of the shutdown, and this, together with the shortage in the Northwest, has caused a strong optimistic feeling over the outlook in Ohio. The railroad movement here and in West Virginia is about normal.

Heavy tonnages of Eastern coals were sent into the middle West on speculation, which resulted in the market being overshipped, and the trade is now dull and heavy. No shortage will develop here unless the mines are idle for a month or more.

Boston, Mass.

Bituminous has been generally unsettled since the news of the prospective adjustment of the labor troubles, and a decided reaction has set in against the high prices of the last of March. While it is realized that the output is light for the present, anything like panic prices are liberally discounted, and buyers are simply waiting developments. Many bought from two to three months' supply in anticipation of trouble and they are not interested now except at nearly normal prices. The British situation, too, has so far improved that prices at Baltimore and Hampton Roads have receded considerably, and when the tonnage now engaged is cleared we are likely to see signs of contracting for the usual coastwise market. Something in that line has already been done and there will soon remain only the issue of anthracite to interfere with the orderly course of trade. That we are to have a reasonably active market is almost certain.

All-rail, the stop in mining has enabled the roads to work out of the congestion, and the movement is much improved. A large amount of speculative coal is gradually being absorbed at a rather uneven line of prices, but there are still buyers enough, in urgent need, to furnish a market.

The Southern agencies are out looking to place May coal but there will probably be but small tonnages sold until something like a working basis is reached. It remains to see what will be the base price f.o.b. Hampton Roads and Baltimore, for season shipment. Many of the larger buyers will wait until the market settles down.

With warm weather the public seems to have lost interest in anthracite. The dealers, however, are all short of stocks and are easing the trade as best they can. The recent advances at retail have served their purposes in stopping consumers from putting in next season's supply, and if the suspension is limited to 30 days, the dealers will not be put to such great inconvenience. There is fear that shipments will be very slow when mining is resumed, and that there will be more or less anxiety during the entire summer.

Water freights have further eased off with the chance of anthracite transportation being diverted to soft coal, and the recent slow loading at the Virginia terminals. The old contract year has expired and few charters have been made coastwise on April coal. Large tonnages from Hampton Roads to Boston would not command more than $1.30@1.35, as against $1.50 ten days or so ago. The Reading barge rate on cargoes all bituminous are announced to be $1.20, Philadelphia to Boston.

Coal quotations range about as follows:

Clearfield, f.o.b. Philadelphia.....	$2.75@3.50
Clearfield, f.o.b. New York.......	2.85@3.80
Clearfield, *en route*, f.o.b. mine basis	1.25@2.25
Georges Creek, (April shipment) f.o.b. Baltimore..............	2.70@2.85
Pocahontas, New River, Providence, on cars..............	5.25@5.75

New York

Trade conditions at this point are unusually dull and quiet, considering the labor troubles in effect at the mines. The market experienced a renewed activity during the latter part of last week, but this was only of short duration, and prices now are at the lowest point they have reached since the panicky conditions in effect just previous to the suspension. Some of the large companies continue to take an optimistic view of the situation, and state that they are well satisfied with the outlook, but if prices are any criterion the prospects for an active trade are anything but encouraging.

The curtailment in production at the mines, together with the milder weather, has definitely relieved the railroad congestion, and the movement of bituminous into New York has been good. Water freights are also easier, due to the release of a large number of transports engaged in the anthracite business. Bituminous prices are hardly quotable as few transactions are being made, but are nominally about $2.90@3.25 f.o.b.

The situation in anthracite is somewhat harder as all arrivals have now ceased and everyone is anxiously awaiting the results of the conference at Philadelphia. The anthracite companies have cleaned up their supplies of egg, nut and steam at circular prices, and there is a particular shortage in the steam grades at the present time. It is believed, however, that there is a great deal of anthracite held on speculation. Should the miners and operators reach an agreement, it is probable that such heavy tonnages will be thrown on the open market that prices will decline sharply. On the other hand, should an agreement not be reached, the speculators will no doubt realize handsome

profits. Current anthracite quotations here, are about as follows:

Broken	$5.25
Egg	5.50
Nut	5.20@5.50
Pea	4.50
Buckwheat	4.00
Rice	3.10@3.50
Barley	2.25@2.50

Philadelphia, Penn.

A little touch of winter early in the week had the effect of spurring retail trade somewhat in this vicinity, but it soon fell off again. One- and two-ton lots are about the way orders are coming in, and the dealers are commencing to get a little anxious about the stocks of coal they have on hand, fearing that matters will be adjusted between the miners and operators, before they are able to work off the stocks they were obliged to pay high prices for. It is not thought, however, that there is likely to be a very prompt settlement of the strike issue, as both sides seem to be determined as to what they desire and are willing to give. Some of the large wholesale operators seem to think that the situation is rather critical. Manufacturing establishments in and around the city are conserving their supplies, and making them go as far as possible.

Of course, as far as the wholesale market is concerned, there is practically nothing moving. The receipts so far this month are about what would be produced in one day of normal mining, and this is mostly coal that has already been mined, but just now coming in. Little or no coal is in stock, and requests for prices are met with the invariable response that no quotations or promises of shipments can be made until mining operations are resumed.

Pittsburg

There is no coal market quotable this week, and the mines are idle pending the result of the referendum vote. Operators expect the agreements to be settled in time to open the mines Monday, Apr. 22. As the operators have no coal to ship, the market would be made by such odd lots as speculators could sell and there does not seem to be enough of this to establish any definite figures, though there is a little slack being sold now and then. As to contracts, operators have not quoted prices yet, since the wage matter is not really settled. The basis will presumably be last season's price of $1.15 for mine-run, plus the advance in the mining rate, but subject to such concessions as may possibly develop. No prices have been named yet on lake coal, but the market will probably open up within a fortnight. The ice has been particularly thick, and no boats are expected to get into Lake Erie ports for loading until about May 5.

Connellsville Coke—The coke market has remained stiff, despite the fact that the wage settlement in the union bituminous districts removes the prospect of there being any demand for raw Connellsville coal; it is a question of supply and demand of coke alone. The furnaces do not seem to have called for suspension of shipments to any extent to use up the stocks accumulated in February and March, and coke is still scarce. The market for spot furnace coke is only a shade easier, at $2.30 to $2.40, and the same is true of spot foundry coke, which runs at $2.75 to $3 according to grade. There has been little contracting done, though one or two second-quarter contracts have been put through at about $2. A number of foundry-coke contracts have been made, at prices running from $2.40 up to $2.65.

The New York State Steel Co. has closed contracts for two lots of furnace coke aggregating 12,000 tons monthly for April, May and June, paying a trifle under $2 for one lot and about $2.10 for the other lot, there being a difference in the quality of the two grades. Based on this fact the absurd report has been in circulation that a sale had been made of 12,000 tons a month for the balance of the year at $2.10, which would be an unreasonable figure. Foundry coke has been in light demand and is a trifle easier. We quote: Prompt furnace, $2.40; prompt foundry, $2.75@3, per ton at ovens.

The *Courier* reports production in the Connellsville and lower Conellsville in the week ending Mar. 30 at 413,141 tons, an increase of 15,000 tons, and shipments at 4678 cars to Pittsburg, 6702 cars to points West and 1070 cars to points East, a total of 12,450 cars, or an increase of 800.

Baltimore, Md.

While prices have by no means dropped to the low level prevailing before the recent activity set in, the figures quoted in the Baltimore market during the past week were considerably below those asked two weeks or even one week ago. In numerous instances the best grades have sold at $2.75 per ton, whereas three or four weeks ago, they brought $3.25@3.35, while the lowest grades are selling at $2 or less. This latter grade, when the demand was at its height in March, brought $2.50@2.75 per ton, and consumers purchased it willingly.

Notwithstanding the settlement of the English strike, there were large shipments of coal made from this port during the week to countries which had been depending on the English mines for their supply. Among these were 5000 tons for South America, shipped by the Hutchinson Coal Co., of Philadelphia, and 5000 tons by the Consolidation Coal Co. destined for Egypt.

Many of the Baltimore companies have renewed contracts for the ensuing year, while others have not yet closed with some of their largest customers. One operator stated that not a few consumers were holding off, believing that contracts could be renewed at lower prices than now prevail. The opinion among operators here is that there will be no strike in the bituminous regions. They feel quite sure that concessions will be made on both sides and that the miners will continue at work.

Buffalo, N. Y.

The coal trade is very dull, with next to no anthracite moving and just enough bituminous to keep the jobber anxious. He has done well as a rule during the late stocking-up season, but now finds that there are miners enough at work to furnish all the coal that is wanted, so the prices are very slack. Some members of the bituminous trade are confident that prices will not drop back to the low level of last season, but others find that they have pretty nearly done so already, certain of the cheaper coals being offered last week as low as 95c. at the mines for mine-run.

As a rule the consumers at points easily reached are well supplied and will not buy at any price, but there are other points that are short, mainly on account of the failure of the railroads to deliver the coal. This is quite often the case at small Canadian towns that are dependent on Buffalo as a supply center. The jobber ought to be in a position to take advantage of such conditions, but the roads are as ready to deliver low-priced coal as any, so that the control of the market is very hard to maintain.

While some bituminous coal is selling at prices all the way up to 50c. over old quotations, there is also some moving at about the former figures, $2.60 for Pittsburg three-quarter, $2.50 for mine-run and $2.25 for slack, with coke also not so strong, but usually commanding a little more than the former $4.50 for best Connellsville foundry.

There is now little uneasiness over the mining situation. No prolonged strike is looked for by anyone, though it is believed that the operators everywhere will resist the chief demand of the miners for a recognition of the union. Quite a good many jobbers have made good profits in bituminous coal, but as a rule the mine owners had too many contracts to fill to make it easy to take advantage of the situation.

There is not much prospect of a supply of anthracite right away. Neither the shipping agents of the large companies nor the sellers of independent anthracite have a supply and nobody is making any effort to fill orders. There is not even any selling on future delivery, so that when the trade is resumed it will be new business.

Columbus, Ohio

Following the announcement that there would not be a suspension of more than 30 days at the most, and probably only three weeks, the coal trade in Ohio has softened considerably from the high quotations paid during the latter part of March. With the settlement of the wage scale and the general good feeling existing between the operators and miners, it is believed that the trade will soon be in a normal condition.

Prices have weakened materially, and they are nearer the figures which prevailed several months before the advance. Another factor which tended to keep down prices recently was the feeling that there was plenty of West Virginia and Kentucky coal on hand. Then, again, most of the steam users succeeded in getting quite a surplus, and there is no one now who would pay very high prices.

Jobbers are playing a waiting game and will be on hand when operations are again resumed. There is practically no demand for the domestic grades, and thus prices are about down to the level which prevailed during the greater part of the winter. The steam grades, of course, are in good demand, but prices are much reduced from the high premiums secured two weeks ago.

Operators are looking forward to a good Lake business, as reports show that little or no coal is being carried over on the docks in the Northwest. With a suspension of several weeks or a month, the surplus on the market will be used up, and this will help to keep quotations up relatively high. There are sufficient stocks in the hands of retailers to fill the small orders which are coming in, and no anxiety is felt on that score. Retailers have a large amount of coal which was held up by the congestion in railroad traffic, and this is now being delivered.

Prices prevailing in Ohio fields are:

Hocking Valley	
Domestic lump	\$1.55
¾-in.	1.45
Mine-run	1.15
Nut	1.15
Nut, pea and slack	1.00
Coarse slack	0.80
Pittsburg No. 8	
¾-in.	\$1.40
Mine-run	1.15
Coarse slack	1.00
Pomeroy Bend	
Domestic lump	\$1.80
¾-in.	1.55
Mine-run	1.25
Nut, pea and slack	1.05
Coarse slack	1.00
Kanawha	
Domestic lump	\$1.50
¾-in.	1.25
Mine-run	1.10
Nut, pea and slack	0.90
Coarse slack	0.80

Cleveland, Ohio

The excitement in the strike situation is over, but now comes the enevitable adjustment. Coal was bought at the eleventh hour and the settlement terminated so suddenly that many parties hastily canceled orders, under various excuses. This has caused friction and bad feeling, and naturally so. The situation at this time is practically at a standstill, owing to everyone stocking up in anticipation of a strike, and a good many are dissatisfied that it failed to materialize. However, the precaution was well advised as it was a guess as to the outcome, and it certainly was not expected that a settlement would be arrived at so abruptly.

Hampton Roads, Va.

There has been a decided drop in coal prices at Hampton Roads during the past few days; last Saturday New River and Pocahontas coals were selling at \$4@4.25 per ton f.o.b. and even at \$4.50, while today the same coals are bringing \$3.50@3.75. High volatile coals, considerable tonnage of which was shipped to tidewater lately over the Chesapeake & Ohio and Norfolk & Western Railways, has dropped to \$2.50@2.75, with a lessened demand.

Several of the large selling agencies are in bad shape for coal to load on ships already here, or chartered, and there is still a heavy demand for the best grades, as the vessel tonnage here is far in excess of the coal on hand at the piers. The car supply at the mines has been slightly better during the past week and a further improvement is looked for, but the Virginian Ry., which was getting better movement on its cars, has again been blocked by an immense slide just west of Roanoke, Va. During the first four days of the month 68,167 tons were loaded for foreign ports at the two Norfolk coal piers.

It is reported that the Panama Canal contract for coal, on which bids were made last month, and rejected by the Commission, has been given to the Pocahontas Fuel Co., covering all requirements from Apr. 1, 1912, to Oct. 1, 1914, at a price of \$2.70 per long ton, f.o.b. Hampton Roads. It is understood that the coal may be shipped from either of the three Hampton Roads piers and that it will be divided up among four or five of the largest shippers at those ports.

Charleston, W. Va.

The transferring of engines and cars from other lines to the West Virginia field, especially along the Chesapeake & Ohio, has assisted greatly in relieving a situation that permitted the mines to operate not over half time. Several thousand cars have been thrown over the C. & O. lines in addition to about a dozen engines.

Not all the mines, however, have profitted by the additional cars. Contrary to expectations about 2000 miners have steadfastly refused to return to work since the first of the month. Some of the large mines along the north side of the Kanawha River have not shipped a ton of coal this month. These are mines at which union men are employed and where the foreign element predominate. The instructions of the union officials have been respected by the Americans and not by the foreigners. The latter allege that heretofore when they entered into an agreement to remain at work, pending a settlement of a wage scale, they have always gotten the worst of it. In one case, it is pointed out, that the operators refused to pay the increase between the time of the expiration of the old contract and the new one, although such an agreement had been made.

The great demand for coal and the high prices prevailing, is making the present shutdown expensive to the operators, who, as a rule, have not been enjoying good prices during the past year or two. The operations at Boomer, owned by the Hanna interests, and the Sunday Creek mines near Boomer, are the heaviest sufferers by the failure of the foreign union men to continue at work.

The output of coal in the Kanawha and New River districts during the month of March was 54,150 tons greater than in February, yet the mines were operated on an average of only 9.8 days, owing to a shortage of cars. The output of the Kanawha, New River and Kentucky districts along the line of the Chesapeake & Ohio was 1,508,090 tons.

Louisville, Ky.

Coal dealers of Louisville, both wholesale and retail, are experiencing considerable difficulty in meeting demands upon them, due to reported lack of car facilities at the mines. The retail dealers are not having as much trouble as the wholesalers, as the warm weather has materially decreased the scope of their business for the present.

Wholesalers who supply commercial plants, office buildings, etc., are being put to considerable trouble. Mine operators lay the slowness in delivery to their inability to get cars. The high waters at present are also interfering seriously with railroad facilities. Many of the Louisville dealers have taken time by the forelock and are fairly well supplied with coal, so much so that frequent requests from other cities have come to them for aid.

Nashville, Tenn.

Since the strike has been settled there is very little activity in the west Kentucky coal fields. The usual dullness in domestic lines incident to the warm weather, combined with the extra storing done the latter part of March, means that few of the operating companies have any business or will have for some time.

Screenings are scarce and cannot be had at any price, owing to the inability of mines to move the larger-size coal.

The operators and miners in the union field of west Kentucky are now attempting to settle their differences, the miners contending for the same basis of settlement that was made in Cleveland, which most of the operators are vigorously opposing on account of the competition which they have in this field with the nonunion mines. There seems to be quite a difference of opinion as to whether or not a settlement can be effected in this district, many believing that it cannot, for quite a while at least.

Indianapolis

As a result of the suspension which went into effect Apr. 1, no bituminous coal will be taken from the mines of this state by union miners, except in case of necessity, and then only by permission of the district officials. The suspension differs from a strike, since the miners readily consent to leave pump men and others at work to protect the mines.

The bituminous miners will be out only long enough for the wage agreement to be ratified by a referendum vote. The tickets for this are now being sent out from the miners' headquarters, and it is confidently believed the agreement will be sanctioned by a large majority. It will take at least two weeks to take the vote and will require additional time to canvas the same, so that the bituminous miners are not expecting to resume work much before May 1.

Operators and miners alike are greatly pleased over a settlement having been reached without a long strike. J. C. Kolsem and P. H. Penna, president and secretary of the Indiana Operators' Association, and W. D. Van Horn and Charles Fox, secretary of the Indiana Mine Workers' Association, all express gratification because an industrial conflict was avoided. It is best for the members of the associations and for the industrial world as well, they assert.

Chicago

With the expectation that mines in the Illinois field will resume operations within a month, Chicago coal dealers are now bending their efforts toward readjusting their business to the decidedly lower scale of prices.

There is absolute quiet in the domestic market and steam users are supplied for a month at least. There was a lot of nonunion coal bought on speculation and these buyers lost heavily as a result of the agreement between the operators and miners. Eastern coals were shipped here at a delivered cost of $3 and the same coal afterward sold at $2 a ton, or less.

The screenings situation has occupied a fairly strong position. Screenings of good grade and fair size have brought $2 to $2.25, Chicago. Coke prices are unchanged.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.50@2.75
Steam lump	2.17
Screenings	1.67@1.82
Springfield:	
Domestic lump	$2.57@2.82
Steam lump	2.17
Mine-run	1.97@2.07
Screenings	1.67@1.82
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.17
Mine-run	1.97@2.07
Screenings	1.67@1.77
Pocahontas and New River:	
Mine-run	$3.15
Lump and egg	4.05

Prices asked for coke are: Connellsville and Wise County, $4.85; byproduct, egg and stove, $4.95; byproduct, nut, $4.75; gas house, $5.

Minneapolis—St. Paul

Coal men in the Twin Cities are doing nothing and the trade is practically at a standstill. Men who have been in the coal business for over 20 years say that never before have they seen the time when business was as quiet as it is at the present time. Generally this period of the year is contracting time, but no one seems to have any prices and, although they have numerous inquiries from parties regarding contracts, they are not at liberty to sign up.

Since the Health Department of Minneapolis, especially the smoke inspector, together with the Civic Commerce Commission, has become quite aggressive in seeking to abate the smoke nuisance, representatives of wholesale companies held a conference with Smoke Inspector Allen to know what his attitude was toward coal other than the so called smokeless coals.

The coal men contend, of course, that the coal from other fields should continue to have a fair show in the steam trade in this city and that from the standpoint of efficiency, Illinois, Indiana, Ohio and Pennsylvania bituminous coals could be shown to have many good points in their favor, and the Health Department should not commend or recommend any one coal for use in plants. Mr. Allen, the city smoke inspector, made it clear that it was not the intention to favor any one coal, but that it was a matter of educating the consumers to the installation of automatic stokers and the correct combustion of fuel, all of which would take time to bring about. He asked for the coöperation of the coal trade in bringing about better conditions in the firing of coal in order to minimize the present nuisance from excessive smoke.

The retail coal business in both cities has been exceptionally dull during the past week as the weather has been very mild.

St. Louis, Mo.

There is very little doing in the St. Louis coal market. As a matter of fact, it is at a standstill, although, on good authority, it is understood there will be no shortage of coal in St. Louis if the mines remain idle for four weeks. There are several hundred cars of coal on track on the east side of the river and at the mines on the railroads owned by coal-producing companies, and there is very little outside coal coming in.

A few cars of smokeless are straggling in, but there is nothing in the way of anthracite, and Kentucky coal is practically a thing of the past, unless something unforeseen comes up. However, there is still a few cars of Kentucky coal coming in on contract, but the bulk of that coming to St. Louis has been disposed of by a Tennessee selling agency in Chicago; this amounted to 10,000 tons.

There is no shortage in this market and probably will not be, as everything indicates that the miners will vote for acceptance of the terms as submitted to them by their representatives and the operators. The mines will probably resume work between Apr. 20 and the first of next month.

A Chicago coal man, with a mine in Franklin County, and a St. Louis office, offered to build a half mile of railroad at East St. Louis, connecting the L. & N. with the I. C., if the railroad would furnish the steel, in order to get the L. & N. to allow their equipment to go to Chicago. The L. & N. turned the proposition down flatly, unless they were guaranteed an empty coal car in return for every load they delivered the I. C., the same to be delivered on the same day. It was impossible to make the guarantee, and consequently the coal was sacrificed on the St. Louis market, and helped further to depress prices.

Portland, Ore.

Coal dealers are not at all optimistic over the outlook here, one of the chief reasons being the extensive introduction of oil. In a great many instances oil is supplanting coal here and throughout the state at steam plants. But with the opening of the Panama Canal, it is expected there will be a good demand for coal, as the great majority of vessels engaged in the coast to coast trade will probably be coal burners. The steamers in the coastwise trade are now burning chiefly oil.

The demand for coal has been very light here this winter, and there is some complaint coming from the old dealers to the effect that much inferior coal has found its way on the market. Storage prices will probably not be made effective for a couple of months yet, although the

weather is already summerlike here. It is expected that the Eastern coal strike may have some effect on the Wyoming coals, and, if this should prove true, local dealers will have an opportunity to gain some of the profit they had in view last winter, which failed to materialize because of the mild weather.

A great deal of interest is taken in the Alaskan coal fields, and if they are thrown open to development and cheaper coal made available, manufacturing will be given a strong impetus. For the present the freight is preventing coal from meeting with the demand here that dealers would like to see.

San Francisco

Imports by sea during the past week comprise 9462 tons of British Columbia, and one cargo, 5160 tons, of Pocahontas, the latter consigned to the United States government for navy uses. Car shipments from the Rocky Mountains were normal; the demand for this coal keeps good, and had it not been for the accumulated stocks in dealers' yards, due to the mild winter, receipts would doubtless have been much heavier.

The Western Fuel Co., a San Francisco corporation, owning large collieries in British Columbia, has been for some time past the dominant factor in this market, so far as British Columbia and Australian coal is concerned. Recently this company absorbed the coal business of a local firm, which was a direct importer and distributor of Australian, and now, as a matter of fact, it has no competitor in either this or the British Columbia product.

While, as previously stated, no accurate data are obtainable as to the quantity of Rocky Mountain coal coming into this state, there can be no question but that it is gaining in favor and securing a strong foothold in the domestic trade; the quality is well liked on account of its cleanliness, and the lower freight rates have enabled the colliery owners to land it here at reasonable prices.

Current prices to dealers are as follows, per ton:

Wellington (British Columbia)	$8.00
Pelau Main (Australian)	8.00
Rocky Mountain	8.50
Cumberland	12.50
Anthracite (Pennsylvania)	15.00

Production and Transportation Statistics

Baltimore Exports

For the period of three months; that is, January, February and March, 149,320 tons of coal were exported from Baltimore to consumers in 11 different countries. February tonnage was heavy, 41,129 tons having been shipped from this port during that month, but the demand was the heaviest during March, when 83,536 tons were loaded here for foreign ports. In January, the tonnage was light, totaling 24,655 tons, as in that month, the strike in England had not yet begun.

Exports

Total exports of anthracite during January, 1912, were 221,854 tons, as compared with 251,737 for the same month last year. Bituminous exports for January, 1912, exclusive of bunker coal, were 667,263 tons, as compared with 740,974 tons for January, 1911. Bunker or fuel coal laden on vessels in the foreign trade amounted to 552,965 tons in January, 1912, as compared with 481,874 tons for same month last year. Exports of coke for January, 1912, were 53,114 tons as compared with 87,578 tons in January, 1911.

Alaska

Shipments of coal to Alaska for January, 1912, were 523 tons as compared with 1107 tons in January, 1911.

Porto Rico

Anthracite shipments to Porto Rico for January, 1911 and 1912, were 1695 and 305 tons respectively. Bituminous shipments for the same months were 8203 and 2233 tons respectively.

Domestic Coastwise Movement

The following is a comparative statement of domestic coal shipments from the five principal Atlantic ports for January, 1911-12, in long tons:

	1911	1912
New York	2,355,276	2,337,474
Philadelphia	555,723	436,361
Baltimore	422,840	265,050
Newport News	244,022	212,194
Norfolk	285,880	389,781
Total	3,863,741	3,640,860

Pennsylvania Railroad

The following is a comparative statement of coal and coke carried on the P. R.R. Co.'s lines east of Pittsburg and Erie for the first two months of 1911-12, in short tons:

	1912	1911
Anthracite	2,147,761	1,938,093
Bituminous	7,668,282	6,594,e38
Coke	1,964,184	1,683,771
Total	11,780,227	10,216,002

Anthracite Shipments

March	1912	1911	Changes
Phila. & Read.	1,472,696	1,057,279	+115,427
Lehigh Valley	1,225,019	1,086,529	+138,490
Cen. R.R. of N. J.	848,110	768,031	+180,079
Del., Lack. & W.	916,824	738,499	+178,325
Del. & Hudson	578,983	698,443	—119,460
Penn. R.R.	537,470	586,016	— 48,546
Erie	761,742	811,357	— 49,615
Ont. & West.	288,843	250,740	— 21,897
Total	6,596,687	5,996,894	+572,793

Production of coal in the first three months of 1912 was 18,209,351 tons, as compared with 16,971,959 tons in 1911, an increase of 1,237,392 tons. These are the heaviest shipments in the quarter of any year.

The Car Situation

The releasing of a number of cars by the more favorable weather resulted in a big increase in the latest idle car statement, for the period ended on Mar. 27. Two weeks earlier the shortages reported in various parts of the country almost resulted in wiping out the net surplus, and the total number of cars reported on that date, which was 3043, was the smallest in years.

The exceptional record which has been made in recent weeks in this line was also explainable in part to the unusual activity of coal shippers who were preparing for the expected strike by getting as much coal on the markets as possible. Two weeks ago there were shortages both in coal and box cars.

There was a total surplus on Mar. 27 of 52,682 cars, shortages in other districts bringing down the net surplus. This indicates the difficulty the companies have experienced in effecting a proper distribution of their free equipment.

Financial Notes

The annual report of the Island Creek Coal Co. for the 1911 calendar year shows net profits of $531,612, equivalent to $2.34 on the 99,568 common shares after payment of preferred dividends.

The annual report of the Delaware & Hudson Co. for the year ended on Dec. 31 shows a surplus of $5,237,000, which is equivalent to 12.32% on the $42,503,000 of stock outstanding. Last year the company earned 12.54%. It is paying annual dividends of 9%.

The listing committee of the New York Curb Market Association has approved the application of the Lehigh Valley Coal Sales Co. to list the outstanding 121,216 shares of the common stock, par value $50 full paid. The total amount authorized is $10,000,000. The Bankers' Trust Co. is registrar for the stock and the transfer agency is located at 90 West Street.

Steel conditions in Canada being largely in sympathy with those in this country, earnings of the Nova Scotia Steel & Coal Co. for the 1911 fiscal term ended Dec. 31, amounting to $1,019,392, exhibited a loss of $121,112 from those of 1910, although they were larger than the figures of 1909. The balance after all charges was $450,342, or $65,853 less than the previous year. while the surplus after preferred dividends of $367,942 was equivalent to 6.13% on the $6,000,000 common stock as against 7.23% in 1910. As 6% was paid on these shares, the net surplus for the year was only $7942, compared with $163,795 the season before.

Another appeal is to be made to the stockholders of the Bon Air Coal & Iron Co. to accept the plan of reorganization suggested last September by the committee composed of Joseph H. Thompson, Maj. E. B. Stahlman and Byrd Douglas. A letter is being sent out by the committee composed of Judge J. M. Dickinson, P. D. Maddin and Edgar Jones, calling attention to the condition of the company. It is stated that for seven months of 1910 the net earnings of the company under operation by the receiver amounted to $62,226, and that for 1911 the net earnings were $47,589, though 1911 was one of the hardest years of history for the iron industry.

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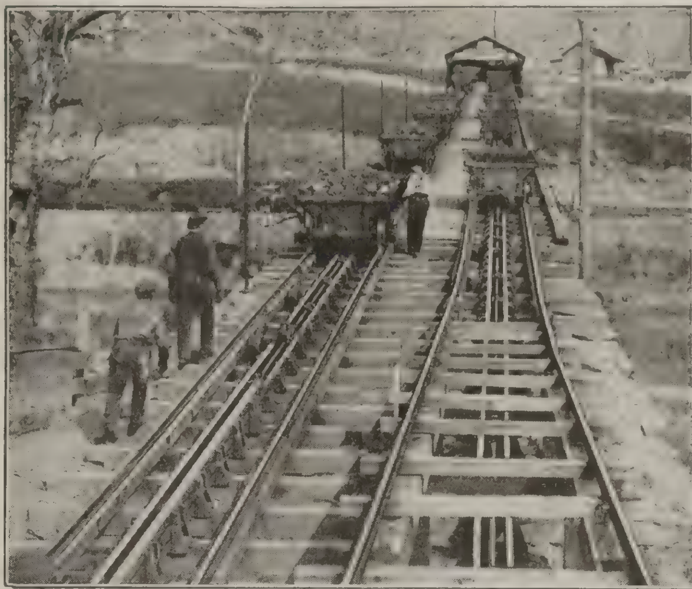

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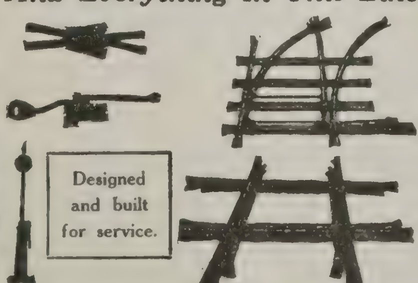

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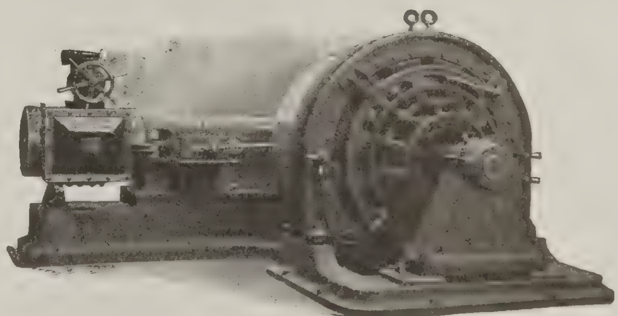

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NEW YORK, APRIL 20, 1912

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INTRODUCTION

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COAL AGE

Vol. 1 NEW YORK, APRIL 20, 1912 No. 28

COMPETITION on the part of laboring men themselves has ever been the chief force to beat down wages. To overcome this condition has been the first aim of labor unions. The principal argument advanced to justify the organization of workingmen is parallel with the idea that a theatre or other crowded building can be more speedily and safely emptied when accomplished in accord with some systematic plan.

Labor leaders discourage tumultuous action, where each person pursues his own individual interest with ignorance, passion and fear. Also, they have accepted as their own the modern idea that "an increase in wages by raising a man's laboring power may enlarge the product proportionately; that underfeeding, whether of man or animals, is false economy."

The question uppermost in our minds to-day, however, is whether strikes are necessary and advisable measures for the betterment of workingmen's social conditions. One or two generations ago, labor wars in England, although not as frequent, were invariably successful. The men were striving simply for enough to eat. Unfair laws had reduced them below the economic point of subsistence. Wage controversies to-day are not always for such a palpable cause.

As to the success or failure of workmen in their contests with employers, no one should so lack in discernment as to believe that when a strike fails to advance wages, the laborers have lost in their fight. We might as well believe the French Revolution was a failure because the Bourbons were restored to power. The king and princes returned, but to rule a new France. The master may remain master, but the dread of another conflict makes the old regime forever impossible.

There is no constructive or healing virtue in a strike. Insurrections of labor, like uprisings in the political body, are purely destructive agencies. Yet, as a rebellion against corrupt government may destroy political institutions that have outlived their usefulness, so a labor war may break up a crust of custom which has formed over the remuneration of a class of workmen.

However, a strike can only justify itself by its results, and unless it makes way for a better order of things, it is waste of the worst sort. Not only is production curtailed, but bad blood and bad habits result from the enforced idleness. Few of us but abhor strikes, and pray for the advent of a saner method of eliminating poverty and restoring freedom. Still we all have to admit that nothing so quickens the sense of justice and equity as does the consciousness that unfair acts are likely to be promptly and fearlessly resisted.

As to the real cost of a strike, and the actual money losses incurred, the truth is that we generally overestimate the dire results. In an industry like coal mining where the productive capacity is so far above requirements, a cessation of work, if not too prolonged, frequently results in clearing up the market situation, and eventually brings benefit to operator and miner alike. Enforced idleness is always succeeded by increased activity and the loss of time is soon made good.

The danger to business of all kinds today is not so much from spontaneous strikes brought about by inhuman, unjust treatment of workmen by employers, but from shut-downs ordered by trades-unions and founded on exactions that cannot be maintained. It often occurs that a slim minority, who give scant consideration to the equities of distribution, frame demands that are both offensive and impossible, and which owners could not concede, if they would, without checking production and diminishing employment.

There is a singular impotence in conspiracy. This is shown by the fact that the most successful strikes arise from a common sense of injury to an outraged body of workmen. Frequently when plans have been carefully made and the machinery of insurrection extensively employed, the attempt to better wages has ended in ignominious failure. When labor is organized to a point of military discipline and the men are under obligation to obey all decrees, action of doubtful legality or expediency is apt to be prompt and arbitrary. *In our next issue, we will endeavor to show how the unwise and improper exercise of newly acquired power is likely to hinder rather than help the workingman's cause.*

The Dewar, Oklahoma, Coal Field

By John A. Garcia *

The Dewar field is an excellent example, on a small scale, of the benefits derived by consolidating the small individual operators. The "gopher" system of mining has been succeeded by more modern methods and electricity is being successfully applied. A rather surprising and unusual feature, for a coal mine, is the practice of burning natural gas in the boilers.

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The coal-mining town of Dewar, Okla., is located on the edge of what is probably the greatest oil field in the West, in Okmulgee County, on the Coalton branch of the Missouri, Oklahoma & Gulf R.R., and about three miles east of the older and well known town of Henryetta, on the 'Frisco Road. Two years ago Dewar was only a water tank and coaling station for the M. O. & G., and nearby were a few slope mines, operated under lease in a very crude and spasmodic fashion, producing nothing in the summer and about 50 to 130 tons per day in winter.

No incentive or encouragement of any kind was offered for the development of the field, mainly because of the oil and gas produced in the immediate neighborhood. This latter is used as a fuel and illuminant by practically all the railroads, manufacturing plants and for domestic purposes, in fact these pioneer coal operators found it more economical to tap the pipe lines running past the mines and use gas under the boilers and for lighting the few houses in the camp. The famous Kiefer oil field is only 40 miles from Dewar and a capped gas well, said to be the largest in this country, was drilled on the edge of the town and plugged up as there was no market for the product.

Surface Plant at Mine No. 3, Showing Typical Arrangement at a Shaft Mine

Economic Considerations

The promotors of the Oklahoma Coal Co., after carefully considering the question of competition from oil and gas, decided that such competition had a very limited future and that a good coal, well prepared and sold at a reasonable price would find a ready market on the new M. O. & G. R.R., then building down through Oklahoma into Texas.

After thoroughly investigating the operating conditions, and being satisfied that they could be handled and the coal placed on cars at a reasonable figure, the several operations were bought up and some 3000 acres of coal acquired. The Oklahoma Coal Co. was formed, organization perfected, and the work of rehabitulation and reconstruction begun.

Several of the older producing mines with but a short life ahead, were leased to responsible parties on a royalty basis, while the operations having good prospects for a future were surveyed, mapped and projected. The haulageways were then brushed and graded, ventilation established and the mines overhauled generally from top to bottom. Most of the mines had been ventilated by furnaces and, as it was obviously impossible to successfully operate for large tonnages with these, fans were installed at all the mines. These are all of the suction type and the slopes are made the intake.

Methods of Working

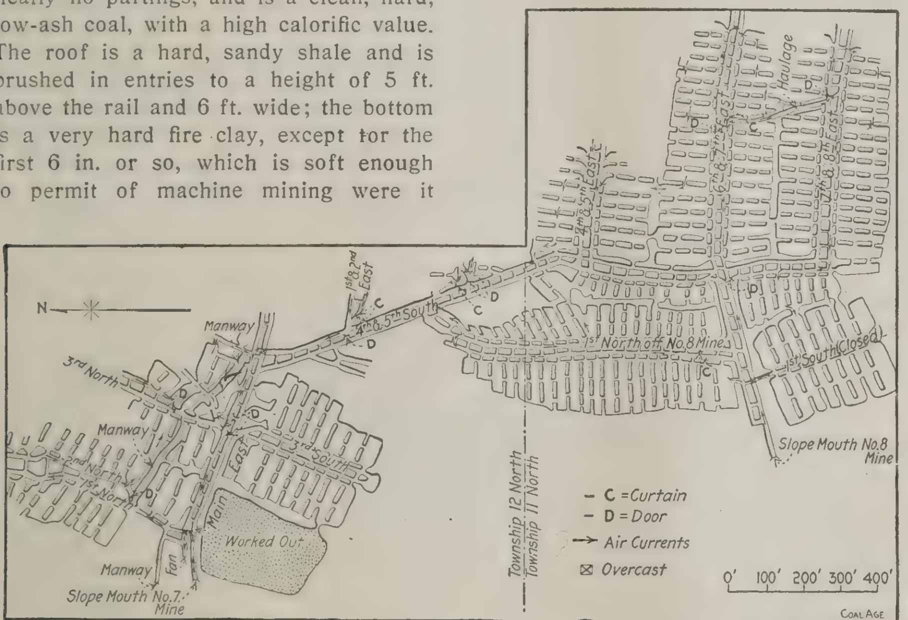
The accompanying halftone shows the No. 3 mine which is a shaft about 50 ft. deep and will be the banner mine of the field. All the coal is caged on one side, and the empty cars run by gravity to run-a-round; the cage room is double tracked and long enough for the storage of 60 cars. Overcasts are used at each pair of cross entries and there are no doors on the main entries. Various other improvements, which are common enough in other states, but considered rather revolutionary at Dewar have been installed.

The railroad follows the outcrop of the coal which can be readily traced along the foot of the hill all the way to Coalton and beyond. The seam measures from 3 ft. to 3 ft., 4 in., has practically no partings, and is a clean, hard, low-ash coal, with a high calorific value. The roof is a hard, sandy shale and is brushed in entries to a height of 5 ft. above the rail and 6 ft. wide; the bottom is a very hard fire clay, except for the first 6 in. or so, which is soft enough to permit of machine mining were it not for occasional boulders and rough places in the floor.

The coal pitches at the outcrop on an angle varying from 5° to 20° for about 100 ft. From that point on there is no regular inclination or pitch, but enough variation in grades to make the systematic projection of workings very difficult and in some instances impossible; especially is this so at the present time when all hauling, except on the main entries at No. 7 mine, is done by mules.

The accompanying map shows the workings of the combined Nos. 7 and 8 mines. The irregular system of working is due to the extreme variation in the pitch of the seam and to the gophering methods commonly used under the old leasing system of Oklahoma where no fixed percentage of extraction was demanded.

An electric hoist is used to pull the trips up the slope at No. 7 mine and partings are now being built inside so that by means of a tail-rope the mule haulage on main roads will be materially reduced.



The Oklahoma Coal Co.'s Mines Nos. 7 and 8, at Dewar, Oklahoma

Shooting from the Solid

Before the advent of the Oklahoma Coal Co. all coal was shot off the solid, except in No. 8 where the clay was mined by hand and an excellent grade of lump coal produced. The great difference in the mining rate, however, (80½c. for solid and $1.05 for pick-mining) and the fact that only the coal with thin cover could be hand mined forced all mines to the solid basis; this has resulted in high percentages of screenings, windy shots and the other innumerable evils which accompany this system. The mines generate no explosive gases and this, together with the fact that the brushing mixes powdered shale with the coal dust, probably accounts for the fact that there has been no explosion or even serious windy shot in the history of these mines.

Chain machines were tried in the No. 6 mine. They were tested in the clay bottom and in the coal and several makes of machines, including both breast- and short-wall, were tried. The tests covered a period of six months and met with uniform and consistent success in each instance, with, however, the customary variation in efficinecies for the different makes of machines due partly to design and partly to the machine men. The machines readily mined the clay but it took so much more power, and was so difficult to keep the nose of the machine in the clay, that it was decided to cut the coal only, though it meant about 14% fine coal to begin with and 5 in. less height, which is an important matter in a 36-in. seam.

The Sullivan short-wall chain machine was finally adopted as a standard, but on the test run with a breast-machine, to determine the proper differential, the miners running the breast-machine were a little to smart for the company men operating the short-wall, and the differential between the two types was established, at only 2½c. per ton, fixing the machine scale at 78 cents.

Power Plant

Electricity for the machines at the various mines is supplied from a central power plant located near No. 5 mine, equipped with a 300-kw., 2200-volt, alternating current, General Electric generator, direct connected to a 21x20-in. Ridgway engine. The power is distributed to the mines over a pole line carrying 3, No. 0 wires, securely fastened to porcelain insulators and made as inaccessible as possible. Motor generator sets are provided at mines Nos. 6, 7 and 8, and there is a transformer at No. 7 for operating the electric hoist. At No. 5 the power is supplied by a 75-kw., direct current, 250-volt, generator which the company had on hand. The boilers are arranged in a battery of 3, and are 18 ft. by 72 in., of 150 hp. each, gas fired and built by the Casey-Hedges Co., Chattanooga, Tenn. Both boiler and engine room are arranged for an additional 300-kw. generator, the necessary boiler power to be installed when development of the mines require it.

Because of the rock top and freedom from water, the mines can be shut down in the summer months and reopened in a few days' time at a nominal expense; on account of the competition of the oil and gas, there is little or no demand for coal through the summer, so that the fact that the mines can stand a long shut down without injury is a very valuable condition, without which it is questionable whether or not they could be profitably operated. The operators on the M. O. & G., however, believe that the six months operating and six months shut down arrangement, will not obtain much longer for the mines on that road, since the product is sent into the large cities in Texas and through a country where the domestic fuel consumption is rapidly increasing.

With anything like fair running time, these mines in the Dewar district will, when fully developed, have a marked influence on the coal business in Oklahoma. They are free from the usual unfavorable conditions such as gas and depth and the heavy pitch so that the production cost will be comparatively low and this fact, together with the good quality of the product and the location on a coal road, make a strong combination in the competitive market.

Water Purification for Collieries

Special Correspondence

Undesirable water may be prepared for use in boilers and for other purposes by the addition of chemical reagents, by preheating, or by a combination of the two methods. Several hot and cold processes are here outlined and the manner of their operation explained. The second of a series of articles on water purification.

In a previous article, it was stated that the subject of water purification for collieries could be dealt with best under the two general heads of hot and cold methods of treatment, and one notable system of water softening by the cold process was described in detail. In some of the types of water-softening apparatus made by Lessen & Hjort, the cold process is used and lime is employed as the reagent.

This form of apparatus will best be understood by reference to Fig. 1. In general it consists of a combination of a measuring and mixing apparatus, settling tanks and a filter, for the purpose of removing the precipitated impurities from the water. The hard water, on entering the softener, passes alternately to each of the two compartments of a tipping device, which oscillates on a horizontal shaft. When either of these compartments is filled with water, the center of gravity is shifted, causing the tipper to over-balance and discharge its contents into an inclosing tank. This brings the other compartment of the tipper under the inlet pipe and it is in turn filled, the center of gravity then being shifted to the opposite side and the tipper caused to overturn in the reverse direction.

Lime Milk Added in Definite Quantities

In this way the oscillation of the tipper is such as to discharge a definite volume of water into the tank at each stroke. Following each discharge, a corresponding amount of water is displaced from the tank and led through a standpipe and chute into the reaction chamber of the softener. At the same moment, the requisite charge of chemical solution is delivered through a valve placed on the bottom of the semicircular chemical container *D*, and operated by the tipper. This valve can be regulated, while working, to discharge the exact quantity of reagent required by the volume of water in the tipper compartment, and in this way the proper amount of reagent, which is calculated to reduce the hardness to a guaranteed figure, is added without altering the solution in the chemical container.

Lime milk, of a 10 per cent. strength, is generally used for the lime reaction, and as this milk has a strength nearly 100 times that of lime water it is possible to employ tanks of a correspondingly smaller size than those required when the latter mixture is used as a reagent. Moreover, since a known quantity of lime can in this case be mixed with a known quantity of water, the strength of the solution obtained is definite. The heavier portion of the precipitate settles on the bottom of the reaction chambers and is discharged from them daily by opening the sludge valves for a few moments. The finer portions of the precipitate are removed by wood-wool filters, packed between rows of wooden bars.

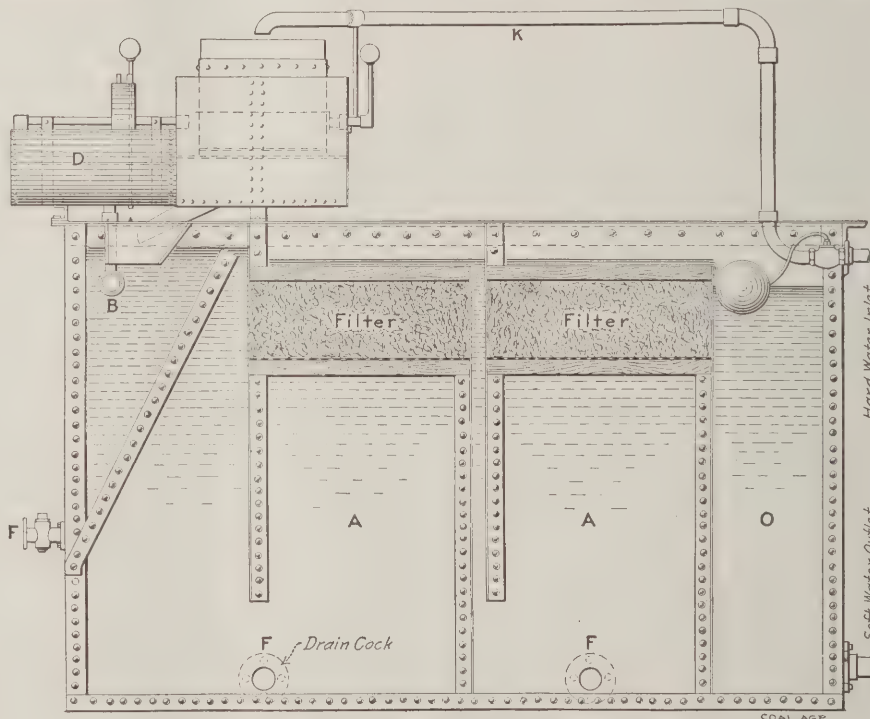


Fig. 1. Lessen & Hjort Cold Process Water Softener

In some cases, Messrs. Lassen & Hjort's softeners are made cylindrical instead of square in form, but this difference is purely mechanical, the method of operation being the same. The cylindrical type, however, allows the discharge to be taken off at a higher level. The chemical container, which is calculated to hold from 10 to 12 hours' supply, is frequently supplemented by a mixing tank, placed on the ground level, with a capacity sufficient to fill the container several times. A pump is employed to supply the solution to the container, and an overflow pipe brings back any excess. Connected with the pump gear, is an agitator which operates inside the tank for the purpose of rendering the mixture homogeneous. In this way a lime milk or sludge of uniform quality is transferred to the container. The pump may be operated either by hand or by power, and in some cases, is driven by a water motor which is connected to the supply of hard water on its way to the softener.

A number of successful installations operating on the Lassen & Hjort principle have been effected at collieries in Great Britain, and other mining installations have been made in places as distant as Mysore, Wallaroo, Huelva, Kobe and Servia. A most interesting plant is one with a capacity of 18,000 gal. per hour, installed at the Askern colliery at Doncaster.

Automatic Measuring of Reagents

A mechanism somewhat similar to the foregoing, is that of the "Eradica" water purifier, manufactured by Messrs. Ashwell & Nesbit, Ltd., of Leicester. The measuring apparatus, in this case also, consists of several oscillating vessels, arranged alongside one another on the same shaft, each auxiliary vessel being connected by an annular passage to the one used for measuring the untreated water. The crude water first flows into the main vessel and is then distributed in definite proportions to the one or more subsidiary compartments. The size of these subsidiary vessels is adjustable and can be arranged to deliver a definite volume of displacing water either to a lime saturator or soda-solution tank.

The arrangement of one form of this measuring apparatus is shown in Fig. 2, in plan and vertical section. It will be noted that a definite volume of water is delivered to each reagent receptacle in proportion to the volume of crude water measured out for purification. Both lime and soda reagents are used in diluted form. Except for charging the lime saturator and soda solutioner and sludging the apparatus, the installation works automatically.

Before passing to the consideration of softeners in which use is made of steam, it will be interesting to refer to the "Reisert" type of purifier which has been supplied to a number of collieries, among which may be mentioned those of R. Evans & Co., of Golborne, near St.

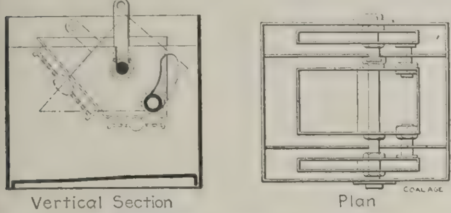


Fig. 2. Measuring Device

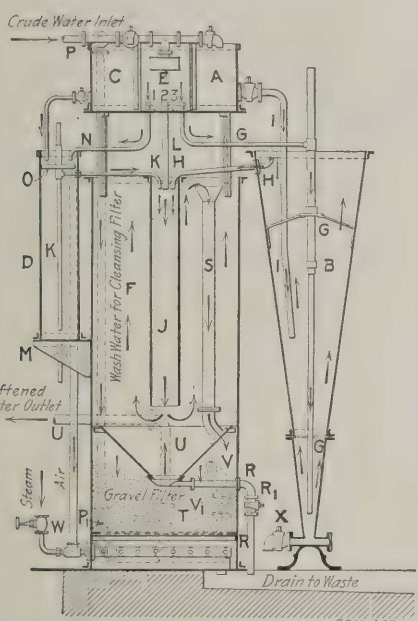


Fig. 3. Reisert Purifier

Helens, where there is a plant dealing with 4400 gal. per hour. The general arrangement of the softener is shown in Fig. 3.

Feeding in the Soda Solution

Lime, slaked in a vessel *A*, is run down a pipe marked *I* into a conical chamber *B*, after the previous spent charge has been run to waste. A regular and known quantity of water passes through the micro-valve marked 3 along a pipe *G* to the bottom of the cone and then upward through the slaked lime, becoming saturated, but not over-saturated, with the lime. As the water proceeds upward its velocity diminishes, owing to the expanding nature of the container and any excess particles of lime settle back until they are dissolved in additions of water. The lime water then passes in a perfectly clear state to the top of the vessel *B*.

A certain quantity of soda is dissolved in the container *C* and runs into the vessel *D*. A regulated quantity of water passes into the top of *D* by way of the micro-valve 1 and the pipe *N*. Since the specific gravity of the soda solution is greater than that of water, it settles to the bottom of the tank, and the incoming crude water is discharged on the float *O* in order to prevent any mixing in the top layers. As the level of the soda solution gradually sinks in the vessel *D*, some little head is required to force it up the pipe *K* as far as the discharge. Consequently the amount of soda solution passing to the mixing pipe *J* is proportional to the amount of water flowing in from the micro-valve 1.

The third quantity of crude water passes directly to the mixing pipe *J* through the micro-valve 2. All these three micro-valves are under the same head so that proportionality is preserved. The mixture of the reagent solutions and the crude water is carried down pipe *J* to the bottom of the reaction chamber. A certain proportion of the precipitated matter is deposited and sludged out by the cock *R* from time to time. The water then overflows from the reaction chamber to the gravel filter *T* where all suspended and floating matter is arrested.

In order to clean the filtering material, a mud outlet valve V_1 is opened,

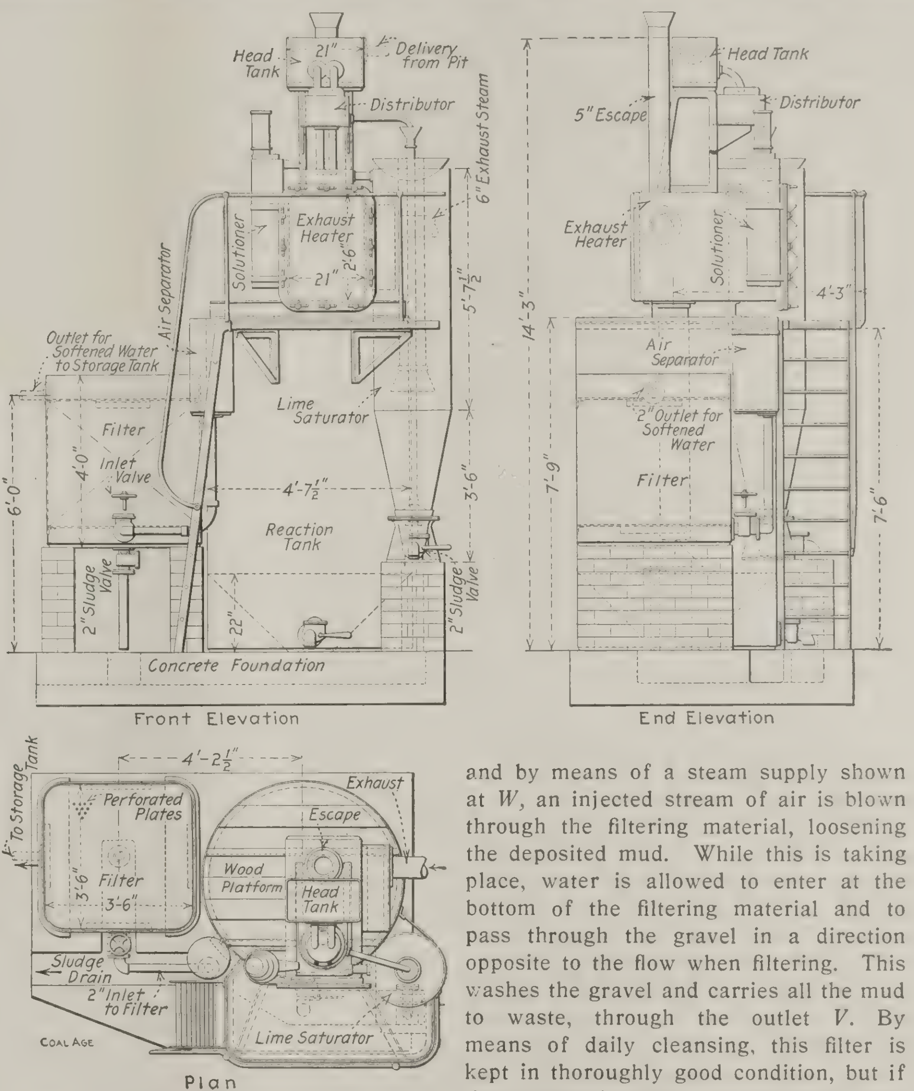


Fig. 4. Heater and Softener

and by means of a steam supply shown at *W*, an injected stream of air is blown through the filtering material, loosening the deposited mud. While this is taking place, water is allowed to enter at the bottom of the filtering material and to pass through the gravel in a direction opposite to the flow when filtering. This washes the gravel and carries all the mud to waste, through the outlet *V*. By means of daily cleansing, this filter is kept in thoroughly good condition, but if the untreated supply is particularly hard and dirty, as is possible in the case of mine water, purified water is used for cleaning the filter.

Preheating with Exhaust Steam

The availability of exhaust steam, from hoisting engines and similar sources at the collieries has made it extremely convenient, in a good many cases, to do without the use of lime for the removal of temporary hardness, and to employ steam to boil the water before entering the boiler, thus removing its calcium and magnesium carbonates. However, where there is also permanent hardness in the water, a combined heater-softener is employed. In this, the action of steam is combined with the injection into the water of a softening solution, usually of soda ash.

The various manufacturers of water-softening apparatus install hot processes, where required, instead of the cold processes already mentioned and but little alteration in the details of design is necessary in order to adapt the plants above described to the functions of the hot process. It will, therefore, not be necessary to recapitulate these designs in detail. In the Lassen & Hjort combined water heater and softener, for example, the water measured and mixed with chemicals, as described above, is heated to the boiling point by means of exhaust steam led into the precipitating chamber. This chamber is provided with a guide plate and sludge cock to facilitate the removal of the large quantities of precipitate which are deposited here. The further deposition of the heavier precipitate takes place in a settling chamber. The water is then filtered, settled and again filtered before passing to the storage tank.

In this type of softener the use of lime is not dispensed with. The makers point to the fact that exhaust steam usually contains a considerable amount of oil, and unless this is coagulated by the action of the lime, it is apt to be carried over into the boilers. This system, it is claimed, effects softening independently of the use of heat.

Combined Heater and Softener

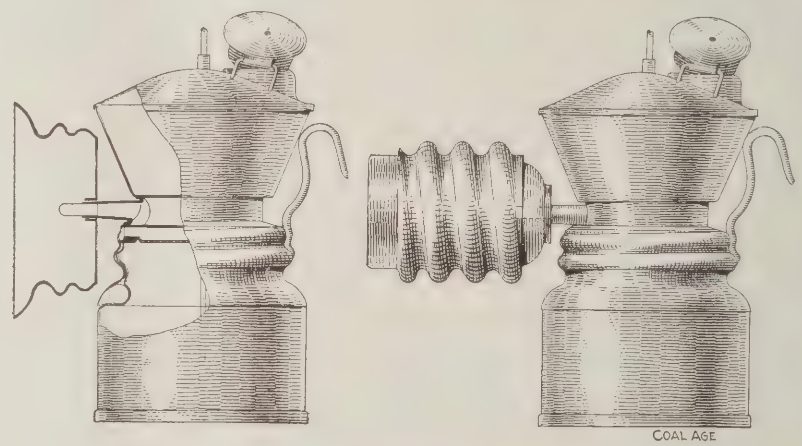
One of the Harris-Anderson water softeners, installed at a colliery in Cumberland, where the water is pumped from the mine and heated by exhaust steam in its passage from the plant, is shown in Fig. 4. In some types of the Harris-Anderson apparatus, where the chief function required is the elimination of oil from the water before it passes to the boiler, the lime saturator is done away with and two solutioners are affixed, one for soda and the other for alum. The bulk of the water passes directly to the treatment tank, while fractional portions are carried by the distributor to solutioners in which the cages are filled respectively with the two reagents. The action of the alum solution is to coagulate the oil. All the water passes to a filter of the usual type which is frequently divided into two independent sections so that one can be cleaned while the other remains in action.

Experiments made in England with calcium chloride as an agent for laying dust in coal mines have shown that a 40- to 50-deg. solution used at the rate of 8 gal. for every 30 ft. will lay dust 3 in. thick and the zone so treated will be safe for a period of 3 months. A roadway cleared of dust for 225 ft. and then treated with 90 gal. of calcium chloride solution was found to remain moist 4 months; 330 lb. of finely ground solid calcium chloride on 250 ft. of roadway was effective for 6 to 8 weeks.

Shields for Acetylene Lamps

By Joseph Daniels*

During a recent trip through the mines of the Roslyn district in Washington, I noticed a device which some of the men had adopted to protect the flames of their acetylene lamps. In exceptionally windy or blowy places, the reflectors ordinarily furnished with the lamps did not afford sufficient protection for the flame, particularly in the cases of trip riders and locomotive men. The scheme which they had adopted here consisted in removing the usual reflector from the lamp and substituting for it the screw top of the extra bottom which is furnished with the Baldwin lamps. By simply perforating this top at the center it was found possible to slip it over the lamp tip and secure it as indicated in the illustration.



Shields for the Flame of Acetylene Lamp

In some places, the men had looked elsewhere for their lamp shields, and found that the brass bases which cap the usual incandescent light bulb, when emptied of their packing and perforated at the top, could be used to advantage This arrangement is likewise pictured in the illustration. Both forms of shield can be removed easily, when not required.

While the light obtained with the use of these shields is not nearly so good as that from a lamp with the ordinary reflector, there is derived the undoubted advantage of having a steady light under varying conditions of draft, which makes this arrangement at times extremely useful to the men under ground. I also noted in the mine referred to that a number of men used these flame protectors at the working faces, apparently with good results. While it is not suggested, that this device should be used except under the conditions referred to, the idea may prove of value or convenience to some who have to contend with like circumstances.

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Coal Production in Africa

With the increasing development of the "Dark Continent" by railways, and the continued opening out of new mining districts to further the production of its wonderful natural treasures, the coal question becomes more and more important.

The proper solution of the problem of coal supply is much more urgent even than that of labor supply, which is so much discussed everywhere on the continent. Up to date there is only one district in Africa which has been shown to be rich in coal—Natal, where there appears to be hundreds of millions of tons. From this supply the Rand mines near Johannesburg draw what they require; and the merchant marine and the navy take coal at Durban. Not so fortunate are the other African mining regions, as for instance German Southwest Africa, where new copper lodes have recently been opened out. These mines lie near the coast; but for all that, freight rates are exceedingly high.

The inland districts, for instance the much discussed copper mines of Katanga in Belgian Congo, lie in the heart of Africa and their product must be carried by rail at least 1100 miles before it reaches the coast. The production of copper on an economical scale would be impossible if coal had to be freighted all that distance to the mines. Three hundred miles from Katanga lie the Wankie coal beds. If these can not deliver enough coal, and other strata are not opened out, the favorable development of the Katanga district will be out of the question, in spite of its great copper deposits.

This example shows plainly the importance of the coal question in central Africa. Without doubt Central Africa—North Rhodesia, Katanga, and the Tanganyika-Nyassa districts—has rich ore deposits. But the hopes now based thereon will disappear if sufficient coal is not discovered.

The Election of Mine Inspectors

By J. T. Beard

Conditions and causes that led to the enactment of the first coal-mining law in the United States. Improvement in mining shown by increased tonnage and decreased death rate in anthracite mines in Pennsylvania. Certification of mine foremen. Law creating miners' examining board and the certification of miners in anthracite mines. The anthracite mine inspectors' election law. Effect on mine inspectors, examining boards for mine foremen. How the law affects miners. The repeal of this law urgent.

Since the enactment of the law in Pennsylvania, in 1901, requiring that all anthracite state mine inspectors be elected by popular vote of the people in the several inspection districts specified in the law, the results have been closely watched by mining men in the principal mining districts throughout the United States and Canada.

Inasmuch as frequent inquiries are made by states facing a similar crisis, asking what success has attended the inauguration of this system in Pennsylvania; and in view of the fact that the enactment has never met with the approval of the state Department of Mines or the mine inspectors themselves; and since, at different times, efforts have been made, though unsuccessfully, to have the act repealed, and these efforts will be repeated at the meeting of the next legislature, it is of interest to review briefly the conditions that were responsible for the enactment and summarize some of the effects of the law.

It was the memorable Avondale disaster, Sept. 6, 1869, that shocked Pennsylvania and aroused her legislators to a realization of the immediate necessity for an adequate mining law. This resulted in the enactment of the law known as the "Ventilation Act," which, though far from being perfect, went a long way toward improving conditions and safeguarding the work of mining, by requiring the adequate ventilation of mines and providing for at least two separate openings to every mine and a thorough system of mine inspection.

Effect of First Pennsylvania Mining Law

There is no doubt in the minds of practical mining men of every type that the enactment of this first mining law in Pennsylvania, in 1870, which was, also, the first adequate law regulating coal mining in the United States, resulted in a vast improvement in mining conditions throughout the state. This is clearly evidenced by even a cursory glance at the tabulated statistics, as published in the anthracite report of the Department of Mines, 1910, p. 62. The table there given shows the number of employees, total tonnage, fatal accidents and death rate, for each year from 1870 to 1910, inclusive. We reproduce here, for handy reference, the same data for each fifth year during this period, and the corresponding averages for each five years, in this time.

The greatest apparent benefit derived from the mining law of 1870 is shown in the rapid decrease in the death rate and the large increase in the tonnage, in the first five-year period following the enactment, 1870-4, inclusive. During this period, the number of employees increased 96.5 per cent., and the production of coal 65.2 per cent. Both of these factors would naturally increase the chances of accident over 100 per cent.; but, owing to the improved conditions under the new law, the number of fatalities increased from 211 to 238, only 12.8 per cent., while the death rate per million tons of coal produced decreased from 14.85 to 10.17, or 31.5 per cent. A similar improvement, though naturally less pronounced, continued during the second five-year period, 1875-9, inclusive, when the number of employees increased 48.7 per cent. and the tonnage 19.5 per cent., while the number of fatal accidents fell to 202, in 1880, a decrease of 15.1 per cent., and the death rate for that year was only 7.22 per million tons of coal produced, decreasing 29.1 per cent., in this period.

The third five-year period, 1880-4, inclusive, fails to show the same marked improvement in mine management. The reasons for this, though to an extent problematical, are to be attributed largely to a growing indifference to the mine law, which had now been in force 10 years, and an ever-increasing demand for coal and decrease of intelligent miners and mine bosses. This latter condition forced the alternative of employing a greater and greater proportion of foreign labor in the mines and increased the dangers of operation. During this period the mine employees and tonnage increased 36.7 per cent., while the fatalities rose to 332, in 1885, an increase of 64.4 per cent., and the death rate per million tons for that year became 8.68, increasing 20.2 per cent.

Five-year Averages, 1870-1910

It is evident that any unusual occurrences, such as variable market conditions affecting the number of days the mines worked in the year; strikes or other labor conditions; mine explosions, etc., might materially modify the results for any year, as given in the first section of the above table. For this reason, the five-year averages, shown in the second portion of the table, are perhaps more representative of existing conditions. The same general increase in number of employees and tonnage per year is shown by these average figures, for the three five-year periods, 1870-1884, inclusive. The average death rate per million tons,

TABLE SHOWING NUMBER OF EMPLOYEES, TONNAGE, NUMBER OF FATAL ACCIDENTS AND DEATH RATE, FOR EACH FIFTH YEAR, 1870–1910, INCLUSIVE. ALSO, AVERAGE OF THE SAME DATA FOR EACH 5-YEAR PERIOD, IN THE SAME TIME, AND THE PERCENTAGES OF INCREASE IN EMPLOYEES AND TONNAGE

Year	Employees	Production in Tons (2000 Lb.)	Number Fatal Accidents	Death Rate Per Million Tons	Death Rate Per 1000 Men		
1870	35,600	14,172,004	211	14.89	5.93		
1875	69,966	23,402,646	238	10.17	3.40		
1880	73,373	27,974.532	202	7.22	2.75		
1885	100,324	38,232,155	332	8.68	3.31		
1890	119,919	44,986,286	378	8.40	3.15		
1895	143,705	56,948,756	421	7.39	2.93		
1900	143,824	57,363,396	411	7.16	2.86		
1905	168,254	78,647,020	644	8.19	3.83		
1910	168,175	83,683,994	601	7.18	3.57		
Period	Five-Year Averages					Percentage Increase Employees	Percentage Increase Output
1870–4	43,987	17,240,762	228	13.38	5.26	96.5	65.2
1875–9	68,019	24,701,618	222	9.03	3.25	48.7	19.5
1880–4	81,820	34,290,125	284	8.23	3.34	36.7	36.7
1885–9	110.413	41,925,038	338	8.05	3.06	19.5	17.7
1890–4	130,307	49,944,523	425	8.51	3.26	17.7	26.7
1895–9	145,275	55,340,810	444	8.03	3.09	0.1	0.7
1900–4	150,554	62,925,186	467	7.41	3.09	17.0	37.2
1905–9	169,780	80,122,004	631	7.87	3.71	0.0	6.4

for the third period, 1880-4, however, shows a decrease instead of increase, pointing to the greater frequency of fatalities toward the close of this period.

Enactment of Law Requiring Certified Mine Foremen, 1885

A growing need was felt at this time for greater competency on the part of the average mine foreman. In the same manner as the Hartley disaster, England (1862), and the Avondale, Penn. (1869), caused a reaction in favor of more adequate mining laws, so the conditions in Pennsylvania, at this time, gave rise to a popular demand for a law requiring the certification of mine foremen, which requirement became law in Pennsylvania, in 1885.

Creation of the Miners' Examining Board, 1889

In 1889, the anthracite mines were further safeguarded by the enactment of a state law creating a Miners' Examining Board in each inspection district, and prohibiting the employment as a miner, in any anthracite mine in Pennsylvania, of any person not holding the certificate of the board. This law, like that providing for the examination of mine foremen, was calculated to raise the standard of intelligence among miners; and but for the reckless disregard of the law and the dishonesty of examining boards in granting certificates to incompetent persons, conditions in the mine would have been greatly improved. Owing to the reasons just stated, however, the benefit derived from the enactment of this law was not as great as the framers of the law had a right to expect

Prominent Features of Mine Law

By the foregoing brief review, I have endeavored to draw attention to the importance of mining legislation, by calling to mind a few of the main features of the Pennsylvania anthracite law that have or should have operated to increase the safety and economy of mining in anthracite mines. It is an old saying that "Figures do not lie"; and when carefully tabulated statistics, such as those published in the annual reports of the Department of Mines, in Pennsylvania, are studied and rightly interpreted, they cannot fail to show the importance of effective mining laws.

Without going into minute details of the numerous rules and regulations intended to safeguard and control minor points in the operation of mines, I have referred to such leading features of mine law as ventilation, inspection, examination and certification of mine foremen and miners. These, each and all, have been the means of establishing a comparatively high degree of safety in the mining of anthracite coal in Pennsylvania.

The Anthracite Mine Inspectors' Election Law, 1901

There is another feature of the anthracite law, enacted in 1901, that has operated quietly to undermine and destroy, during the past decade, all that the law had previously accomplished. This enactment is the law requiring the election of the anthracite mine inspectors by popular vote of the people. The law has well been described as pernicious, seductive and destructive, as opposed to all that is wholesome, ingenuous and constructive. In his annual report for the year 1903, James E. Roderick, chief of the Department of Mines, in Pennsylvania, refers to this law as the work of "a few interested persons" who succeeded in inducing the anthracite miners, assembled in convention, to pass a resolution calling upon the legislature to amend the mining law so as to provide for the election of the anthracite mine inspectors by the people.

The reason given for this demand was that it would place in the hands of the voters, in each district, the choice of the inspector for that district and remove all cause of complaint growing out of the appointment of an inspector who might prove objectionable to the miners of the district. The reasoning was seductive; it was seemingly a just and fair proposition to allow the people to choose, by direct vote, their own inspector. Thinking men, however, saw the inevitable result of granting this demand voiced by a few men whose judgment was temporarily blinded by the rehearsal of some supposed wrongs ascribed to an alleged objectionable inspector. The sequel has proved the unwisdom of the law, and today the demand among intelligent people for its repeal is even more urgent than that for its passage ten years ago.

Effect of the Law on Mine Inspectors

The mine-inspection service of the state is a thankless service. The men charged with its duties are officers of the law, whose business it is to enforce its provisions. To transgressors and violators of law, these men are often "objectionable." To place the choice of the inspector in the control of the voters of a district where the votes are practically dictated by a few men who desire to be unmolested and to make their own interpretation of the laws to suit their individual cases, would be to surrender the law to its violators.

What is law, when the officer charged with its execution is helpless in the hands of would-be violators of law? What is mine inspection when the inspector must close his eyes as he goes through the mines and seal his mouth when he comes to the surface? But this is the logical result and what must be expected under the anthracite mine inspectors' election law. The inspector becomes the servant of the officials of the mines he inspects, instead of the servant of the people and an officer of the law.

On the inspector's side, the effect of this law is no less baneful. His conscience is stultified, his dignity degraded and his usefulness to the state forfeited In some instances the inspector, in the anthracite region, has proved a mere figure head. It is true he has collected some valuable statistics of mining and drawn his salary. In other instances he has even made suggestions, some of which may have been carried out. Few indeed are the cases where there has been any serious contention on the inspector's part, who has generally refrained from making suggestions that would be at variance with the company's wishes.

Effect of the Law on Examining Boards

One of the most harmful effects of the mine inspectors' election law is the influence exerted by the other members of the examining board for mine foremen to force the inspector into line, in reference to the desired recommendation of a candidate whose examination before the board has shown him to be wholly incompetent to hold the position of mine foreman, but whose political influence, backed by the expressed wishes of his company, demands recognition by the board. The mine inspector is an *ex-officio* member of the board of examiners for mine foremen, the other members of the board being two miners and one mine operator, superintendent or owner. The inspector is generally in a position better qualified to judge of the competency and fitness of a candidate to fill the position of mine foreman than any of the other members of the board. In most cases, however, he is compelled to set aside his own convictions and join with the rest in recommending the candidate and signing his certificate of competency. The refusal to do this would probably jeopardize his chances in the next election, and no one realizes this better than the inspector himself.

Effect of the Law on Miners

Instead of this law working to the advantage of miners, as they had been led to believe it would, by placing in the hands of each miner a vote for the man of his choice, it has operated much to their disadvantage. In many instances the miner's vote is not his own but is cast in compliance with the dictation of bosses, which limits his choice of inspector to their selection of the man for whom he must vote.

The working of the law with respect to examining boards for mine foremen has proved a menace to the safety of mines, by the certification of many in-

competent men for that position, by reason of which the lives of miners have been endangered.

The same law has also proved a hindrance to many ambitious, deserving miners who have studied to fit themselves for foremen and assistant foremen. Their knowledge of theoretical and practical mining will, in many cases, surpass that of the man who secures his certificate by other means than proving his competency in examination. Too often the worthy and competent miner is pushed aside by one whose only hope is through the employment of dishonest means to secure the necessary certificate.

Repeal the Mine Inspectors' Election Law

There is probably no law on the statute books of Pennsylvania, the repeal of which is more urgently demanded by intelligent mining men of all classes, from the miner who advocated the law, to the mine inspector who has most keenly felt its burden. Let the miners, who are responsible for the enactment of this election law, do their part to wipe it off the books, recognizing what is a fact, that it is a disgrace to honest mining, the work of grafters and wire pullers, and subserves no good purpose but rather is a menace to life and property and a hindrance to the merited advancement of ambitious and competent miners.

Appointment of Mine Inspectors

Throughout the bituminous districts of Pennsylvania, as in almost every mining state, the appointment of mine inspectors is general. In most cases, the governor is clothed with the appointing power and the term of office varies from two to four years. I have suggested, at different times, the feasibility of the delegation of the appointment of mine inspectors to the judges of the district courts in the respective inspection districts who should also properly appoint the boards of examiners for mine inspectors, and base their selection of mine inspectors on the reports of the examining boards. The appointment of both the examining boards and the mine inspectors should be, confessedly, as far removed from politics and the influence of wire pullers as it is possible to have them.

The work of mine inspection is a most important work. It is and should be a subsidiary part of the state government and subject to its control, as far as its work is concerned. Owing, however, to the peculiar relations that the inspector must bear to the mine operator and miner, as custodian of the mine law, his position should only be assailable through the courts, by process of law.

There are strong reasons why the appointment of mine inspectors should be for a long period of years, say, 20 or 30 years, or good behavior with a time limit. One of the most important of these reasons is the fact that a good inspector becomes more efficient and valuable each year. His growing familiarity with the mines and district in his charge and his knowledge of local conditions and requirements make his service more effective each succeeding year. He knows each mine as a mother knows her child. He understands better the whims and habits of both operators and men as time improves his acquaintance. A short term of office and the frequent change of inspectors is both troublesome and costly. Owing to the lack of a full appreciation of conditions, and in part, to the desire of a new man to do something worth while and to make his presence felt, changes in the mine work or equipment are often urged that a longer acquaintance with the mine would show unnecessary and perhaps even harmful. The need of longer term appointments is more urgent in mine-inspection work than in any other calling, owing to the expense and danger incurred by ill advised changes in methods or equipment, in and about mines.

A careful consideration of these and other facts, in the same connection, should impress any thinking man with the inadvisability of the mine inspectors' election law. But, in closing, I would ask, if such an election law is necessary or advisable in the anthracite district of Pennsylvania, why is it not likewise advisable to enact such a law for the bituminous districts? What difference of conditions or requirements exists between these two districts, in the same state, that the anthracite inspectors must work for their reëlection at the polls, while the bituminous men are reappointed on their record. Much valuable time is lost to the state and the work of the inspector hampered when he is forced into politics and must exert himself for weeks in the endeavor to secure his reelection at the polls.

Some Drafting Accessories

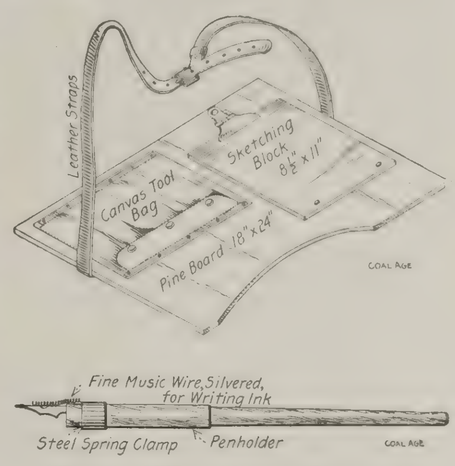
The following notes, from the *American Machinist,* will doubtless prove of interest to the members of engineering profession among the Coal Age readers:

A Convenient Sketching Device

The accompanying diagram illustrates a convenient sketching device. It consists of a small drawing board about 18x24 in. It is intended that when the board is in use it will be hung from the shoulders of the draftsman. For this purpose leather shoulder straps are attached on each side at a point a little beyond the center. When the device is not in use it may be allowed to hang vertically from the shoulders and the user is but little inconvenienced in moving or climbing about. The straps are adjustable as to length. The side of the board nearest the user is cut away slightly to conform to the natural form of the body.

The board is provided on the right with a sketching block or pad, which is securely held by means of a spring clip. Two small pegs at the lower end fit into corresponding holes in the block to prevent it from slipping about. It is intended that the sketches when completed may be removed from the block and inserted in a loose-leaf book cover.

On the left side the board is provided with a canvas tool bag which is fastened to the board by means of thin metal strips at each end. The canvas flap may be fastened down by means of straps and buckles or snap fasteners as desired. The bag is divided into compartments in which the draftsman may keep his instruments.



Sketch Board and Reservoir Pen

When taking measurements the board may be laid to one side if necessary in order that the draftsman may move freely about. A sheet of celluloid may be kept under the hand to protect the sketch from dust and grease.

Another Reservoir Pen

I have been using a reservoir pen for five or six years; I think it better than any other type I have ever seen described. The pen I refer to has the advantage of being equally useful for writing or india-ink work. The flow of ink to the point can be regulated by sliding the coil up or down on the penpoint. While the coil can be made of steel music wire for india ink, I made mine of silvered banjo strings, so as to use them with any kind of ink. The penpoint can be removed by sliding the coil up out of the way.

To Determine Pillar Thickness

The following rule has been suggested for determining the thickness of pillar necessary to avoid squeezes, and protect an entry from the first room in the panel: Take 1 per cent. of the depth of the seam in feet, add five and multiply this sum by thickness of seam and you will have the necessary pillar thickness.

The Pit Boss

The pit-boss stood at the Pearly Gate
His face looked worn and old,
He meekly asked the man of fate
For admission to the fold.

"What have you done," asked Peter kind,
To seek admission here?"
"Oh, I used to boss a coal mine
On earth for twenty year."

The gate swung open sharp
As Peter touched the bell.
"Come in, my lad, and take your harp
You've had enough of Hell."

—William Harkes, in "Fuel."

Double Tipple for Colonial Coal Co.

By W. T. Griffith *

Conditions which attended the development of the Colonial Coal & Coke Co.'s property, near Prestonsburg, Ky., were met by the construction of a double tipple, which embodies several interesting features. The tipple and also the local power plant are here described.

While the property controlled by the Colonial Coal & Coke Co., near Prestonsburg, Ky., lies adjacent to the railroad and the Big Sandy River, its frontage is a bluff 30 to 60 ft. high, except for a small steep drain known as Kelse Hollow, which empties into the river near the middle of the track; and it is in this hollow that the tipple and power plant are located. The seam of coal that is here being worked lies at tipple height above the railroad. Two mines have been opened, one on each side of the hollow, and tracks from each opening run to the tipple, which is located midway between them.

Two-inch Bar Screens

After the introduction of machine mining in this locality, it was found that the native miners, being used to shooting from the solid, persisted in using as much powder after the coal had been undercut as they had previously been accustomed to employ, with the result that an excessive amount of slack coal was produced. On this account, the tipple was provided with 2-in. bar screens, and the miners are now paid on the basis of the amount of coal which passes over these bars. That the introduction of the 2-in. bar screen has had the desired effect, is shown by the fact that, whereas, formerly 30 per cent. of four-inch lump was exceptional, now 40 to 50 per cent. of four-inch lump and 20 to 25 per cent. of egg are commonly obtained.

In designing the tipple for this operation, another difficulty had to be solved. It was necessary to be able at any time to change quickly from making sized coal to loading run-of-mine, or *vice versa*. This was accomplished by building a double tipple, the south side of which is for screened coal and the north side for run-of-mine. On the tipple floor, Fig. 1, the tracks are so arranged that, by throwing two levers, four switches are operated which effect the necessary changes in the movement of the cars from the two openings. Thus, if it is desired to load screened coal, the switches A and A_2 are left open for a straight run to the screen dump, while the switches B and B_2 are closed to provide a free passage for the empties to the empty track. If run-of-mine coal is to be loaded the position of these switches is reversed.

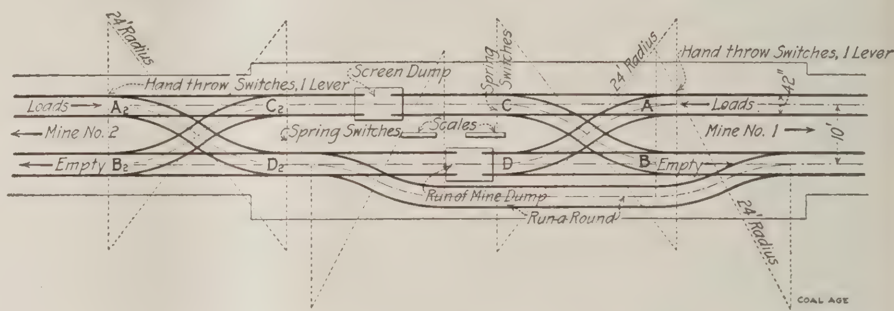


FIG. 1. TRACK PLAN, SHOWING TWO DUMPS AND ARRANGEMENT OF SWITCHES

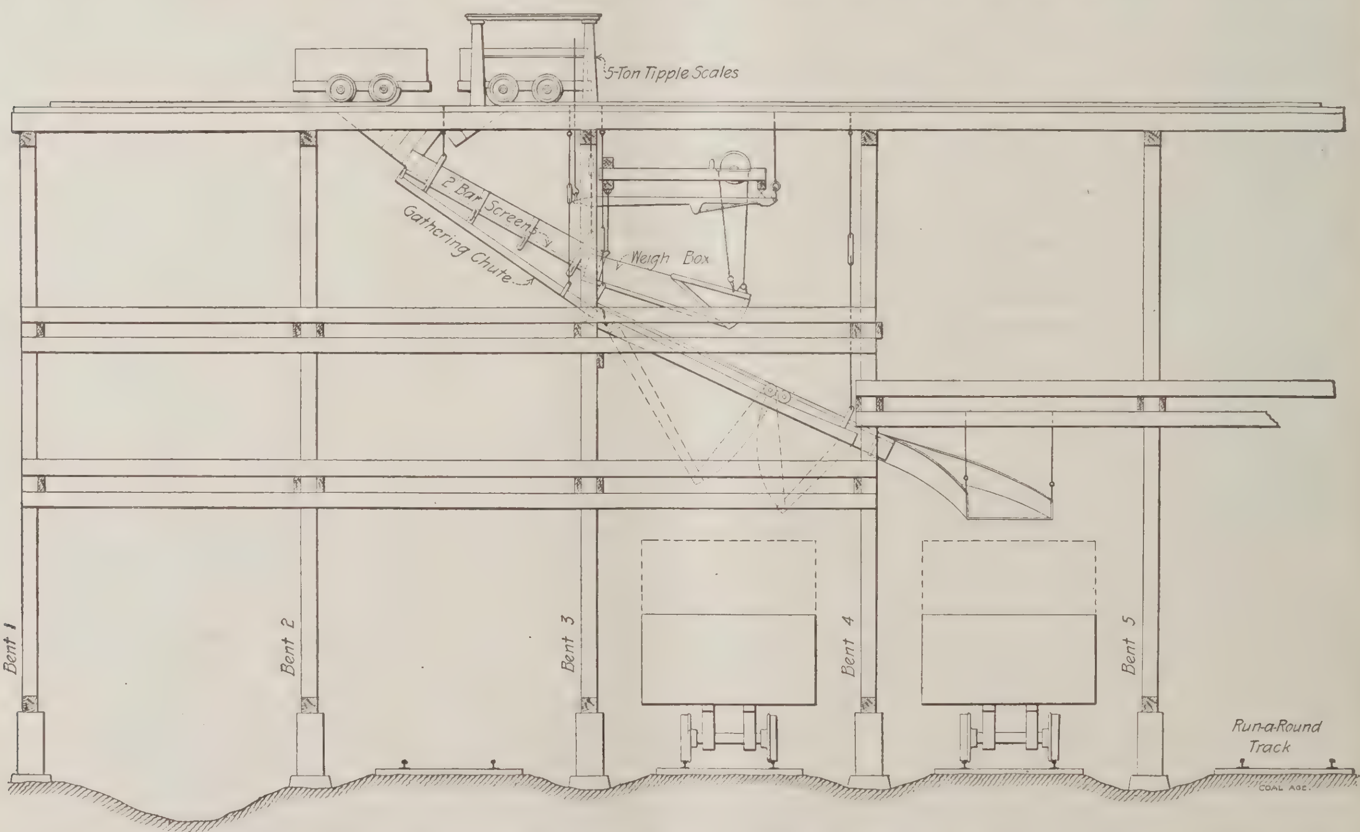


FIG. 2. SIDE ELEVATION, SHOWING MINE-RUN DUMP AND LOADING CHUTES

*Civil and mining engineer, Pikeville, Ky.

The switches C and C_2, also D and D_2, are held in place by springs to give a free run to the empty cars. They are pushed open by the wheel flanges as the loads pass through and always stand in the same position whichever side of the tipple is being used. In order that motors and machines may be taken from one mine to the other, a run-around track is provided at one side of the tipple.

Loading Facilities

While making screened coal, it often happens that a rush order for a car of run-of-mine comes when the lump track is blocked with a partly loaded car, althought the egg-coal track can be cleared at once. In order that either track may be used in a case of this kind, a drop-bottom has been provided in the run-of-mine chute, which, on being opened, allows the coal to pass into a car on the egg-coal track, and when closed carries it over to a car on the lump track.

In loading run-of-mine, coal from the pit cars is dumped onto the 2-in. bar screens, and the fine material that goes through is taken by a gathering pan to the main loading chute, while the coal that passes over the bars runs into the weigh box, and after being weighed, is dumped into the main chute.

On the screened coal side of the tipple, is another set of bar screens, and a gathering chute. The fine coal passing through the bars goes to the upper end of the slack and nut shaker, while that passing over the bars, after being weighed, is dropped onto the middle of the same shaker. The upper shaking screen is 5½ ft. wide, and the lower shaker is 6 ft. wide, there being a 3-in. drop from one to the other. The screen plates of both are made in sections 4 ft. long and are easily removed and changed. Two sets are provided for each shaker, so that any of the combinations shown in Fig. 3 may be made.

The bottom of the bin or hopper under the egg-coal screen, is pitched in the direction of the loading track, and constitutes a lip screen, with ¾- by 1½-in. slotted openings, so that small coal, caused by breakage in traveling through the screens is taken out and sent to the slack car by a screw conveyer.

Since the tipple was designed the railroad company has increased the height of some of its cars. In order to clear the brake wheels of these, a drop basket, which was built for the lump track, has been set aside and a swinging chute substituted. This is hinged loosely on a piece of 2-in. shafting, and by slipping it along the shaft, to clear the shaker, it can be raised by the counter weight to pass the brake wheels, after which it is returned to place, the whole operation taking about two minutes.

The shaking screens have a 9-in. throw, and are run at 100 r.p.m. These, together with the screw conveyer are driven by a 25 hp. General Electric motor. With the exception of the screw conveyer and the bar screens, all the machinery, including shakers and chutes was furnished by the Stevens-Adamson Manufacturing Co. from my designs.

The Power Plant

The power house at this mine is equipped with a single 150-hp. Kingsford Scotch-marine-type boiler, and a 100 kw. Curtiss-turbine generator set. Provision has been made for installing two more boilers and additional generators as future development may require them. The water supply for this plant is taken from the Big Sandy River by a deep well pump, having a capacity of 100 gal. per min., and is pumped to a reservoir on the hillside 140 ft. above the railroad. There is thus furnished a much larger amount of water than will ever be needed for power purposes, the idea being, however, to secure adequate fire protection as well. As an auxiliary supply, a small dam was built across the hollow, and if necessary, the boilers can be supplied from this source by a steam injector.

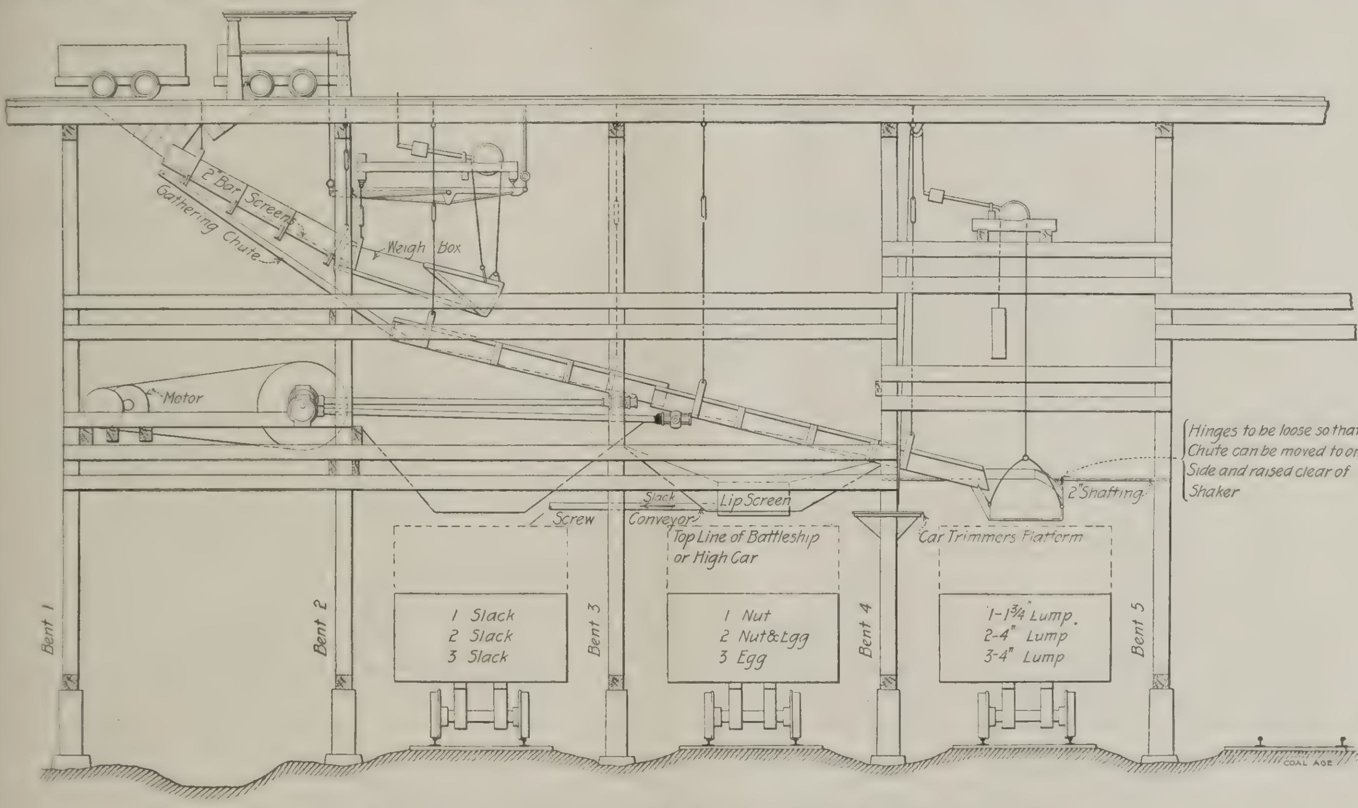


Fig. 3. Side Elevation, Showing Screened-coal Portion of Tipple

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One of the largest producer gas units in the world is located at the Berchenwood colliery, Kidsgrove, England. The plant is equivalent to 32,000 hp., gasifies 320 tons of fuel per 24 hours and comprises 13 special Mond producers fitted with arrangements for the mechanical removal of ash. Waste shale, low grade coking coal, bituminous slack, washery refuse and belt pickings are used for gas production.

The Susie, Wyoming, Explosion

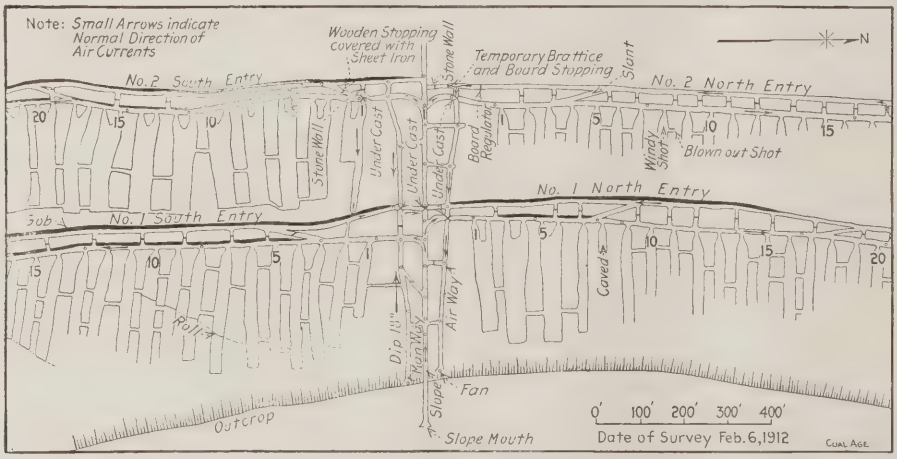
By C. S. Beach*

The final conclusions relative to the cause and effect of the Susie explosion are presented herewith. The accident is another glaring example of the striking ignorance and carelessness of some of our miners today.

An explosion occurred in No. 4 mine of The Kemmerer Coal Company, situated at Susie, about four miles north of Kemmerer, Wyo., shortly after 4 p.m., Jan. 20 last, killing 5 men, and injuring 20 more. This mine was opened for operation in the fall of 1907, and the present development consists of a main slope, manway, return airway, and two double entries to the north and south. The approximate output is 500 tons per day of 8 hours.

System of Mining

The double entry system with the room-and-pillar method of mining is used. The strike is nearly north and south, the seam dipping about 18° to the west, and it is practically 6 ft. thick. The bottom 12 to 14 in. of coal is comparatively soft throughout the mine, and is separated from the top coal by a band of clay varying from nothing up to 6 in. thick. A cap rock varying from nothing up to 20 in. thick comes down in places.



Portion of the Kemmerer Coal Co.'s Mine No. 4, at Susie, Wyo.

The haulageways and air courses are 6x10 ft., except in places where the cap rock is excessive, when they are driven wider and the rock gobbed on the lower rib. The single rooms are driven on 50-ft. centers, 25-ft. room and 25-ft. pillar. The double rooms are driven on 30-ft. centers, 40-ft. room, with about 30-ft. pillars. The mine is ventilated by a 4-ft. belt-driven Stevens fan, running 490 revolutions per minute, exhausting. Concrete undercasts and rock wall main stoppings are used.

In places the mine is naturally damp, the water coming from the roof, and from the parting between the top and bottom coal. Sprinkling is done by means of a water car, and pipe line connected both with the mine pump and outside water supply. Black powder fired by fuse and squib is used entirely, and shooting off the solid is the custom. No gas has ever been discovered in the mine up to the present time.

The Explosion

The evidence at the coroner's inquest proved beyond doubt, that the origin of the explosion was in No. 8 Room, on the No. 2 North Entry. It is believed that the miner in No. 8 Room fired two shots, both in the bottom coal near the clay parting, one at the face near the center of the room and one in the unfinished crosscut, leading to No. 9 Room, a little above the center.

The shot in the crosscut blew out without doing any work, and the shot at the face of the room broke from the back of the hole through a slip, and must have been very windy, as little of the powder's force was expended in doing work. These shots were so placed that the resulting forces crossed each other at nearly a right angle, and the evidence gathered in the room shows the same.

When the explosion reached the main entry it divided, a part going inside and doing little damage. Five men at the new room, No. 15, felt the force, but no flames were seen. The force going towards the slope evidently split at the mouth of the slant, enough going into back entry to destroy a temporary canvas brattice across the slant, and a board regulator 4 ft. inside the return air course.

The force again split on reaching the main slope, part crossing into the No. 2 South and blowing parts of a board and sheet iron stopping in the first slant, about 300 ft. in the back entry. Part of the force wrecked a newly constructed stone stopping about 18 in. thick, just off the main slope in the No. 2 North Back Entry, forcing same towards the return airway, while an old temporary board and brattice stopping 30 ft. inside of the stone stopping was left intact.* There was no evidence of the force of the explosion having gone to the face of the slope.

From the second entries the force of the explosion traveled up the slope, going into both the No. 1 North and South Entries for short distances. Although considerable smoke came out of the main slope, and manway, there was no flame. The force of explosion in the return airway was sufficient to throw the belt off the fan engine and raise slightly the roof of the fan conduit, made of sheet iron riveted to 20-lb. rails, and covered with earth. The fan was not damaged in the least and was running probably within 8 to 10 minutes after the explosion.

Effects of the Explosion

Men on and near the slope, at the partings, were severely burned on the exposed parts of their bodies, and men between No. 8 Room, on the No. 2 North Entry and the slope, were also burned. Approximately 120 men were in the mine at the time of the accident.

The only fire or flame seems to have been such as was caused by the ignition of the dust, pulverized by the blown-out shots, and such as would naturally exist from the breakage of coal at the face when the shots were fired. The explosion was purely local, due to the fact that the mine was practically free from such dust as generally serves to extend such explosions.

That No. 4 mine was not in an explosive condition, is proved by the fact that the flame was confined to such a small area. The advantage of concrete undercasts and good stone stoppings was fully shown here by their ability to withstand the force of the explosion. A careful examination of the mine showed very little damage done.

Many individual acts of heroism were performed by the employees of No. 4 mine as well as men from adjoining mines in rescuing the injured and recovering the dead.

*Assistant superintendent, the Kemmerer Coal Co., Kemmerer, Wyo.

*For a detailed discussion of this strange phenomenon, see Coal Age, Vol. 1, p. 650.

Expropriation of British Mines

Special Correspondence

The British government, by accepting the principle of a minimum wage scale and incorporating it into an act of Parliament, has taken a definite step toward the expropriation of the coal mines of the United Kingdom. The strike of the British miners has clearly and abundantly demonstrated that the integrity of the empire politically and socially lies within the power of a million of mine workers. There is no exaggeration in this statement. The realization of that fact came home to every man, woman and child in Great Britain and Ireland during the past five or six weeks, to some with actual suffering and to others with a haunting apprehension of suffering to come.

It seems to me as I interpret the future by the light which this historical labor revolt and its consequences affords, that another strike on a similar scale would be fatal to the industrial, financial and international supremacy of England. A repetition of such a strike she must obviate at all cost. How can she do it? In my opinion, there is only one way in which it may be done, and that is by expropriating the coal mines of England, Scotland and Wales. But it will be said that such a measure is an acknowledgment of the necessity for the adoption of socialistic principles. Not at all. But even if it is, in my judgment, the fact and its consequences must be accepted to avoid a greater evil, if the power of the British miner to injure the empire does indeed constitute an evil. Englishmen are not afraid to face the logic of realities. If it is necessary, or if they deem it necessary, they, without the slightest hesitation, will expropriate the mines rather than face the alternative of industrial anarchy and national distress.

The Tory or Conservative press of Great Britain is today demanding whether forty-two millions of people must be at the mercy of one million men who happen to be engaged in an essential industry. The British Tory press declares that the Liberal government has raised a Frankenstein which it cannot conjure. Of course, this is more or less party politics; but it expresses a truth which cannot be gainsaid. As matters stand, forty-two millions of people *are* absolutely at the mercy of one million of mine workers. The acceptance of a minimum wage scale as a national economic principle has not altered the situation; it has only to a certain extent modified it. Neither the British miners nor the British operators seem to be satisfied with the establishment of district boards as regulators of the minimum wage scheme. The miners have realized their omnipotence, and what they accomplished yesterday with such ease they can accomplish tomorrow for some other purpose.

Great Britain has to maintain an enormous fleet of battleships, not to speak of a stupendous mercantile marine. The one is complementary to the other. Without the mercantile marine, Great Britain would have little or no need of her enormous fleet. She must maintain both at the height of their efficiency. She cannot do this without coal. It may be accepted as established that for England, at least, local strikes are bygone incidents, and that for the future under the auspices of the Miners' Federation all strikes in the coal fields of Great Britain will be national in extent and a unit in intensity. I am satisfied that before a British government, no matter which party is in power, permits another strike on the scale of that which has just lately closed, it will come out plainly and squarely for the expropriation of the mines, and that in doing so it will have behind it the solid and enthusiastic support of the people of the country. I do not think that that consummation is very far off. There is nothing really new in this proposition.

Twenty years ago the Irish landlords were as firmly entrenched in the possession of their estates as the colliery proprietors are today in the possession of their mines. The social and economic upheaval which ended with the expropriation of the hereditary possessions of the Irish country gentry with adequate compensation, meant as much to them, and to their country and no more than a change in ownership of the mines of Great Britain will involve to the operators and people of the British Isles. Of course, national transformations of this kind do not take place in a day. It takes all the statemanship, all the financial genius of a nation to effect these things without suffering even more revolutionary upheavals. But the industrial situation in Great Britain is inevitably heading that way.

A general strike is more devastating and disconcerting financially than a war, even a civil war. In war the arteries of national commerce remain open, and often are more active than they were before, or are in the succeeding years. The national life is not totally paralyzed, as it often is in a general strike among miners or railroad employees.

But it may be asked whether the nationalization of the mines or the railroad would prevent general strikes. This is a question into which it is impossible for me to enter here. A national strike in a national industry is simply rebellion, and rebellion is so contrary to social unity that it is but rarely found in any country and it seems unlikely that the British workman would favor it.

Using Ontario's Peat Bogs

It is announced by the Mines Department of the Canadian government that the associated manufacturers at Brantford, Ont., have become so convinced that the air-dried peat method employed by the mines branch can be made a commercial success that, according to U. S. Consul H. A. Conant, they have contracted with the government to continue the work at Alfred, Ont., and will spend over $50,000 of private capital in trying to improve peat machines. This action was decided on only after a thorough investigation. The machine to be used will have a capacity of 60 to 80 tons per day, as compared with the 30 tons the government turned out.

The government experimental plant at Alfred exhibited samples of machinery and of peat ready for market at the Ottawa fair. A thousand tons of peat were made up, which was sold at $3.25 a ton. It burns to a fine ash, there being pracically no residue, and is much cheaper than coal.

The results of the Dominion government's experiments in the production of fuel from the peat bogs in Alfred Township, Prescott County, have been so successful that the Canadian Pacific Ry. has opened negotiations with the government for the purchase of these bogs. Should the railway company secure the property, it is understood that the output of prepared peat will be greatly increased.

There are vast bogs in many parts of Ontario, and success in the present instance will be apt to start operations in many places, the more so, because of the scarcity of wood and the high cost of coal.

Distinguished German Visitors

A small committee, consisting of directors of the German Museum in Munich, holding high offices in their country, has come to the United States. The visitors are His Excellency Count Podewils, late Prime Minister of Bavaria, Dr. von Borscht, Lord Mayor of Munich, and Dr. von Miller, Councillor of the State.

The mission of this committee is to bring the German Museum into closer touch with institutions in the United States, devoted to the history of technical science. Having only a limited time at their command, its members would naturally like such Americans as sympathize with their mission to come forward, with a view to facilitating an early communication.

Coal Age therefore suggests that any of our readers who are able to give information, or wish to communicate with the committee, send their addresses to this paper, to be passed on to the German visitors as soon as possible.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Anchoring New Bolts in Old Foundation

It is sometimes necessary to change an old foundation to accommodate a new arrangement of equipment, when, for instance, low- and high-pressure steam cylinders are compounded to increase the power of an engine. Whenever it is necessary to set an anchor bolt in an old foundation, the difficulty may be met in one of two ways, says R. B. Dale in *Power*.

In the first method a hole is drilled in the concrete slightly larger in diameter than the bolt to be used and to the proper depth. A bolt is then prepared by cutting a slot in one end lengthwise of the bolt and about 6 or 8 in. long. This slot is then fitted with a wedge of hardened steel held in place by a pin of copper or other soft metal. The bolt is lowered into the hole and struck several hard blows on the upper end with a heavy hammer. This shears the soft metal pin and drives the wedge into the slot, thus enlarging the diameter of the bolt at the lower end. The bolt is then grouted into the hole and the nut is tightened to complete the work.

In the second method a hole is drilled for the bolt as before. A second hole is then drilled laterally through the side of the masonry to meet the first hole and this is enlarged sufficiently to take the standard anchor plate. The work is completed in the customary manner, precautions being taken to grout the anchor plate to a firm bearing in the old concrete. The first method is cheap and simple, although there is no certainty as to what happens in the bottom of the hole. The second method, while more troublesome and expensive, is the more reliable and should be used on the more important work. It gives the bolt almost as secure a hold as if the foundation had been built around it.

China as a Coal Producer

By Thomas T. Read

The coalfields of China are largely in the interior and consequently but little opportunity exists for transportation of the product. Nowhere are opportunities for mining more favorable and nowhere are they more neglected. Probably as much coal exists in China as in the United States. Sulphur is usually in low percentage, but the phosphorus content is sometimes excessively high.

Coal is easily the first of the mineral resources of China, both in the extent of its deposits and in its development. A conservative estimate of the present production is 15,000,000 tons annually. The casual visitor to North China, where the winter climate is rigorous, seeing the children of the villages, armed with rake and basket, engaged in collecting every scrap of vegetable material that can be utilized as fuel, is likely to wonder why coal is not more generally used. The reason is not hard to understand: in many regions the low cost of labor, the high cost of transportation, and the low scale of living put coal beyond the reach of the people. It is probably safe to estimate that one-half the cost of the food of an ordinary workman is chargeable to the fuel used in cooking it, and where the otherwise unemployed children can be sent out to gather grass and pull up the roots of the larger cereals, such as corn and *kaoliang*, there is little market for coal, except for industrial purposes. Near the mines, where coal is abundant and cheap, it is freely employed. The development of railroads, steamships and industrial plants will not only create a greater market for coal, *per se*, but, by raising the scale of living through the higher wages paid for labor, will increase the consumption of coal for household purposes. The annual consumption of coal in the United States is approximately 3.5 tons per capita per annum; the consumption in China figures roughly only one-twenty-fifth of a ton. An approximate estimate of the present coal-production in China is given in Table I.

*Formerly professor of metallurgy, Imperial Pei-Yang University, Tientsin, China.

Note—Read at San Francisco meeting of the American Institute of Mining Engineers, October, 1911.

FIG. 1. COKE OVENS AT P'ING-HSIANG COLLIERY, KIANGSI

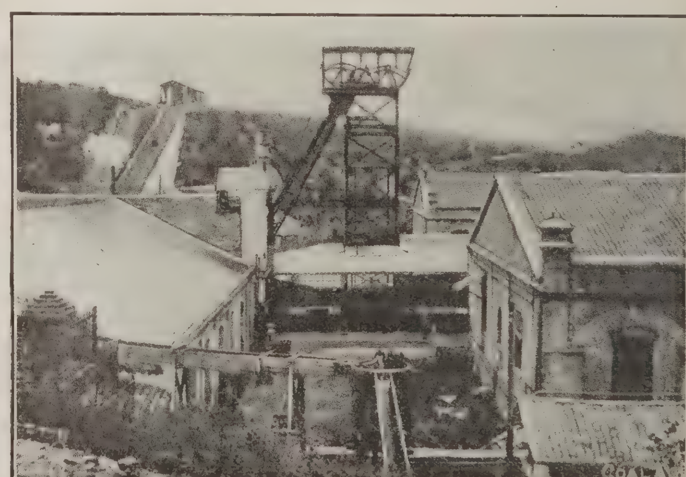


FIG. 2. HEADFRAME AND BUILDINGS AT SAME COLLIERY

FIG. 3. THE P'ING-HSIANG COLLIERY, COKE OVENS AND WASHERY

TABLE 1. APPROXIMATE ESTIMATE OF THE PRESENT COAL-PRODUCTION OF CHINA

Province	Anthracite	Bituminous	Sub-bituminous and Lignite
	Tons	Tons	Tons
Manchuria	....	25,000	1,000,000
Chili	840,000	2,090,000	150,000
Shansi	4,000,000	25,000	
Shensi	....	500,000	
Kansu	....	500,000	
Shantung	300,000	500,000	
Honan	1,000,000	....	
Ssu-chuan	....	500,000	
Kweichou	....	250,000	
Yunnan	....	300,000	
Chekiang	....	10,000	
Kiangsi	....	700,000	
Hunan	....	200,000	
Kuangtung	....	50,000	
Kuangsi	....	100,000	
Other provinces	....	100,000	
Total	6,140,000	5,850,000	1,150,000

Total production of all kinds of coal, 13,140,000 tons per annum.

The sketch map, Fig. 6, shows in general the coal areas of China. The dark spots in Fig. 7 show where coal has been uncovered in Manchuria.

The coals of China are as varied in quality as those of the United States, but this difference should be noted: the amount of lignite is comparatively small, and the proportion of anthracite to bituminous coal is larger than it is in the United States. Willis has estimated that the anthracite resources of Shansi and the adjacent fields are practically equal to those of Pennsylvania. If this is in error it is probably upon the safe side, and the total coal resources of the Chinese Empire seem likely, upon careful mapping, to compare favorably with those of the United States.

MANCHURIAN COAL

In Manchuria, one large mine is now in operation at Fushun. This field, seen just above the word "Mukden" on the sketch map, Fig. 7, has been described in detail, so nothing further will be given here than the statement that the coal is sub-bituminous and of excellent quality. The mines, owned and operated by the South Manchuria Ry., had a production in 1910 of 830,328 tons, and are expected to reach 1,000,000 tons per year when the second of the two pairs of deep shafts (18 and 20 ft. in diameter) are in full working order. More recently the mines at Pen-hsi-hu, on the Antung-Mukden Ry., have been developed. The chief engineer at Fushun stated, in 1909, that the Pen-hsi-hu coal is friable and semi-bituminous, occurring in Jurassic strata, and not of especially good grade, but more extensive development may have disclosed seams of better quality. The same remarks will apply to Sai-ma-chi; owing to its distance from the railroad no very serious attempts have been made to develop these workings. All mines in the South Manchuria Ry. zone are to be developed jointly by Japanese and Chinese.

Just east of Kwan-cheng-tze, coal similar to that at Fushun occurs in several places, and though the attempts at working have not been very successful as yet, the seams at this place are likely to become of great importance, as the branch railroad to Kirin cuts directly across them. West of the Liao River, a valuable and important field is said to exist, but I have not visited the locality and have no definite knowledge of it. Some time since, the Imperial Railways of North China attempted to exploit some seams of a true lignite a short distance north of the Great Wall, but they proved to be of too poor quality. Other localities where coal occurs are Yentai and Wu-hu-tsui, but the production is unimportant. As the workable coal in the Fushun field has been estimated at 800,000,000 tons, Manchuria is well supplied with coal. But the Manchurian coals are very friable, furnishing but a small proportion of lump size, and no good coking coal has yet been found.

Chili, which immediately adjoins Manchuria on the southwest, and is the metropolitan province, is now the most important producer of coal.

The lignite and bituminous coal of the Jehol district is produced by native methods, the nature of which can be inferred from the photographic views, Figs. 4 and 5, taken in the Western Hills. The Kin-Han (Peking-Hankow) railway district anthracite field and the Peking-Kalgan railway district field are northern and southern portions of one field, lying a short distance west of Peking. Hoover & Woo have described the Chinese Engineering & Mining Co.'s mines, at Tongshan and Linsi, in detail. These are the largest and most important coal mines in China. They are owned by an Eng-

FIG. 4. MOUTH OF A TYPICAL CHINESE COAL MINE

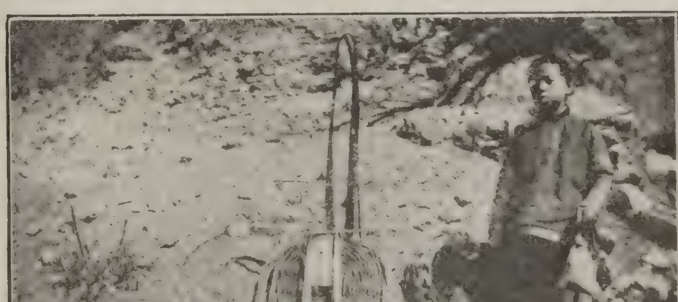


FIG. 5. IN CHINA, BASKETS REPLACE THE MINE CAR

lish company, but it has been proposed by the gentry of the province that the concession be purchased by the provincial government. Since the descriptions were written, the mines have been much developed and improved. They produce nearly all of the 1,400,000 tons, estimated in Table III, as the semi-official Lanchow mines, in the same field, have only recently been started and, though well equipped, seem unable to operate at a profit. The net return of the Chinese Engineering & Mining Co. mines for the year ended February, 1910, is given as $1,184,871. The Ching-Hsing mines, on the railroad from Shih-chia-chuang to Tai-yuan-fu, are worked under German supervision, and have both Chinese and German capital. The production in 1910 was 150,000 tons. The Lincheng mines are operated to supply the Kin-Han Ry. with fuel, and are under the supervision of K. Y. Kwong. They have an output of 800 tons per day.

Shantung Coal Fields

In Shantung, coal occurs in many places, but the larger part of the production comes from the mines owned by the Shantung Bergbau Gesellschaft, at Poshan and Fang-tze; 252,816 tons of anthracite coal having been produced at the former place in 1910, and 230,064 tons of bituminous at the latter. These mines have washing plants. Some difficulty has been found in working, owing to the faulting and disturbance of the beds, and the native papers say that there is little profit in their operation. In this, as in every other coal field in China, there is a large amount of native mining upon a small scale. Farther to the southeast, near Yi-hsien, is a bituminous field which is said to be larger and better, but which I have not visited. The production of the native mines is already important. A large native company, called the Chung Hsing Kung Ssu, has been formed, machinery procured from Germany, and a railroad constructed from the mines 35 miles to the Grand Canal. This will probably be extended to connect with the Tientsin-Pukou R.R., and when the latter road is in operation, the production of coal in this district should become important.

As Much Anthracite in Shansi as in Pennsylvania

Much has been written concerning the coal fields of Shansi. These anthracite seams are the most striking coal beds in the empire, as they are so thick, so little disturbed, so well exposed and so widely distributed, having an extent of nearly 200 miles north and south, and from 25 to 30 miles east and west. There are several seams, one of which is especially thick and persistent. Richthofen estimated the area of the field as 13,500 square miles, and Drake estimated the average workable thickness of the seams as 22 ft. As the beds are frequently but slightly inclined, this corresponds to a yield of over 22,000,000 tons per square mile of workable area, so it is safe to estimate that the anthracite resources of this part of China are at least equal to those of the United States.

TABLE III. PRODUCTION OF COAL IN CHILI PROVINCE FOR 1909

District	Tons
Lignite	
Jehol district coal-fields	150,000
Total lignite	150,000
Anthracite Coal	
Kin-Han railway	600,000
Peking-Shanhaikwan railway	50,000
Peking-Kalgan railway	170,000
Total anthracite	820,000
Bituminous Coal	
Peking-Shanhaikwan railway	1,400,000
Kin-Han railway	410,000
Peking-Kalgan railway	40,000
Lan-Ho and Jehol	100,000
Chow-yang-fu	140,000
Total bituminous coal	2,090,000

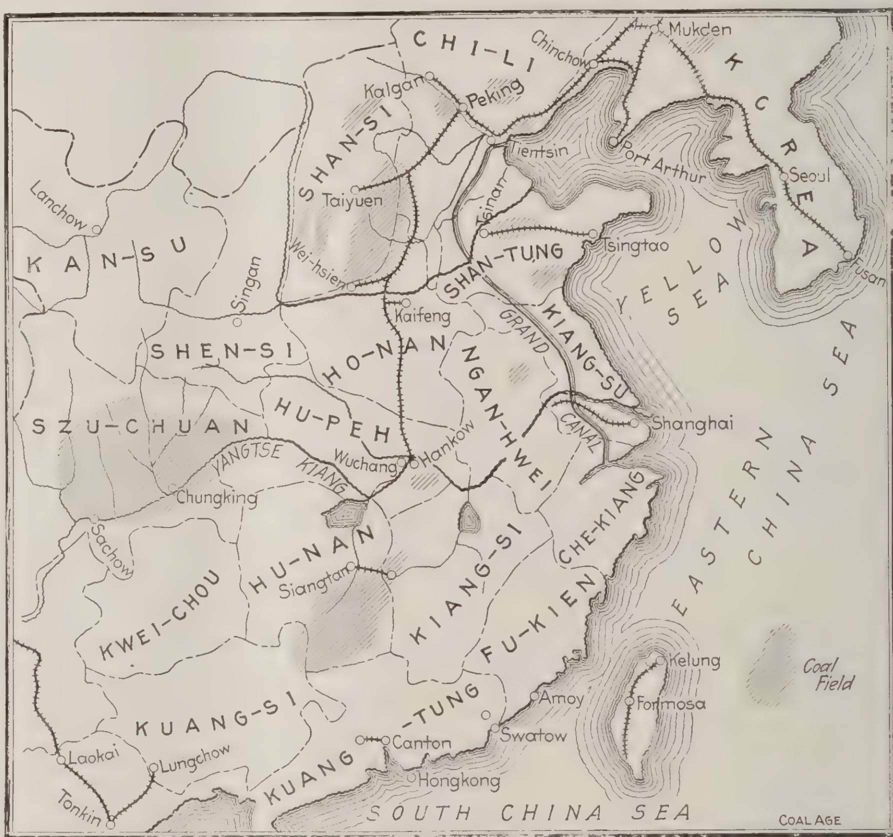


Fig. 6. The Chinese Coal Areas and Railroads

Shansi also possesses considerable resources in bituminous and semi-anthracite coal, which is produced both to the east and west of Tai-yuan-fu.

Shensi, Kansu and Ssu-chuan

In Shensi, which adjoins Shansi on the west, extensive coal fields are known to exist, and Richthofen thought that the bituminous fields to the west of Tai-yuan-fu were of equal extent and importance to the anthracite fields on the east. This is possibly too optimistic, but they are certainly very important. I have estimated the production of this province as 500,000 tons, but this is problematical, as the area is so little known. The same remarks apply to Kansu, which adjoins Shensi on the west. I have, for this reason, omitted Mongolia from Table I, though it is known to possess coal seams in those portions which adjoin Chili and

TABLE II. ANALYSES OF MANCHURIAN COALS

No.	Locality	Moisture	Volatile Hydrocarbon	Fixed Carbon	Ash	Sulphur	Analyst	Remarks
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
1	Fu-shun	6.30	39.34	52.90	3.18	0.27	C. H. Wang	Average of 7 analyses
2	Fu-shun	4.43	40.33	48.89	6.35	1.00		
3	Wu-hu-tsui	2.70	11.42	76.69	9.19	0 50	Geological Survey of Japan	
4	Pen-hsi-hu	0.96	21.66	66.06	11.32	0.84		Average of 3 analyses
5	Yen-t'ai	1.07	14.22	74.98	9.75	0.66		Average of 3 analyses
6	Sai-ma-chi	1.39	25 58	60 47	12.25	0.80		Average of 3 analyses

TABLE IV. ANALYSES OF SOME CHILI COALS

No.	Locality	Moisture	Ash	Fixed Carbon	Volatile Hydrocarbon	Sulphur	Fixed Carbon Ratio	Source	Remarks
		Per Cent	Per Cent	Per Cent	Per Cent	Per Cent			
1	Tongshan, C. E. & M. Co.	1.00	16.67	56.78	25.55	1.01	2.22	C. H. Wang	Coking, bituminous
2	Tongshan, C.E. & M. Co.	0.84	18.02	57.19	23.95	1.46	2.38	C. H. Wang	Bituminous
3	Tonsghan, C. E. & M. Co.	1.37	21.72	53.81	23.10	2.55	2.33	C. H. Wang	Non-coking, bituminous
4	Tongshan, C. E. & M. Co.	0.93	12.29	59.75	27.03	3.90	2.21	C. H. Wang	Coking, bituminous
5	Tongshan, C. E. & M. Co.	0.90	13.55	70.33	15.22	2.26	4.62	C. H. Wang	Coking, bituminous
6	Tongshan, C. E. & M. Co.	0.77	18.59	53.28	27.40	1.11	.....	C. E. & M. Co.	Average
7	Linsi, C. E. & M. Co.	0.77	19.18	51.97	28.05	0.88	.....	C. E. & M. Co.	Average
8	Ching-Hsing	0.54	13.49	61.16	24.81	2.26	2.46	C. H. Wang	Coking, bituminous
9	Chai-t'ang	2.11	6.67	68.23	22.99	0.19	2.97	C. H. Wang	Non-coking, bituminous
10	114° 30′ E., 38° 45′ N	1.20	12.97	80.50	5.43	0.97	14.81	C. H. Wang	Hard, dry anthracite

Shansi. Passing directly south, to Ssu-chuan, Kwei-chou and Yunnan, our knowledge is in a similarly unsatisfactory state. Richthofen, who only traversed the northeastern part of Ssu-chuan, says, in substance, that coal is very generally worked throughout the province, as the Mesozoic strata are extensively folded and are cut across by the rivers, thus conveniently exposing the seams. So far as I can learn, the coal here is not of as good quality as other deposits more favorably situated with respect to the larger markets, which, together with the difficulties of transportation on the Yangtze, restricts production to the amount required for local needs.

The anthracite field of Shansi extends southward into Honan province and at Ching-hua-hsein, the Peking Syndicate is operating several shafts, equipped with modern machinery. This company has had many vicissitudes, but is now meeting with success; the production during 1910 is given as 357,205 tons. There is a good deal of production by native methods in this province.

The great southern coal field lies to the east of the Hsiang River, in Hunan and Kiangsi provinces. The greater part of the field is in the former province, but the most important producer, the collieries of the Han-Yeh-P'ing Iron & Coal Co., are at P'ing-hsiang, in Kiangsi. A view of the P'ing-hsiang colliery, showing two banks of coke ovens and the washing plant, is given in Fig. 3, and a nearer view of one bank of ovens is shown in Fig. 1. The steel headframe of the shaft is shown in Fig. 2. This coal is a bituminous coking variety (with associated thin seams of anthracite), which contains 28 per cent. of ash as mined, but after washing and drying, an average analysis, furnished by the company, gave:

Analysis P'ing-Hsiang Coal

	Per Cent.
Volatile hydrocarbons	22.35
Fixed carbon	68.90
Ash	8.70
Sulphur	0.10

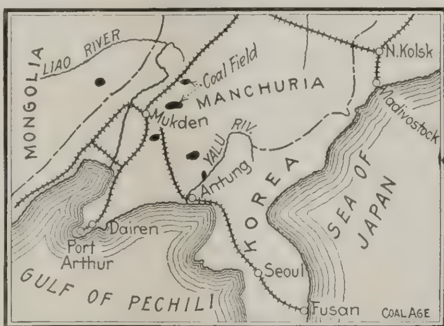


Fig. 7. Manchurian Coal Fields

It yields excellent coke, which supplies the blast furnaces at Han-Yang and the general market; more than 107,000 tons having been produced in 1909. The production for 1910 is given as 610,000 tons. The coal fields extend west and south from this point for a great distance, and Richthofen says that southward the coal is anthracite and of better quality. Transportation is difficult, owing to the shallowness of the rivers; so development has lagged; but when the Canton-Hankow Ry., now under construction, is in operation, this field, which I regard as only second in importance to the Shansi field, is likely to develop greatly. Some of the most important mineral regions in China lie to the west of the projected railway line, and the transportation facilities thus afforded should lead to a great increase in mineral production.

Conclusions

In conclusion, it should be said that the coal fields of China are of great extent, the coal is generally of good quality and the fields are widely scattered, so that no parts of the empire are far distant from the sources of supply. In extent and quality the coal resources of the empire compare favorably with those of the United States. As a rough comparison, it may be said that Chinese coals are slightly younger than those of North America, most of the fields being upper Carboniferous or Permian. In the north, Jurassic and Tertiary coals occur, but except for the Fushun field, are of little importance as yet. Bituminous coking coal is very common; coke made by native methods can be obtained almost anywhere in the empire. When made from washed coal, the resulting coke is of excellent quality, and will afford an abundant supply for the smelting industries which are likely to develop. The anthracite is of excellent quality, but the bituminous is often friable, yielding an excessive proportion of fine coal. When worked on a large scale, this can be washed and converted into coke. The Chinese custom is to make the dust into briquettes with clay as a binder. These are dried before burning. Recently the number of mines equipped with modern machinery has become comparatively great, and the present supply amply meets the demands.

TABLE V. ANALYSES OF SHANSI COALS

No.	Locality	Moisture	Volatile Hydrocarbon	Fixed Carbon	Ash	Sulphur	Phosphorus	Analyst	Sp. Gr.
		Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.		
1	Chuang-chuang-kou	0.91	8.20	78.75	12.14	0.67	0.476	C. H. Wang	
2	Hon-ho-kou	0.94	6.15	85.70	7.21	0.59	n. d.	C. H. Wang	
3	Han-ho-kou	0.38	8.55	84.00	6.72	0.409	0.23	F. N. Lu	1.38
4	Tuan-chia-kou	0.76	6.44	79.10	13.66	0.683	1.80	F. N. Lu	1.35–1.38
5	Lao-hsien-shêng-kou	0.66	4.49	89.50	5.46	0.509	2.53	F. N. Lu	1.4
6	Nan-t'ien-mêng	2.01	7.05	81.35	9.61	0.867	n. d.	F. N. Lu	1.3–1.5
7	Meng-tsen-chêng	0.33	4.39	89.25	6.03	0.405	2.15	F. N. Lu	1.3 high
8	Chuang-chuang-kou	14.75	19.28	52.42	13.45	0.890	n. d.	F. N. Lu	
9	Chang-tsai-kou	0.50	14.20	75.89	9.41	0.258	n. d.	C. H. Wang	
10	Tung-chia-chuang	1.73	10.72	84.22	3.33	1.150	n. d.	C. H. Wang	
11	....	1.93	3.45	81.44	14.17	0.35	n. d.		
12	....	2.91	86.80		9.88	0.41	n. d.		

Sample 1, semi-anthracite, does not coke. Sample 2, hard dry anthracite. Sample 8, coked in crucible, probably due to oxidation. Sample 9, semi-bituminous, coked in crucible. Sample 10, semi-anthracite, does not coke. Sample 11, average of six samples by Drake. Sample 12, average of six samples by Shockley. n. d. = not determined.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

In no other industry is there such a lack of unison was in coal mining. For this reason, men like Samuel A. Taylor, of Pittsburg, who are possessed of the ability to draw factions, as well as individuals, together, are assets of no small value.

Mr. Taylor long ago proved himself the champion banisher of discord. One cheering look from him is sufficient to cause the blackest, most threatening clouds to scurry away and leave the sky as clear and serene as a placid lake on a summer afternoon. His supply of oil for disturbed waters comes from an everlasting fountain of inexhaustible flow, and the most tumultous seas are rendered calm as death when subjected to his tender efficient care.

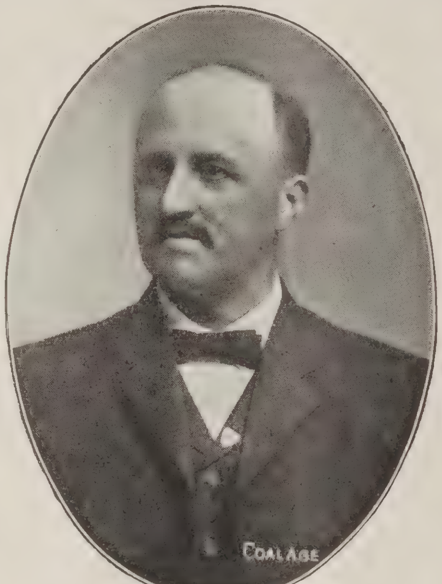
Concentration calls, not for talented men, nor yet for geniuses, but for men who are trained to do one thing as well as it can be done. In this matter of "singleness of purpose," Mr. Taylor is unusually proficient, for he has never once moved his residence from Allegheny County since he was born in North Versailles Township, Oct. 24, 1863.

He is an excellent example of the class of "Stay-at-Homes," whose mental philosophy includes a belief in the story of the "rolling stone." Samuel takes no chances on knocking off any moss, although he has confined the growth of that much desired substance to those parts of his being, not directly connected with human ideas and modern notions.

Mr. Taylor was educated at the common schools until 10 years old. At this early age he began working in the coal mines, which line of effort he followed until he was 15, when he gave up the mines and learned the carpenter trade.

At 18, he entered the Polytechnic Institute of Allegheny, Penn., and at 20 commenced his college course in civil engineering at the Western University of Pennsylvania, now the University of Pittsburg. "S. A." graduated from this latter institution in the class of 1887, and immediately got a job in the structural-iron department of the Homestead Mills of the Carnegie Steel Co., under Julian Kennedy.

He left the Carnegie people in 1888, and accepted a position in the construction department of the Pennsylvania R.R. While with this latter concern he had charge of the construction of a number of branch railroad lines until 1893, when he opened a general engineering office in Pittsburg, which was conducted by him until the close of 1904, when this private engineering practice was turned over to three of the men who had been associated with him.



Samuel A. Taylor

Since 1904, "S. A." has acted as a consulting engineer, and has managed a number of coal and water-works plants. He organized and became president of the Domestic Coal Co., the Crescent Coal Co. and later the Mifflin Coal Co. and the Corona Coal & Coke Company.

He has served on a number of mining commissions and as director of several banks, water companies and coal companies. Is a member of the Engineers' Society of Western Pennsylvania, and during the last year was president of the Coal Mining Institute of America. At the recent meeting of the American Mining Congress, in Chicago, Mr. Taylor was elected president of that body, and is today actively engaged in bringing the influence of the Congress to bear on the subject of necessary legislation looking to a betterment of conditions in the coal and metal industries.

And without I miss my guess, "Samuel A." will get some results if playing politics is all that is essential to the accomplishment. He is neither a novice nor bungler at the game, and can come nearer the consummation of a fixed plan, through affability of manner and earnestness of purpose, than paid professionals can ever hope to get by sharp trading and the bestowal of party patronage. There are many schools calculated to turn out capable politicians, but when a man has overcome the obstacles that confront a practicing engineer, and in addition has a bowing acquaintance with the inner circle of Pittsburg politics, then he is eligible to an honored place in the national hall of political fame.

Samuel Taylor is also a member of the American Society of Mining Engineers, the American Society of Civil Engineers, and a string of scientific organizations, the enumeration of which would make the "etc's" affixed to King George's name appear like a lonesome college degree compared with an open discussion on "how to fight a mine fire." In fact, no technical society today is bold enough to organize without having Samuel on its charter-member list. Might as well dispense with by-laws, officers and rules as try to get along without him.

The Association of Pittsburg Coal Operators long ago recognized Sam's cementing qualities and made him their secretary. Some day bituminous operators generally will want a Moses to lead them from the wilderness and it is a sure bet their searching gaze will light on "S. A.'s" assuring smile.

Pittsburg has long deserved recognition as a seat of mining education, and this cherished ambition may now be realized, due to Mr. Taylor's election, on Apr. 1, to the deanship of the mining school of the University of Pittsburg. For some years he has been trustee of his old Alma Mater, and when the popular and able Prof. Wadsworth resigned recently, the university officers chose "Sam'l A." to fill the place.

Ask Mr. Taylor to prepare a paper for presentation before a technical society or any meeting of serious-minded men, and if you are not particular to specify the subject, you can stake your faith and rest easy in the belief that Samuel will discuss workmen's compensation and the principle of old-age pensions for coal-mine employees. One such paper, prepared and read by him, a few years ago, has been used as a guide to a recent report of the American Mining Congress, whose suggested enactment has become the basis of proposed legislation in several states.

But it must not be inferred that S. A. Taylor plays a harp with a single string. He has marked convictions on the subject of conservation and believes that the sale of coal by analysis is the prospective cause of more willful waste of available fuel than the careless mining of earlier days.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

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COAL AGE

National Control of Mines

Our correspondent in his interesting article on the "Expropriation of Mines" reviews the recent British strike, and suggests that the coal mines of England and Scotland, before long will be purchased by the government of the United Kingdom. The Socialists in the Mine Workers' Union have an expectation that the same course of action will be followed in America. It is, therefore, an appropriate subject for consideration.

The demand for such nationalization seems to come not so much from the Socialists as from such patriotic people as have for many years been depreciatively dubbed "jingoes." These people appear to believe that by nationalizing the mines, the government will have a firmer hold on the mine worker and will be able to compel him to work when he is prone to seek the redress of what, rightly or improperly, he considers his wrongs.

We cannot be sure that strikes will not occur despite such an arrangement. In fact there have been several strikes threatened and not a few consummated where public utilities were in control of the national government. There are growing signs of a disaffection of postal employees and it appears that segregation has much to do with the fact that their discontent has not burst actively into flame. In Italy and France, strike suspensions have occurred on state railroads, and it is a foregone conclusion that any well organized industry which has once been afflicted with strike disturbances is likely to continue to be a fertile field for them even after the government has taken direct charge. Moreover it seems possible that strikes which paralyze a whole people could be prevented without such expropriation.

To pass laws forbidding the suspension of work by the employees of the state is a measure just as subversive of the rights of the individuals of the proletariat as to pass or enforce laws against unreasonable collectivity when bargaining for wages with private employers. In fact we believe that the control by the government of the worker in a nationalized industry would be nil.

The advocates of the new order have confused the horse with the rider. The miner would run the state, rather than the state govern the miner. This power of the operative to rule is undoubted. In fact, any organized body working in the production of a staple product and comprising over 5 per cent. of the population has that power—the farmer of America for instance. So far however, patriotism, segregation and self protection have prevented the workers in any industry from using their destructive power to involve themselves and others in a common overwhelming misfortune.

Surprised to find the Ultra-Conservatives for once in accord with them, the Socialists add to their argument the further consideration that the government with nationalized mines will pay the men a sufficient wage. The fitting wage is a difficult matter to determine, and the state might well differ with the miner as to what constitutes such a remuneration. Judging by recent declarations, we suppose that the approved miners' wage should be not less than 25 per cent. above existing labor prices. This statement cannot well be discussed with any hope of a gratifying solution. Let it be conceded, however, that the government would give such an increase. It would then be a notice to all workers that wages in general needed a similar advance. The usual readjustment would follow, and the miner would be in no manner benefitted.

The only argument which seems to have any validity is one which few are now advancing, though it has had in the past no little attention. Wages could not be readily raised in purchasing power, but it is possible that if the mines were acquired by the government, profits could, in some cases, be reduced. The government could operate the mines on a small margin not to exceed the interest charge consequent on the scale of bonds to affect their purchase. This rate of in-

terest would be three or four per cent. The average owner is perhaps making twice and certainly no more than three times that figure.

The coal operator of the British Isles is not among the more wealthy capitalists of Great Britain. In fact, it may be pointed out that it is not he who is the recipient of excessive profits. The land holders of city properties occupy this enviable position. In fact, if capital needs the curb of expropriation for the benefit of the poor, the coal operator should certainly not be the first to taste of such a socialistic experiment, because it seems probable that the public in that event would not be markedly benefitted.

In fact it is likely that the little difference between the profit, which the government might demand, and the average profit in British mines today would be more than covered by the inefficiency of the bureaucracy. If any improvement could be looked for, it must be expected to arise from the closing down of some few collieries where conditions are peculiarly unfavorable to successful operation and liberal wages. This, however, would involve a colonizing of such parts of England and Wales, as are most suited for coal production and a decrease in the output of Scotland, the Forest of Dean and Somersetshire, where coal mining is conducted under difficulties. It is likely that such an enforced exodus would be unwelcome to those colliers who live in these parts, and would not be agreeable to the industries and trades, which find in the purchases of the miners, their means of support.

Sober second thought it seems will nationalize lands, railroads, breweries and distilleries long before the mines and quarries of the United Kingdom.

The End of Coal Mining?

Press reports from England state that Sir William Ramsay has announced the perfecting of a system for extracting power from the coal in its native bed. It is only from such a man as Sir William Ramsay that such a statement would be taken seriously. Should his system prove feasible, the changes in conditions of employment and the economies it will be possible to effect are almost beyond comprehension.

According to the most reliable information now available, Sir William Ramsay proposes to tap the coal seams by means of drill holes, and by igniting the coal, drive off the gases, which will be utilized in gas engines for generating electricity.

While no intelligent criticism of the scheme can be attempted until the full plans have been made public, we can nevertheless see many obstacles to its consummation. Among these would be the provision of an adequate air supply to insure proper combustion, the difficulty of maintaining same, due to the accumulations of coke and the subsidence of the roof, and finally the necessity for an elaborate plant for treating the gases, which would naturally carry high percentages of impurities and would require careful washing before they could be used in the gas engine. Sir William would also face a further difficulty here in the shape of a patent taken out in 1909 by A. A. Betts of New York, which reads in part: "Power gas is generated from unmined coal by starting a fire at the base of one or more shafts or drill holes, supplying the air and steam through a pipe, and withdrawing the gas through the same or other shafts or drill holes."

On the other hand, there is no question but what the proposed change offers food for serious thought. The enormous hydro-electric installations of the West have fully demonstrated the feasibility of long high-power electrical transmission, while the losses involved in mining, handling and re-handling the coal from the working face to the consuming power plant are very great.

Mechanical Handling of Coal

Great progress has been made of late in our methods of handling and preparing coal. At best, its transfer from the working face of the mines to the bin of the consumer involves a more or less frequent lifting up and dropping down of this fragile material, but recently numerous devices have been sought and achieved which not only increase the efficiency of colliery operation, but tend to prevent undue breakage and degradation of the product. Conveyors have been devised which largely eliminate the prevalent five- or ten-foot fall from loading pockets to car bottom, and the long toboggan-like gravity chute has been condemned and generally abandoned in favor of spirals and similar retarding constructions.

It may be questioned, however, if these efforts have not been somewhat disconnected and sporadic in character and directed toward the correction of evident faults in existing methods, rather than dedicated to the application of a recognized principle, or set of principles, which if consistently adhered to, might be expected to produce more certain and comprehensive results.

For example, there is much evidence to support the contention that in handling coal, dependence on the force of gravity should be avoided as far as practicable, instead of embraced wherever possible as heretofore has been common practice. The mine car which is handled to or from the cage or dump by means of a descending grade may or may not move as required, depending entirely on the condition of its running gear. The railroad car which in summer has to be guarded zealously against running away, in winter may have to be coaxed along with a pinch bar.

More evident still are the limitations of gravity in connection with the distribution of material in our anthracite breakers. The character of the coal varies not only from time to time as different seams are brought within the scope of operation, but varies continually during the course of a single day, where the colliery draws its supply from several sources. The fixed gravity chute offers inadequate means for regulating the flow under these conditions, with the result that provision is usually made for the slowest material, and the balance is allowed to batter itself to pieces in precipitate flight.

It would seem that much might be accomplished toward eliminating these and many similar defects by an extended application of methods for handling the material mechanically. This is unquestionably the tendency of modern practice. We would suggest that it be recognized and reduced to a working principle. Power-operated cagers and car-handling systems, face and distributing conveyors, loading booms and many similar devices should mean positive, continuous, reliable and easily regulated progress of the coal through the course of the various colliery operations. They also should mean decrease in breakage of the product. It seems reasonable to believe that the increased efficiency and improved output which might be attained in this way would greatly over-balance the higher cost of installation.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Coal Dust in Mine Explosions

I have only now had the opportunity of reading the editorial remarks in COAL AGE, Mar. 2, on "Afterdamp" and "Coal Dust Heterodoxies." Having just returned from attending the inquest and investigating the Merritt disaster, I beg to offer a few remarks, which I hope will provoke further discussion that will help to elucidate the questions we are studying.

First, with regard to afterdamp, I take this term, as used in mining, to mean any mixture of gases resulting from the explosion or violent inflammation of gas or dust, in a coal mine. Some years ago I was myself puzzled by the effect of afterdamp on the eyes. I attributed this effect to ammonia, but a student and lecturer on mine gases (Dr. Carnelly, now dead) assured me that this was not probable and made tests to prove it. If I remember correctly, he suggested that the effect was due to an oxide of nitrogen that might be produced in a mine explosion. Whatever is said in regard to the composition of afterdamp one thing is certain, that the afterdamp resulting from an explosion in a mine has never the same composition. The kind and quantity of gases formed will depend wholly on the conditions attending the explosion.

COAL DUST HETERODOXIES

Your remarks under this head appear to be principally based on the extract you quote from my paper entitled "Some Coal Dust Explosion Problems." This paper, which was prepared and presented to the South Wales Institute of Engineers, is now under discussion by the institute. I regret that the whole of the paper was not before you when making the comments you did, as this would have enabled you to have prepared a better synopsis. For example, you make no reference to my quotation from the French experiments at Lievin and you omit to mention or describe what forms the most instructive part of the paper; namely, the photographs showing the damage done to the testing tubes or galleries and the general effect of the explosion.

Your editorial leads one to infer that I have been writing on the detonation of coal dust; whereas, the cases I quote are suggestive only of the detonation of gases created at a certain stage in a coal-dust explosion. This is not a detonation of the dust particles, each floating in its own balloon of gas.

WATERING IN COAL MINES

The last paragraph in the editorial to which I have referred gives a clear opinion on the subject of watering or dampening of mine air that is directly contrary to my own expressed opinion and writings on this subject. I am not speaking now of watering down or spraying accumulations of dust at the working face or on roadways; but refer to the humidification of the mine air by spraying. It will be remembered that Prof. Harold Dixon, some years ago, published his conclusions in regard to the effect of coal dust in mine explosions, in a paper entitled "The Rate of Explosions in Gases." In this paper, Professor Dixon distinctly states that mixtures of certain gases with air give the highest speed in explosion when the mixture contains 5 per cent. of water vapor. The point I wish to emphasize is that *it is this high speed produced when water vapor is present that gives the detonating effect of the gas* to which I have referred. If some high authority on explosive gases can explain away Professor Dixon's conclusions in this regard, I may be inclined to think that the humidification of the mine air is of some value. Up to the present time this has not been done and we must believe that the presence of water vapor in mine air is a factor that will increase the speed and violence of an explosion. To put this a little more strongly, I would say, that the presence of the water vapor tends to cause a detonating effect, which is the point intended to be brought out in my paper. I am glad to note that in closing you express a lingering doubt as to the ability of humidification to immunize the mine as we might wish it could.

[We are glad to give space to these comments of Mr. Ashworth and regret that the entire copy of his paper is not available at the present time. Mr. Ashworth has certainly made some valuable deductions that cannot fail to make interesting subjects of discussion. It is only just to Mr. Ashworth, whose views in regard to mine explosions command respect, to state here that he has always advocated the thorough wetting down of the coal face and immediate vicinity before firing blasts in dusty mines where blasting is dangerous; and the spraying of the mine roads to such extent as may be necessary to keep the air on these roads clear. See "Mine Gases and Explosions," p. 193.—EDITOR.]

The Fireboss Question

I would like to congratulate the writer of the communication signed "A Fire Boss, Western Pennsylvania," COAL AGE, March 9, p. 717. He suggests that there should be a law passed, or that the Department of Mines should make a ruling prohibiting mine bosses and mine foremen who are regularly employed as such from acting in the capacity of fireboss at any mine generating explosive gases. This strikes me as an excellent suggestion. We firebosses have felt for a long time that we have no protection in our work, and that we are particularly subject to difficulty in attempting to carry out the state mine law and at the same time please our employers, by whom we are paid.

I would suggest that all firebosses who feel the same write to their respective representatives, at Washington, D. C., and also to the legislators of their respective districts, at the State Capitol, urging the passage of a law such as has been suggested. The law should also require that all firebosses charged with the responsibility of the daily examination of mines generating explosive gas, shall act under the jurisdiction of the State Mining Department, in their respective states. The law should make all firebosses in gaseous mines responsible solely to the district mine inspector and subject to his control, or to the Department of Mines, in each state. I think such a law could be worked out all right and would be more satisfactory, both to the miners and operators. There is no question but that such legislation would please all firebosses.

AN INDIANA FIREBOSS.

Electrical Machinery for Coal Mines

Referring to the article, "Electrical Machinery for Coal Mines," in COAL AGE of Mar. 16, and to the last paragraph but one on p. 737, I note that the author, in speaking of the speed variation of the three-phase induction motor, says that by cutting down the number of pairs of poles by one-half, the speed of the motor is reduced in the same proportion. Also, in the last paragraph, he states that, for a machine having six pairs of poles, the speed would be reduced 33⅓ per cent. by cutting out two pairs of poles.

I would differ with the author in these statements and would say that, as I figure it, reducing the number of poles of an induction motor by half would increase the speed in the inverse proportion. In other words, speed varies inversely as the number of pairs of poles, that is, of course, theoretically. Practically, the slip must be taken into consideration in making a statement of this kind.

I would be interested to hear what the author has to say in regard to this criticism and how he can explain the relation of frequency to speed and pairs of poles in such a way as to agree with the statement he has made. As I have always understood it, frequency equals pairs of poles multiplied by speed. The author seems to figure it the other way.

Syracuse, N. Y. H. V. BROWN.

[It is quite apparent that the statements referred to by Mr. Brown are in error, and should be changed to read as he has suggested.—EDITOR.]

A Graphic Solution for Pumping Problems

Note—From the "American Machinist."

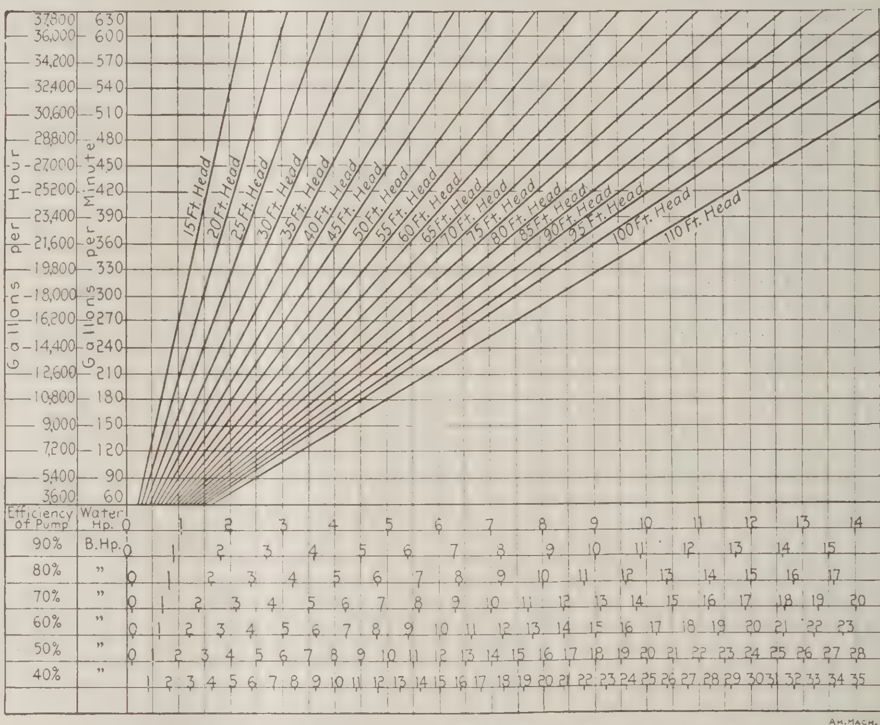
When dealing with pumping questions it often entails a fair amount of "figuring" to obtain say the power required to pump a certain quantity of water to a given height, when the efficiency of the pump is known, or having a certain amount of power available how much water can be raised to a certain height per hour? To arrive at any of the above answers a considerable amount of time is involved, whereas with the following diagrams any of the above requirements can be seen at a glance.

The accompanying diagrams give the brake horsepower, number of gallons per minute, and per hour, the various heads in feet, and the pump efficiencies from 15 ft. up to 300 ft. head.

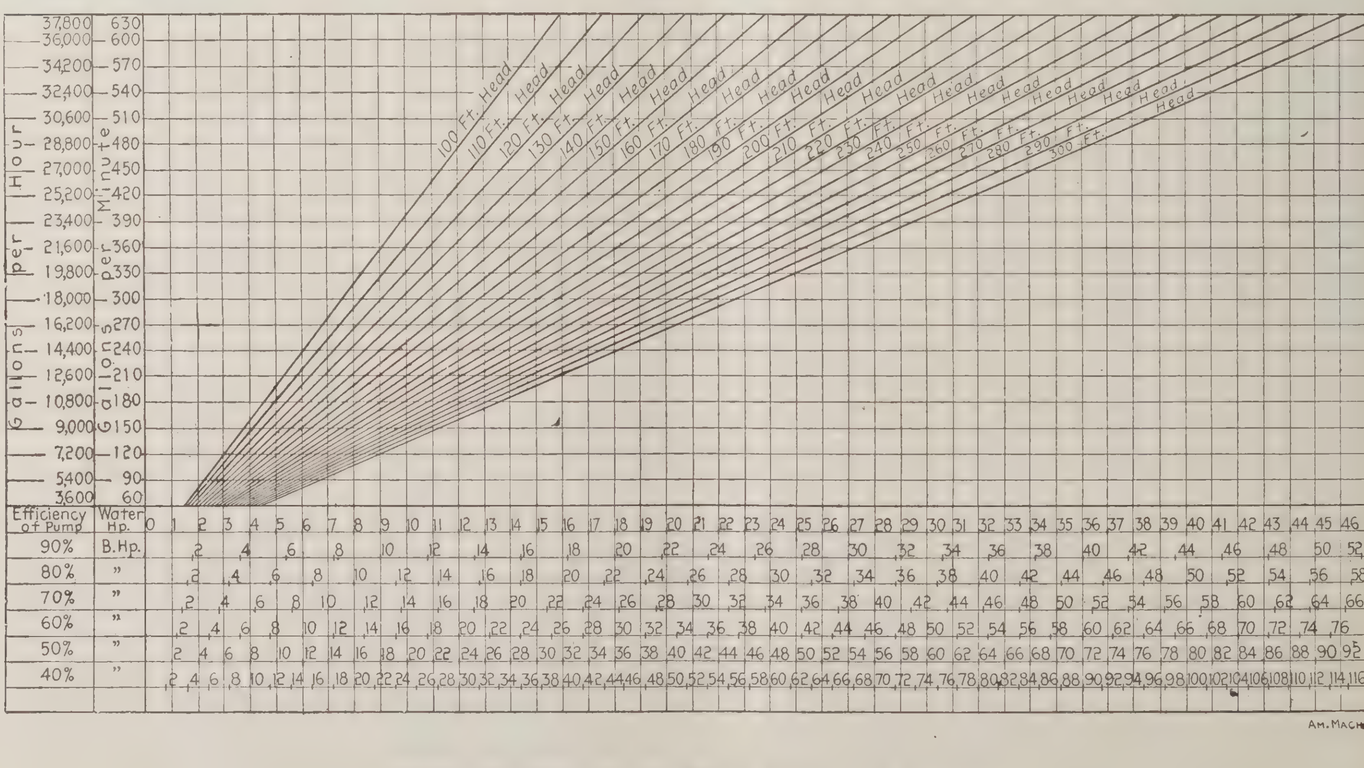
As an example, we require to pump 360 gal. per minute with a total head of 85 ft. and the efficiency of the pump is 60 per cent. What is the brake horsepower required?

On the left-hand side of the diagram is shown gallons per hour and gallons per minute. On the line 350 gal. trace along toward the right hand until the horizontal line intersects the diagonal line marked "85 feet head." Then trace the vertical line at this intersection downward and at the bottom of diagram will be read the b.hp. = 13, on the horizontal line of 60 per cent. pump efficiency where the vertical line intersects.

Letchworth, England. W. E. WORT.



PUMPING DIAGRAM, 15- TO 110-FT. HEAD (U. S. GALLONS)



PUMPING DIAGRAM, 100- TO 300-FT. HEAD (U. S. GALLONS)

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Short Circuiting Air Current, Effect on Speed of Fan

Some mining men claim that when the mine fan is working up to nearly its full capacity, and the air is short-circuited, the fan will speed up and the water gage will fall. According to my ideas, if the water gage is placed so that it only measures the mine resistance, the short-circuiting of the air current at the shaft bottom and the consequent cutting off of the mine resistance, will cause a fall of water gage, and at the same time the fan will slow down somewhat, owing to the increased amount of air passing. If, however, the water gage is so placed that it measures the resistance of the fan and the mine the water gage will be increased when the air is short-circuited, while the speed of the fan will be slightly reduced, as before. This result, I believe, would be due to the resistance in the fan being somewhat increased by the increased flow of air through the fan.

I would like to have this question definitely answered, and also to see it discussed by the readers of COAL AGE.

BENJAMIN HARTILL.

Johnstown, Penn.

Our correspondent is correct in his first statement; namely, when the air current is short-circuited at the foot of the shaft, the water gage will fall and the speed of the fan be reduced, assuming the power applied to the fan shaft remains constant. There is, however, no position of the water gage possible in which it will measure both the resistance of the mine and that of the fan. The water gage reading taken at the bottom of a shaft measures the difference between the intake pressure and that of the return at that point, which difference of pressure (lb. per sq.ft.) multiplied by the sectional area of the airway where the reading is taken (sq.ft.) represents the resistance of the mine inby from the point where the water-gage reading is taken. On the other hand, when the water gage is placed on the fan drift its reading measures the difference between the atmospheric presure and the pressure in the fan drift (lb. per sq.ft.), which multiplied by the sectional area of the fan drift (sq.ft.) represents the total resistance met by the air current in its passage from the fan to the point where it is discharged into the atmosphere.

There is no way of measuring the resistance of the fan to the passage of the air. This can only be estimated, and determines what is called the efficiency of the fan. It will not be necessary to consider the matter of the efficiency of the fan when the air is short-circuited or the mine resistance cut off, further than to say the quantity of work lost or absorbed in the fan itself varies practically with the cube of the quantity of air passing through the fan.

Assuming 100 horsepower is applied to the fan shaft, as indicated by an indicator card taken from the engine driving the fan; perhaps, of this amount, 80 horsepower is consumed in circulating the air through the mine and the shafts, leaving 20 horsepower absorbed or lost in the fan. Assume that 80,000 cu.ft. of air are in circulation before the air is short-circuited; and after short-circuiting the air by setting open the main separation doors at the foot of the shaft, say 100,000 cu.ft. of air are passing through the shafts. The quantity of air passing through the fan is thus increased in the ratio

$$\frac{10}{8} = \frac{5}{4} = 1.25$$

and the power absorbed or lost in the fan, increasing as the cube of this ratio, is 1.25^3 = say 2 times or double the previous loss of power. That is to say, after short-circuiting the air, 40 horsepower is lost in the fan and the remaining 60 horsepower is therefore consumed in passing the air through the shafts. These results are tabulated below.

Before change:		
Fan	20 hp.	80,000 cu.ft.
Mine and shafts	80 hp.	
After change:		
Fan	40 hp.	100,000 cu.ft.
Shafts	60 hp.	

From the above it is clearly seen that owing to the increased loss of power in the fan the effective power available for moving the air is decreased from 80 horsepower before the air was short-circuited to 60 horsepower after the change was made. It is this effective work that is concerned in turning the fan, and the speed of the fan varies as the cube root of the horsepower; or, in this case,

$$\sqrt[3]{\frac{60}{80}} = \sqrt[3]{0.75} = 0.9$$

That is to say, the speed of the fan after short-circuiting the air will be about 0.9 of what it was before the air was short-circuited. If the first speed was, say 100 r.p.m., the second speed will be about 90 r.p.m. In common mining practice the speed of the fan in short-circuiting the air drops about 5 or 10 per cent., according to conditions.

Direction in which a Mine Explosion Propagates

Does an explosion of gas or dust in a mine always develop its greatest magnitude in the direction from which fresh air comes, or against the air current?

TOM. E. FITZGERALD.

California, Penn.

In considering the explosion of gas or dust, the mine or that portion of it where the explosion occurred must be considered, in most cases, as a *cul de sac*, or confined space in which the gases produced by the explosion expand toward the opening as though shot from a gun.

This condition, however, describes only the initial force resulting from the ignition and explosion of an accumulated body of firedamp, or the violent inflammation of a cloud of dust, which forms the center of the disturbance, and from which the force radiates in every direction. The force cushions inby but expands freely outward or in the opposite direction.

There are two general types of explosions in mines with respect to the manner of their propagation. (1) Propagation by percussion; (2) propagation by burning. In the first of these two types of explosion the force or explosive effect is transmitted with lightning rapidly throughout the entire mine. There is much that is yet to be learned in regard to the principle of action of this form of explosion. Theories have been suggested to account for the phenomena, and these are being closely studied, at the present time. Whatever may be true in regard to the principle by which the explosive wave is transmitted, it is a fact that this type of explosion may be either with or against the air. The direction of the air current appears to have little effect in determining the direction of the blast.

In the second type of explosion, that in which the explosive wave advances more slowly, by burning the combustible material (gas and dust) lying in its path, the explosion can advance any great distance, only in the direction in which it is fed by fresh air. That is to say, the advance is in the direction against the air current. The reason for this is clear when one considers that owing to the lack of air for its support the explosion would be snuffed out in its own trail, in the opposite direction.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions

(Answered by request)

Thickness of Mine Dam Required to Support a Given Head

Ques.—Having decided to dam off a heading 15 ft. wide and 6 ft. high, with a concrete dam, using a mixture of cement, sand and cinders, in the proportions 1:3:5; it is desired to know the total pressure against the dam and the thickness of the dam required to withstand such pressure (a) when the water stands 5 ft. above the pavement, at the dam; and (b) when the water will back up and reach a level 30 ft. above the pavement at the dam.

Ans.—The total pressure exerted by water on a dam is found by multiplying the wetted area of the face of the dam (sq.ft.) by 62.5 (wt. of 1 cu.ft. of water in lb.), and this product by the vertical height of the surface of the water above the center of gravity of the wetted area.

(a) The water being 5 ft. deep at the dam, the wetted area of the face of the dam is $5 \times 15 = 75$ sq.ft. The center of gravity of this area is its center of figure, which is 2.5 ft. below the surface of the water. The total pressure on the dam, in this case, is

$$75 \times 62.5 \times 2.5 = 11{,}718+ \text{ lb.}$$

For practical considerations it would not be advisable to build a dam of this width, with a thickness less than, say 20 in. or 2 ft., although the calculated thickness for this depth of water is much less.

(b) When the water stands 30 ft. above the pavement, the wetted face of the dam is $6 \times 15 = 90$ sq.ft. The center of gravity of this area is its center of figure, which is $30 - 3 = 27$ ft. below the surface of the water. Hence, the total pressure on the dam is now

$$90 \times 62.5 \times 27 = 151{,}875 \text{ lb.}$$

To calculate the required thickness of the dam, let

t = Thickness of dam (in.);
r = Shorter radius of dam (in.);
w = Width of opening or span (in.);
p = Pressure of water at dam (lb. per sq.in.);
S = Compressive strength of material (lb. per sq.in.)

For a cylindrical dam

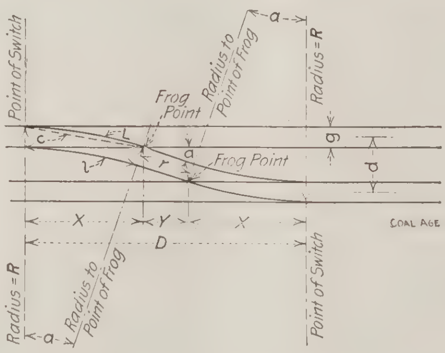
$$t = \frac{pw\sqrt{4r - 1}}{4S}$$

The shorter radius of the dam should be from ¼ to ⅓ greater than the clear span or width of opening. In this case, r = say 20 ft. (240 in.); $w = 12 \times 15 = 180$ in.; $p = 27 \times 0.434 = 11.718$ lb. per sq.in.; and $S = 600$ lb. per sq.in. Hence, the required thickness of a cylindrical concrete dam to support the given head of water is

$$t = \frac{11.718 \times 180\sqrt{4 \times 240 - 1}}{4 \times 600}$$
$$= 27+, \textit{ say } 30 \textit{ in.}$$

Calculating A Crossover Switch

Ques.—(a) Explain the method and give the necessary formulas for calculating the lengths and distances required to lay a good crossover switch between two parallel tracks in a mine. (b) Find the several dimensions of a crossover switch for a 30-in. track gage when the distance between track centers is 7 ft. and a No. 3 frog is used in each track.



Calculating A Crossover Switch

Ans.—(a) In considering a crossover switch there is usually,

Given,
- frog number (n)
- track gage (g)
- track centers (d)

To find,

chord of lead rail $c = 2ng$

radius of lead rail $R = nc$

frog angle $\sin. \tfrac{1}{2} a = \frac{1}{2n}$

length of lead rail $L = \frac{a}{180}\pi R$

length of follower $l = \frac{R - g}{R} L$

length of straight track

$$r = \frac{d - g(1 + \cos. a)}{\sin. a}$$

lead of switch $x = R \sin. a$

frog distance apart

$$y = r \cos. a - g \sin. a$$

distance between switches

$$D = 2x + y$$

The letters in the formulas refer to the dimensions specified in the accompanying figure.

(b) When $n = 3$, $g = 30$ in. (2.5 ft.); and $d = 7$ ft.

chord of lead rail

$$c = 2 \times 3 \times 2.5 = 15 \textit{ ft.}$$

radius of lead rail

$$R = 3 \times 15 = 45 \textit{ ft.}$$

frog angle

$$\sin. \tfrac{1}{2} a = \frac{1}{2 \times 3} = 0.1666;$$
$$a = 19^\circ 12' = 19.2^\circ$$
$$(\sin. a = 0.3289;\ \cos. a = 0.9444)$$

length of lead rail

$$L = \frac{19.2}{180}(3.1416 \times 45) = 15.08 \textit{ ft.}$$

length of follower

$$l = \frac{45 - 2.5}{45} \times 15.08 = 14.24 \textit{ ft}$$

length of straight track

$$r = \frac{7 - 2.5\,(1.9444)}{0.3289} = 6.50 \textit{ ft.}$$

lead of switch

$$x = 45 \times 0.3289 = 14.8 \textit{ ft.}$$

frog distance apart

$$y = 6.5 \times 0.9444 - 2.5 \times 0.3289 = 5.31 \textit{ ft}$$

total length of crossover

$$D = 2 \times 14.8 + 5.31 = 34.91 \textit{ ft.}$$

Percentage of Gas in Return

Ques.—If, after making due allowance for the expansion of the return air current caused by a rise of temperature and a fall of pressure, the air measurements taken on the intake and return airways still show an increase of 2500 cu.ft. on the return; (a) how is this increase in volume to be explained? (b) what percentage of gas is then contained in the return current when there is 120,000 cu.ft. of air and gas passing.

Ans.—(a) The increase in the volume of the air current is probably due to the mine gases absorbed by the current in its passage through the mine. These gases may and often do consist largely of marsh gas generated in the mine.

(b) The percentage of gas in the return, in this case, is

$$\frac{2500 \times 100}{120{,}000} = 2.08\%$$

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Housing of Scottish Miners

It has always seemed that those who would prepare for the housing of foreign miners, should know something about the character of the structures to which those miners have been accustomed. The illustrations accompanying this article are taken from the report of J. C. M'Vail, officer of health for Sterling and Dumbarton Counties, which shires are in the narrow waistline of Scotland, between the Firths of Forth and Clyde. The facts herein recorded have the same source.

Two-room Houses Predominate

It will be noted that all the houses are substantial, being made of brick or stone and roofed with slate, but on some of the older houses red-tile roofs are to be found. The apartments are usually built in long blocks, but greater privacy is secured in these than in the average American miner's double house, because the walls are invariably made of brick. But it will be noted how rarely does one tenant uses more than two rooms. One of these serves as a kitchen and the other as a combination of bedroom and parlor. The latter chamber is termed impressively *"the room."*

Of 873 miners' houses in the two counties, 2.5 per cent. have one apartment, 84.2 per cent. have two, 11.5 per cent., three, and only 1.8 per cent. have as many as four rooms. It is probable that in the United States as large a proportion of four- and five-roomed miners' houses are to be found as of two-roomed houses in the Lowlands of Scotland.

Cheerful Appearance

A long walk, sometimes of concrete, is laid close up to the house fronts and between this and the wagon road is placed a surface channel for drainage. At the back are small outhouses and beyond them small gardens or clothes-drying greens. Sometimes an attempt is made to arrange a cheerful color scheme by making the quoins and arches of the windows and doors with contrasting material. In like manner, the outlines of the blocks and the edges of the chimneys are brought out plainly. This feature is one worthy of comment, because it does not involve any expense and certainly serves to correct the barrack-like appearance of house-blocks.

Damp-proofing

One feature of the Scotch houses is the attempt made to exclude moisture. If the walls are of stone, they are furred and lathed before plastering, but if they are of brick they are built hollow with an air space of three inches, and the plastering is then placed on the brick. One plan is followed about as frequently as the other. Mr. McVail, however, declares the first one to be the most efficient as a defense against moisture. It is urged that the arrangement of furring and lathing is not as strong as the other, and not suited to houses likely to be occupied by boisterous tenants.

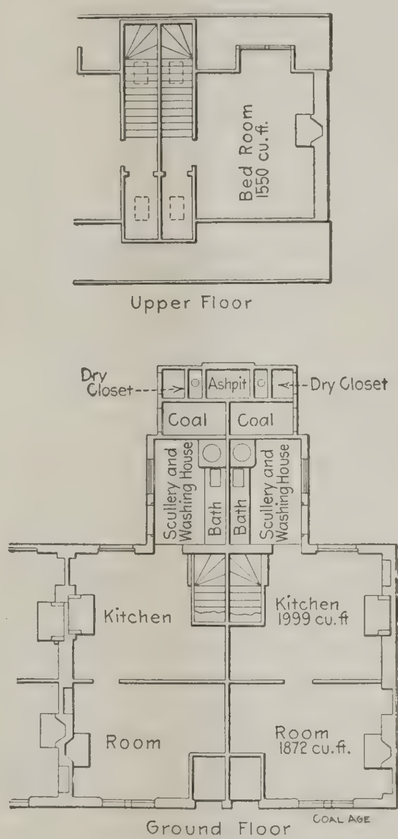


Fig. 1. Present-day Type of Homes of Scotch Colliers

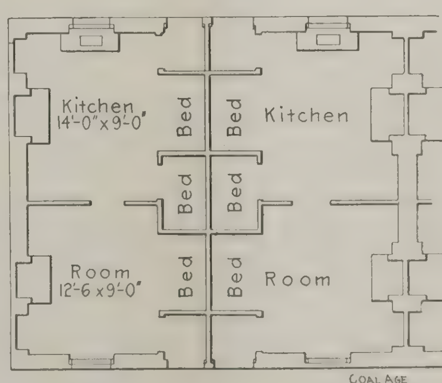


Fig. 2. Plan of Older Types of Miners' House, Scotland

Wherever a wall is made thin to accommodate a clothes press, it is necessary to make it waterproof by lathing and plastering, and at the sides of doors and windows, if the outer and inner divisions of a hollow wall are connected by brickwork, dampness is apt to be admitted from rain beating on the wall. At doors and windows either the hollow must be carried up to the woodwork, or else the brick must be dipped in tar or some other damp-proof compound.

Damp-proof courses are always required, and in obtaining a permit for the erection of a house under the Public Health Act of Scotland, the material and thickness of this course must always be specified. Caithness paving stone is considered desirable for that purpose, but other material is also used. The frequent use of a porous clamp-burned brick made open in texture by admixture of slack coal in the clay before burning and the natural dampness of the British Isles combine to make these precautions necessary.

Modern Conveniences

All the houses have some species of drainage provision. When fecal matters are not discharged into the sewers, open invert drains are frequently used. These are often made of concrete. These open drains are placed between the walk and the road, and connect eventually with the underground system. Some of them are flushed several times daily by automatic flush tanks.

In 14.5 per cent. of the houses, the sculleries have a clothes boiler, and in 85.5 per cent. there are outside wash-houses. Baths have been provided in 7.9 per cent. of the houses. In 67.5 per cent. an indoor water supply is provided. In 30.2 per cent. of the cases the tenants draw and carry the water from outside pillar wells. In 38.2 per cent. of the houses, water closets are provided, while in 61.8 per cent. of the houses dry closets are in use. In many cases one closet serves for two houses. Dust bins are usually provided for dry refuse, but ash pits are more common. These are roofed to keep out the rain and sun.

The Bed Place

Many of the houses have the antiquated Scottish bed places—recesses built in the walls to hold a bed. Fig. 2

shows such an arrangement. Two bed places are in the kitchen and one in the "room." At one time these bed places were closed in, even more than today. Where such a closet, as in Fig. 2, is used for a bed, the conditions are little better than exist when a box bed is used. Even the most open of set-in bed places are adorned with curtains, which hinder access of air.

To check this fault, the wooden "brow band" at the ceiling is now forbidden. Sometimes to prevent this hanging of curtains, the brick partition between the two kitchen bed places is plastered and not lined with wood. But the provision is ineffectual and the final result is that the plaster is often broken by the driving of nails to hold curtains. Wooden bed boards and "stocks" were formerly as universal as bed places, and did not make for cleanliness, but were apt to harbor vermin if the house was not kept clean. Occasionally a defaulting tenant about to vacate a house, would combine economy with sanitary reform by using the bed boards for firewood, a theft of lumber duplicated in America where yards are fenced in. In planning the houses of some of the newer villages, the owners have acceded to the request to provide iron bedsteads for the bed places. Also, in the "room" there is often now no set-in bed place, but only an iron bedstead in a corner, as in bedrooms of better-class dwellings.

Sculleries

As has been seen, the house of two apartments is the standard accommodation for a miner and his family. This is quite a usual size of house for the working classes in general throughout Scotland, but in many modern two-roomed houses a good scullery is provided, which is an important addition to the amenity of the dwelling. Of the 873 houses for which plans have been passed under the building by-laws, 422 are provided with sculleries. These sculleries, if they have a water supply, facilitate the keeping of the kitchen tidy and comfortable as a sitting room and living room.

Light and Ventilation

The minimum window area required is one-tenth of the floor space, and under the by-laws, windows are invariably sashed and double hung, so that one-half of the total space is available for ventilation. Care is taken that the window tops reach as near as possible to the ceiling to facilitate ventilation. In rooms where there is no fireplace and chimney, special means of ventilation are required, and this consists almost invariably in a roof ventilator—a circular tube at least six inches in diameter, protected by a cowl. In the kitchen, where there is always a fire, the chimney is, of course, an important aid to ventilation.

In the great majority of two-roomed houses, there is only one entrance—the kitchen door—"the room" being usually directly off the kitchen, so that through ventilation is obtained by means of the kitchen window behind, through the intervening doorway.

The floors of the houses are usually of wood, but sometimes the kitchen floor is paved with brick or concrete. The wood floors are usually ventilated underneath, but not in all the older houses.

Conclusions

On the whole it may be said that the average miner's house in Scotland is more substantial, and better equipped than in the United States. It supplies, however, quarters too narrow to suit the average American workingman, and it lacks in adequate ventilation. The curtilage accompanying each apartment is severely restricted, for which there is little occasion here, where land is plentiful.

Closing one's eyes resolutely to unfavorable features, one can see a number of points which might well be adopted with advantage. It is certain that the average five-roomed American cottage, too often contains a room devoted solely to an occasional gratification of the family pride. The chromos on the walls and the crayon enlargements on easels in such rooms infrequently gaze on the few honored guests who are privileged to enter, but for the most part rest in undisturbed darkness and stuffiness. It is, perhaps, a folly to plead for a more sensible return to the simple life, because arbitrary demands of society are usually more inexorable than its needs. Granted, however, that five rooms are unneeded, it is a far cry from that to the cabined simplicity of life in a two-roomed house, no matter what comforts may be offered as a palliation.

The Scotch house has arisen from Scotch conditions, just as the American miner's dwelling has developed from the settler's or the farmer's house. Wood has been cheap in the United States. A large house was, therefore, possible, and is now considered essential. But, as the mines have been started in places remote from cities, all the discomforts of rural life are to be found in miners' dwellings—lack of sanitary conveniences, water obtained from outside wells, pipes and springs, cheap construction, the lack of places for the disposal of garbage and the absence of bathrooms. In time, evolution will give us fewer rooms, as the inevitable result of the greater cost of materials. But the miners will have more conveniences as the certain outcome of greater crowding, which permits such betterments, at the same time as it makes them absolutely necessary.

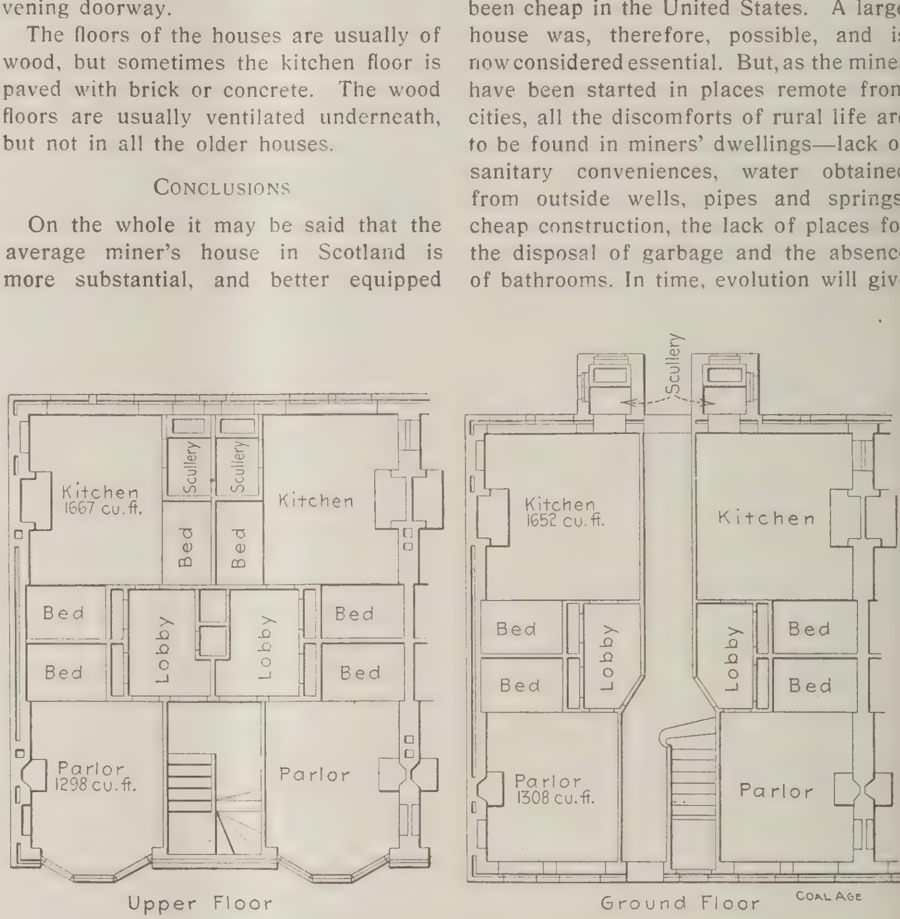


Fig. 3. Part of a Two-story Block of Houses, Designed for Scotch Miners

A Tree For Mine Camps

Few trees are better suited for resisting depressant fumes than the sycamore. It has a world wide growth and thrives wherever planted. The sycamore is quite generally found south of the 41st parallel. More northerly the climate seems too rigorous for its growth and even just south of that line, it is not much seen where the elevation is considerable. It has the great advantage of a yearly shedding of its outer bark, and thus where exposed to smoke and noxious fumes it shows itself resistant to these influences and quite hardy. It is found growing in cities like London, England, where the products of the combustion of large quantities of bituminous coal are fatal to most trees.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Judge Martin A. Knapp, of the Commerce Court, appeared on Apr. 15 before the House Committee on Interstate and Foreign Commerce, to explain the terms of the bill drawn up by a subcommittee in conference with himself and Dr. C. P. Neill, commissioners of labor, to extend the terms of the Erdman act to the arbitration of strikes in the coal industry. Judge Knapp explained that the Lee bill, which was originally referred to the committee, has been changed in many particulars.

For one thing, it has been extended to include all classes of railroad employees. The present measure can be applied to not more than one-third of the railroad men. In connection with extending the act to the coal industry, Judge Knapp said that he preferred not to discuss the constitutionality of this provision, in view of his position in the judiciary. However, he explained that since the act is not compulsory, but the invocation of it entirely voluntary on the part of the contending parties, it appears to him that the courts would never be called upon to exercise any power in that connection, and the question of constitutionality would never be brought up.

Application to Other Industries

He was then asked, if the constitutionality of the law will never be questioned, why it should not be extended to all industrial operations, intrastate as well as interstate. The witness said that he believed that the terms of the act should be gradually extended, but that it should be done slowly and the way carefully felt. In the first place, it should be made to embrace those industries which are of the most importance to the welfare of the country. For this reason it was thought well to extend it to the coal industry first. He was then asked if it would be constitutional for Congress to appropriate money to arbitrate industrial disputes which are clearly intrastate. To this Judge Knapp said that it had been noted in the bill that the law could not be invoked except in those cases where the coal went into interstate commerce.

The third important change suggested in the bill was the provision for substituting for the present mediators, a regular board of mediation and conciliation. Judge Knapp said that he and Dr. Neill had no complaint to make, but that the duties of administering the Erdman act, in addition to their regular work, have become extremely heavy, and that inasmuch as it is proposed to extend the terms of the act to other industries, the services of at least one man would be needed all the time. For this reason the bill provides for the creation of the office of Commissioner of Mediation and Arbitration, with a salary of $7500.

Pittsburg District Extended

In a report in the case of Clyde Coal Co. vs. the Pennsylvania R.R. Co. *et al.* the Interstate Commerce Commission has handed down a verdict in which the present rate on coal from Clyde siding, Fredericktown, Penn., to Ashtabula Harbor, Ohio, when for transshipment by vessel on the Great Lakes to points beyond, is found to be unreasonable to the extent that it exceeds 78c. per net ton, which is the rate ordered by the Commission to be established from the Pittsburg district to Ashtabula Harbor. The southern boundary of the Pittsburg district is changed to include complainant's mine.

The opinion of the Commission goes on to say:

There is no evidence that traffic from the Clyde mine to the lake would move through any part of the Connellsville district. A wide area of undeveloped coal lands, probably 60 miles across, separates the Clyde property from the Fairmont district proper, and there is no railroad connecting the two localities. From the facts before us in this proceeding the conclusion is inevitable that the Clyde mine cannot be consistently included within the Fairmont-Connellsville rate group.

In forming the Pittsburg district, the carriers have followed no hard and fast rule; they have taken in mines more distant from Pittsburg than the Clyde, and the contour of the district has been materially changed so as to include certain mines and exclude others. All grouping for rate purposes is necessarily more or less arbitrary. Group lines generally have the appearance of injustice to some point just across the line. Yet the line must be drawn somewhere or the grouping abandoned. Once established, groups should not be lightly or unnecessarily disturbed.

We do not think the defendants have justified the eccentric movement of the Pittsburg district boundary line where it sidesteps complainant's shipping point. We believe that the location of the Clyde mine close to the 30-mile radius from Pittsburg, its accessibility to one of defendants' assembling points for lake-cargo coal, and other facts before noted, all combine to show that it properly belongs within the Pittsburg district and is entitled to the rate of 78c. ordered by the Commission to become effective from such district.

Alabama

Birmingham—The Roden Coal Co claims to have broken all records for coal output in the Cahaba field. At its Marvel mine, the production during March was 28,065 tons with a maximum output of 7400 tons for one week and 1435 tons for a single day. The Roden company has recently secured a year's contract for supplying coal for all vessels of the United Fruit Co., sailing from Mobile and Pensacola, amounting altogether to about 50,000 tons.

It was recently announced by the Woodward Iron Co. that all details of the merger with the Birmingham Coal & Iron Co. have been completed and the consolidation is now in effect. The new company is incorporated in Delaware. No plans for improvements, other than those for the new byproduct ovens and blast furnace, have as yet been announced. By its new acquisitions the Woodward company secures an immense acreage of coal and ore deposits and becomes practically impregnable in the raw material market.

Illinois

Chicago—Union mine workers in Illinois, as in other states of the central competitive field, voted Apr. 10 on the acceptance of the Cleveland wage-scale agreement. A statement received from officials of their organization, urged the men to accept the scale on the ground that it would restore the interstate trade agreement and permit the miners to give their entire attention to the organization of nonunion fields.

A proposed advance of 5 per cent. on the rates of soft coal over the Chicago, Burlington & Quincy from mines in Illinois to Clinton and Lyons, Ia., via Chicago, effective Apr 25, has been suspended by the Interstate Commerce Commission until Aug. 3.

Assumption—The mine of the Assumption Coal and Mining Co. was damaged recently by a caving in of the surface near the escape shaft. The loss is estimated at $3000.

Westville—The Bunsen Coal Co. is taking advantage of the suspension to have repairs made wherever they are needed at its different mines. The Bunsen mine No. 4 is receiving a general overhauling. New haulage ropes are being put in, two new cages are being built, a new hoisting drum is to be put in the engine room, two electric motors are to

be installed to haul the coal from the "latches" to the "bottom" and the shakers that have been in use for some time are to be taken out and replaced by new screens.

Danville—Three thousand miners in the coal fields of Danville and vicinity are temporarily idle awaiting the result of the vote on the proposed wage scale. The operators generally are taking advantage of the enforced idleness by cleaning out the mines, and several mines will be fitted out with new machinery during the lull in operations. The installation of new machinery and the cleaning of the mines are practically impossible while work is going on and the lay-off is not regarded entirely in the light of a hardship.

Indiana

Indianapolis—That 90 per cent. of the soft-coal miners throughout the country have approved the proposed two-year wage contract, was announced, Apr. 11, by Edwin Perry, secretary-treasurer of the United Mine Workers, after he had received telegrams from representative locals, reporting results of the referendum vote. The weekly pay question is one which is expected to operate against the agreement in this state. The new contract voted on, says nothing about a weekly pay, but contains a clause which states, in effect, that aside from the increase in pay specifically provided in the contract, there shall be no change in conditions which will add to the cost of production. Operators have insisted that the weekly pay day would add to their cost of operation, as compared with the bi-weekly pay, and some have so notified the miners. Dissatisfaction with this situation, it is believed, will be shown when the official vote in the Indiana fields becomes known, and for this reason the percentage of miners favoring the agreement is expected to be less in Indiana than in Ohio, Illinois and western Pennsylvania.

Clinton—The recent announcement that the Brazil Block Coal Co., which operates mines Nos. 6 and 8, south of Clinton, in the Vermillion County field, would go out of business, has been followed by the information that the mines have been purchased and taken over by the Oak Hill Coal & Mining Co. D. B. Medill, who came to this state after Mr. Deering and his associates and took over the Oak Hill mines, is to be the local head of the seven operations in this field.

Linton—A seam of superior grade coal has been found on leased land between Linton and Pleasantville, in the Green County field, where drilling has been going on for some time. It is understood that four new mines will be opened this year by a local company now forming. Eastern capitalists are financing the deal.

Kansas

Pittsburg—Two new steam shovels have been ordered by the Ellsworth-Klaner Construction Co. for work in stripping the property of the Central Coal & Coke Co., near Weir. It is claimed that the shovels will be the largest in the world. When they arrive, there will be 9 machines of this kind at work in the vicinity of Pittsburg. There are large areas of coal land in this region, passed by in previous mining operations, that are now being stripped.

Kentucky

Louisville—The coal operators and miners of western Kentucky have reached an agreement on a wage scale after numerous conferences. The joint conference committee finally decided to accept the scale adopted at Cleveland, and will meet again at Central City, to approve a number of details referred to a subcommittee. The men insisted, for a time, on an increase in the estimated ratio of lump to mine-run coal produced. Their demand that the operators pay the cost of shotfiring was relinquished. The new scale will give the miners an increase of 5c. a ton for lump coal, 3c. a ton for run-of-mine, and 5.26 per cent. on day wages.

The Pioneer Coal Co., of Louisville, has begun operations at its mine in the Straight Creek district near Pineville. The present output is three cars a day, but this is to be greatly increased.

Providence—The Luton Coal Co. has been making improvements to its plant, installing an air compressor and other mining equipment. It also has additional miners' houses under construction.

Ohio

Steubenville—The sheriff has been asked to appoint deputies to preserve order at the Bradley mines of the United States Coal Co. The company desires to maintain pumpers and track repairmen in the mines during the suspension, but the Italian miners, refusing to permit it, have engaged in several riots and have injured a number of pumpers and others. The men who filed information in court against their assailants were expelled and thrown bodily from the union hall.

Bellaire—Deeds of transfer filed in the Belmont County courts at St. Clairsville, Apr. 9, gave the first intimation of a big deal in eastern Ohio coal lands. The No. 8 Coal Co., stockholders and officers of which are thought to be Pittsburg and Cleveland capitalists, have bought the Belmont Coal Co.'s property, consisting of 8000 acres of coal, three operating mines and valuable surface land. The property is estimated to be worth $3,500,000. The Lorain Coal & Dock Co. had arranged to purchase the property a year ago but the final transfer was stopped because some of the land titles were not clear. Since then all titles have been cleared up.

Martins Ferry—Three thousand miners resumed work in Belmont County on Apr. 2. They are employed in the mines of the Etna-Standard and Laughlin plant of the American Sheet & Tin Plate Co. and the Whitaker & Glessner plant of this city. The resumption followed the signing of the scale by the company, on permission of the miners' policy committee. Eight thousand other miners in the county will remain out pending the result of the referendum vote.

Columbus—While no official statement has been given out, it is unofficially announced that more than 90 per cent. of the miners in the Ohio field have voted in favor of the adoption of the new wage contract drafted at the recent joint conference. The official announcement is expected to be made shortly after the middle of the month when operators will start to prepare for resumption of work. Some operators believe that the mines will be in operation by Apr. 22, but the majority believe that little coal will be mined in Ohio before May 1.

Cleveland—Contracts for transporting 750,000 tons of coal to Lake Superior points were recently distributed among Cleveland vessel managers. The contracts provide for an increase of 25 per cent. of the tonnage, if the shipper desires, by the middle of the summer. The freight rate is 30c. a ton. Independently of arrangements that have been made for floating large amounts of coal, for which contracts have not been signed here, there have been awarded independent vessel managers more than 2,000,000 tons of coal at last year's rates.

Pennsylvania

Bituminous

Pittsburg—District No. 5, United Mine Workers, voted, Apr. 11, overwhelmingly in favor of the Cleveland wage settlements. Demands which miners of western Pennsylvania will make upon the operators were formulated at the convention on Apr. 12. Operators and miners of the Pittsburg district will meet in joint conference to reach an agreement for this field. The agreement will be based on the demands approved Apr. 12 and the basis for the wage contracts reached at the interstate joint conference in Cleveland. Among the more important demands for the local field are:

Abolishing machines in extracting ribs and stumps; uniform outside day wage scale; uniform scale for slate and dead work; complete check-off for the organization for all men working in or about the mines; house rent and the price of

house coal to remain the same and not be increased because the men's wages are increased; rent to be $1 a room a month and house coal $1 a ton; no discrimination against miners for refusal to patronize company stores; where a miner is discharged or forced to remain idle through a dispute with the company, and is afterward found to have been unjustly dealt with, he is to be reinstated and paid for lost time.

California—In the face of the stand taken by the miners of District No. 5 in their convention at Pittsburg, when they agreed to remain idle until Apr. 22, Vesta No. 4, the largest mine in the district, resumed operations Apr. 11.

Washington—Options on about 800 acres of the Pittsburg vein of coal underlying several farms on the southern border of this city have been taken by C. T. Bartlett, of Washington, and the deal is expected to result in the opening of a coal mine just over the borough line. Mr. Bartlett is reported to have optioned the coal at $300 an acre.

Du Bois—The operators' association of District No. 2, United Mine Workers, took a decided stand in the joint scale conference, Apr. 10, practically refusing the scale presented by the miners and offering a renewal of the previous wage agreement for two years. In the event of this counter proposition not being acceptable to the men, the operators proposed to submit the matter to arbitration.

Johnstown—Preliminary surveys have been made and a definite route is now being mapped out for an extension of the Windber-South Fork branch of the Pennsylvania R.R. into the Shade township coal fields in Somerset County. Several local coal firms are interested in the project as they own big holdings in that field. The route will branch off the Windber-South Fork tracks at a point below Arrow. It will follow the general direction of Shade Creek and will be routed toward Central City. The extension will open for the Pennsylvania R.R., the basin in which the Shade field is situated, as far south as Berlin, an airline distance of from 25 to 30 miles.

Anthracite

Scranton—The colliery railroad lines of the Mount Jessup, Moosic Mountain and Dolph Coal Companies, independent operations at Jessup, near here, were put temporarily out of commission by a dynamite explosion on a cross-over of the railroads, Apr. 11. Sticks of dynamite were found under the rails of an Erie Railroad mine switch for a distance of 100 ft., and if they had not been found, a train crew would probably have been blown up. On Apr. 13, the Dolph company's pump runners, firemen, engineers and repairmen, who have worked during the suspension, were attacked by a crowd of nearly 100 men. The rioting is attributed by the miners' union, the colliery owners and the sheriff to a branch of the Industrial Workers of the World that has been flourishing in Jessup for several years.

Thirteen damage suits were started recently against the Price-Pancoast Coal Co. by families of victims of the Pancoast mine disaster of Apr. 7, 1911. In three of the actions $50,000 is the measure of damages fixed and in the other cases the amounts vary from $20,000 to $30,000.

The average price at New York for domestic sizes of anthracite coal for March has been determined by Commissioner Neill as $4.88. This price entitles the mine workers to an increase of 7 per cent. on the rates of wages fixed in the award of the anthracite strike commission. In the last 12 months the average monthly bonus to mine workers under the sliding scale has been about 4⅔ per cent.

Wilkes-Barre—The anthracite coal companies of the Wyoming region offer no encouragement to large coal consumers that the suspension of work at the mines will be of short duration. The Delaware & Hudson Co. recently notified the officials of the Sheldon Axle Works that if they wanted more coal they had better place their order at once.

The Prospect colliery of the Lehigh Valley Coal Co., located in Wilkes-Barre, claims the world's record for a month's production of anthracite coal. It turned out 104,000 tons during March.

Fires continue to be drawn from under the boilers and mules taken out of the mines in this region, which many think is a sure indication that the suspension of work will last longer than first expected.

Shamokin—Orders from union headquarters have called off all repair work in this district after Apr. 10. There will be no interference with the pumpmen and workmen needed to prevent damage to property until after the result of the conference at Philadelphia becomes known, when it is intended to suspend everything if an agreement is not reached. The union heads claim that some companies were taking advantage of the permission granted to do repair work to prosecute new work, which led to the order being issued.

Philadelphia—Conferences of anthracite operators and miners were opened here, Apr. 10. Representatives of the miners declined the offer of Mr. Baer, on behalf of the operators, to submit the controversy to a board of arbitration, and the whole matter in dispute was referred to a committee of four operators and four miners. So far no definite results of their deliberations have been made public, but an optimistic feeling seems to prevail to the effect that a satisfactory settlement will be reached.

Virginia

Pocahontas—The Panama R.R. Co. has awarded the contract for 2 years' supply of coal at the Panama Canal to the Pocahontas Fuel Co. The contract calls for the delivery of as much as 550,000 tons a year at $2.70 a gross ton, with a reduction of 5c. a ton should the price of coal decline during the second year.

West Virginia

Fairmont—Several large mining companies, employing nonunion labor, have announced an increase in the wages of their employees. The companies making the advance are the Consolidation Coal Co., the Davis Coal & Coke Co. and the Black-Sheridan-Wilson Co. In all about 15,000 men are affected. These companies are considered to have always treated their employees liberally, and have few labor difficulties in their respective fields.

Fayetteville—Extra police have been placed in the mining communities of Boomer, Cannelton and Marting, where race riots are feared between American and Italian miners. Feeling runs high following the murder of a bank boss of the Boomer Coal Co., who was followed to a stable by three Italian miners and shot down in cold blood. Governor Glasscock was asked to have the militia in readiness to be sent there. All the mines are idle pending the decision on the referendum vote on the Cleveland agreement.

Moundsville — When non-union men were leaving the Mound City coal mine, Apr. 9, they were attacked by a mob of 400 union miners armed with guns and clubs. Two were probably fatally injured and several others seriously injured. A riot call was sent in and the sheriff with a posse of 100 deputies, rushed to the shaft of the mine and charged the mob. Six deputies were injured in the mêlée. The company has applied to United States Judge A. G. Dayton for an injunction against interference by the strikers.

Bohemia

Karlsbad—The strike in the Bohemian coal fields, which was ordered at the same time as the British strike, came to an end Apr. 3 when the mine owners gave the miners guarantees of wage increases, although the men will not get the full 15 per cent. demanded.

Spain

Madrid—A commission representing the mine owners has not been able to reach an agreement with Premier Canalejas on the threatened strike of the coal miners. The miners in the Asturias region, failing to receive an increase of 10 per cent. in their wages, threaten to strike.

Personals

J. M. Fitzgerald, the recently elected president of the Davis Coal & Coke Co., was in Baltimore last week, after having completed a trip over the company's properties in West Virginia.

W. J. Finnegan has resigned as secretary of the Central City Coal & Iron Co., with offices in Louisville, to become general sales agent and assistant manager of the Louisville Coal & Coke Co.

J. W. McNeill, marine clerk in the offices of the Davis Coal & Coke Co., will go to New York as chief clerk to President Fitzgerald. C. C. Knobeloch will fill the position formerly held by Mr. McNeill.

George Watkin Evans has recently resigned his position as chief of coal surveys for the Washington Geological Survey, and has opened an office in Seattle as consulting mining geologist and engineer, specializing in coal.

C. S. Bookwalter, of Paducah, Ky., has been elected general manager and treasurer of a new company which has been organized to take over the property of the old Carbondale Coal & Coke Co., with mines at Hamby, Ky.

E. N. Zern, assistant professor of coal mining at the University of Pittsburg, has been elected professor of coal mining by the board of regents of the University of West Virginia to fill a position created by the recent establishment of a school of mining at this institution.

C. T. Fairburn, general manager of the southern district of the Republic Iron & Steel Co., has withdrawn from the executive committee of the Alabama Coal Operators' Association, and has been succeeded by A. H. Woodward, of Birmingham, general manager of the Woodward Iron Co.

E. M. Wadsworth, dean of the mining department, University of Pittsburg, has retired and S. A. Taylor, president of the American Mining Congress, has been elected to fill the vacancy. Mr. Wadsworth will receive a pension from the university and will probably devote a portion of his time to its affairs.

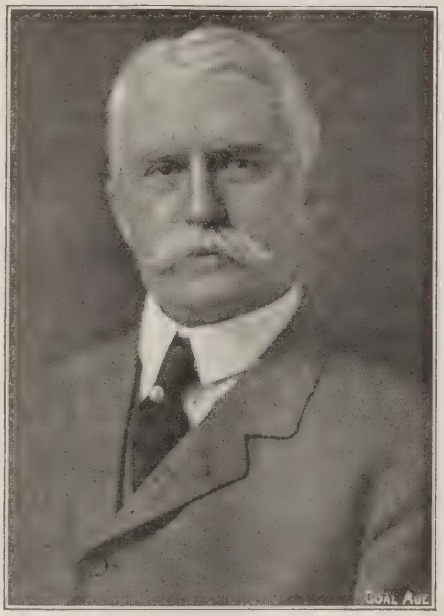
John F. Meagher, of Mulga, Ala., general superintendent of coal mines for the Birmingham Coal & Iron Co., has been appointed assistant general superintendent of coal mines for the Tennessee Coal, Iron & R.R. Co., with headquarters at Ensley, Ala. Mr. Meagher will assume his new duties at once.

Edwin Ball, of Birmingham, Ala., manager of ore mines and quarries for the Tennessee Coal, Iron & R.R. Co., has been appointed general superintendent of all the company's mines, following the resignation of Edward H. Coxe, general superintendent of coal mines and coke ovens. Mr. Coxe will remain with the company until about June 1.

Obituary

William A. Lathrop, president of the Lehigh Coal & Navigation Co., and Lehigh & New England R.R., one of the foremost men in American mining circles, died Friday morning, Apr. 12, at the City Hospital, Wilkes-Barre, Penn., following an operation for appendicitis. His condition had been critical for several days, and a number of specialists had been summoned to his bedside.

Mr. Lathrop was 58 years old. He was born in Springville, Susquehanna County, Penn., and acquired his earlier education at the schools of this town. Later, he entered Lehigh University, and in 1875 was graduated with honors as a civil engineer. He afterward took a course in mining and received his degree



William A. Lathrop

of mining engineer from the same institution.

For two or three years after his graduation Mr. Lathrop was employed in various minor capacities, both in the anthracite mines and on railroad work in the Wyoming and Lehigh districts of Pennsylvania. He subsequently became assistant to Robert H. Sayre, chief engineer of the Lehigh Valley, and filled this position with great credit for several years. Later, he was associated with Major Irving A. Stearns, of Wilkes-Barre, and for a time took over the management of an iron-mining enterprise in northern New Jersey.

In 1881, when the Southwest Virginia Coal Co. required a superintendent and mining engineer to open up its properties in southwestern Virginia, Mr. Lathrop was selected for the position. He started the mines which have since become the center of the Pocahontas field, and laid out and built the present town of Pocahontas.

After several years of labor against great difficulties in this pioneer work in Virginia, he returned to Pennsylvania in charge of the bituminous mines of the Lehigh Valley Coal Co., at Snowshoe, in Center County, and in 1888 was made superintendent and general manager of all the Lehigh Valley mining operations, succeeding the late Frederick Mercur. Mr. Lathrop remained at Wilkes-Barre in this capacity until 1902, when he resigned to take the presidency of the Webster Coal & Coke Co., operating in central Pennsylvania, and later was made president of the Pennsylvania Coal & Coke Co. When this company leased its mines and lands to other interests, he became president of the Lehigh Coal & Navigation Co., with headquarters in Philadelphia, succeeding Lewis A. Riley.

Mr. Lathrop was a member of the state commission, appointed by Governor Tener, a few months ago, to devise a plan for the protection of the surface of the anthracite region from damage by mine caves. He was a trustee of Lehigh University, president of several coal companies, a director of the People's Bank, of Wilkes-Barre, and of the Fourth National Bank, of Philadelphia, a member of the American Institute of Mining Engineers, the Mining and Metallurgical Society, the Union League, University, Art and Downtown clubs, of Philadelphia, the Westmoreland Club, of Wilkes-Barre, the Railroad Club, of New York, and the Pennsylvania Society of Sons of the Revolution. Although in recent years much of his time was spent in Philadelphia, Mr. Lathrop made his home at Dorranceton, near Wilkes-Barre, Penn. He is survived by his wife and one daughter.

Construction News

Birmingham, Ala.—Plans are being prepared by the Corona Coal Co. for improvements to its property at Corona and elsewhere, involving an expenditure of about $300,000.

Zanesville, Ohio—R. P. Dutro, of Crooksville, has leased 300 acres of coal land in Perry County and will develop the property by opening a mine some time this summer.

Louisville, Ky.—The Perry County Coal Co., which has been organized by Cincinnati interests, will begin mining operations at Viper, Ky. A mine is to be opened in the immediate future.

Wilkes-Barre, Penn.—The contract for building a new breaker to replace the Paine breaker, which was burned down some time ago, has been awarded to W. L. Moore, of Luzerne. Work will be started at once.

Louisville, Ky.—The Consolidation Coal Co., of Baltimore, Md., has awarded a contract for the construction of 1000 buildings at the new town of McRoberts, Ky., to the Nicola Construction Co., of Pittsburg. Work is in progress.

Charleston, W. Va.—The Kimball Pocahontas Coal Co., of Kimball, W. Va., has been incorporated, with $100,000 capital, to operate in the Brown's Creek district of McDowell County. H. D. Hatfield, Eckman, W. Va., is one of the incorporators.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

While there has been no further recession in prices, the coal market is undoubtedly at a complete standstill. This is due to the unexpectedly short duration of the bituminous suspension, the heavy stocking and the general belief that a further decline in prices is inevitable. Most of the large consumers and dealers were prepared for a protracted shutdown at the mines, with the result that the former are showing no disposition to buy, while the latter are anxiously seeking a market for their product, acquired in many instances at a high figure.

In the East there is little or no business being done in the open market, the movement being confined almost entirely to contracts. With the bituminous agreements settled, interest is now centered on the anthracite conferences, and it is believed that a resumption at the hard-coal mines will not be effected before May 15. While quotations have eased off in some sections, there is so much high-priced coal on hand that wholesalers are making every effort to hold the market at the present high level. There is considerable activity in the Pittsburg coke market, in which the suspension over the Easter holidays developed a temporary but pronounced shortage.

A general holiday is in effect in the Ohio trade, there being but few arrivals, which are selling at a low figure. The suspension has resulted in the consumers using up much of their surplus coal, which, together with the shortage in the Northwest, has engendered a strong feeling of optimism over the outlook.

In the Middle West the trade generally is dull and quiet, while at Chicago heavy tonnages which accumulated on demurrage, were forced on the market and caused a ruinous slump in prices. Rumors of a possible strike in the Far West next fall have had a stimulating effect on the markets there.

Boston, Mass.

The week has shown a sagging market, with bituminous easing off to nearly normal prices, and anthracite bringing much reduced premiums. This, in the face of no supplies on hand, and a partial suspension at the soft-coal mines, shows the extent to which buyers are waiting. Shipments from the Georges Creek field have narrowed the demand for the Pennsylvanias, and quotations on the latter vary according to the anxiety of the shippers to sell. There is little present interest in bituminous, more than enough to carry over into June, when everybody is predicting an easy market, both as to coal and freights.

The loading situation on Pocahontas and New River, at Hampton Roads, is not clearing as fast as was expected; boats are still taking two weeks and more to load. The agencies are apparently waiting for the market to settle down before attempting to contract for the new year. Efforts in that direction seem to be confined entirely to shippers of Georges Creek.

In anthracite the trade is at a complete standstill. The companies are cleaning up loose ends of stock here and there, while the available supply of new arrivals has practically disappeared. Quotations are off considerably from what they were, and there appears to be a feeling that the suspension will only be of short duration. The reports of the conferences are followed here with much interest.

Soft coal all-rail is slow again; the volume of speculative shipments was so large that the consumers are well satisfied with the situation at present. Prices have been forced down to nearly normal for the cheaper grades, and there has been no difficulty in obtaining consignments of arrivals at the transfer points.

Freights are much easier. Dollar freights from Hampton Roads to Boston are in sight, and in Reading transportation from Philadelphia the rate had been put down to about $1.20@1.

Current prices are as follows:

Clearfield, f.o.b. mines	$1.50@1.25
Clearfield, f.o.b. Philadelphia	2.75@2.50
Pocahontas, New River, f.o.b. Hampton Roads	3.25@3.85
Georges Creek, f.o.b. Baltimore	2.80@2.95
Georges Creek, f.o.b. Philadelphia	2.87@3.05

New York

The situation in the New York market continues unchanged. The trade is apparently undergoing a period of readjustment, made necessary by the unexpectedly short duration of the suspension in the bituminous fields. Interest is now centered entirely on the anthracite conferences being held in this city, and should these not result in an agreement, it is probable there will be a renewed activity in trade circles. A shortage in anthracite will materially effect the bituminous consumption, so that progress of negotiations is being keenly followed by both branches.

In bituminous the arrivals are good, and the trade is quiet, with only a few transactions being recorded. There appear to be large tonnages of the low-grade fuels on the market, and these are exerting a depressing influence on prices, which are now quoted around $3, f.o.b. Mines shipping this market are working under a fair to normal capacity. The railroad movement is good, and while the dealers are short in supplies, the consumers generally are well stocked.

The anthracite trade is at a complete standstill, with nothing coming in and little or no demand. An acute shortage developed in rice, while supplies generally are estimated at less than one-tenth normal.

Current wholesale quotations here are as follows, per ton:

Broken	$5.00@5.25
Egg	5.00@5.25
Stove	5.50@5.75
Nut	5.20@5.50
Pea	3.75@4.25
Buckwheat	3.50@4.00
Rice	2.50@3.25
Barley	1.90@2.25

Philadelphia, Penn.

The trade in this vicinity is about the same as last week, which is not saying a great deal, as the very optimistic reports that the newspapers are making about a favorable settlement of the trouble between the operators and miners, is causing householders generally to postpone any purchases of coal unless absolutely necessary. The dealers are fairly well stocked, that is, with the domestic sizes of coal, but declare that business is exceedingly poor.

No coal is being sent to market, and there is nothing offering with the exception of some that is in the hands of speculators, who are asking, but in very few cases receiving, exorbitant prices. As a whole, the consumers are fairly well supplied with fuel, and with the coming of warm weather, when most fires will be drawn, are loth to worry about the situation. It is still in doubt what the final outcome of the difficulty will be, and what the adjustment, if any, will amount to. It is believed the two most important items of the miners' demands, recognition of the union and increased wages, are the stumbling blocks, and it almost goes without saying that an increase in the scale of wages will bring about an addition to the prevailing prices for coal.

Already it is rumored that stove size is likely to be put on a parity with chestnut, or in other words, an advance of 25c. over last year, but the wholesale operators neither confirm nor deny this, taking refuge in the statement that present prices, or the March circular, will prevail, until some adjustment of the trouble is brought about. Predictions are freely made that it looks now as though it would be the middle of May before resumption of mining.

Pittsburg

Bituminous—There has been practically no coal market the past week. The operators have no coal to sell and consumers are fairly well provided, having as a rule laid in larger stocks than necessary to tide them over the suspension, which proves unexpectedly short. While official warrant is not yet available, it is expected the mines will resume next Monday, as presaged in last week's report.

The Lake shipping season will open May 1, when the new rate of 78c. on cargo coal to the lakes goes into effect, against the old rate of 88c. Many contracts will probably have been closed before that time, but operators do not admit that any have been made thus far. Expectations are for a much better movement this year than last, as last year's movement was light and the hard winter cleaned up stocks in the Northwest very thoroughly. The Pittsburg district does not, however, expect to obtain a much larger percentage of the total business than in the past couple years.

Connellsville Coke—Coke has been higher the past week, partly on account of increased production cost through the advance in wages and partly through decreased production owing to celebration of the Easter holidays. It is estimated that last week's production was about 60 per cent. of normal, production in the first two days being not over 30 per cent. of normal, while the two days following was somewhat low also.

Very little coke has moved, but $2.75 and $2.85 has been freely paid for small prompt lots, while occasionally a few carloads brought still higher prices, when the seller could assure spot shipments by giving car at the time of making sale. There is no market on contract furnace coke, neither buyers nor sellers having gotten down to business. There is little contract business to be closed for second quarter, but a considerable tonnage runs out July 1. We quote: Prompt furnace, $2.75@3; prompt foundry, $3@3.25; contract foundry, $2.65@2.75.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Apr. 6 at 415,464 tons, an increase of 2000 tons, and shipments at 4339 cars to Pittsburg, 6605 cars to points West and 1370 cars to points East, a total of 12,314 cars, a decrease of 136 cars; shipments East, however, increased 300 cars.

Baltimore, Md.

The Baltimore market eased off considerably during the past week, prices being lower and the demand less active than heretofore. This is due to the fact that many consumers stocked up to protect themselves, and that they now find a goodly supply on hand, with little possibility of a serious tie-up in either the anthracite or bituminous fields. The few who decided to take chances in the market in the event of a strike, are apparently not doing any buying, they believing that prices will go much lower than they are at present.

One large operator declared that, so far as his company was concerned, he found it difficult to sell coal at the prices which prevailed before the undue activity set in, as the result of strike conditions abroad and the unrest in labor circles here. At the present time, there is a large amount of coal in the market, and shipments are being made with the greatest dispatch. The car supply is adequate.

Buffalo, N. Y.

The market is very quite here and this is likely to continue for some time or at least till an understanding is reached with the miners. So little progress has been made in that direction as yet that it is impossible to make any prediction as to when business will return to normal.

There is just enough bituminous production to bring prices down close to last winter's figures. Some incautious operators and jobbers have found themselves with considerable coal on hand for which there is no market and more or less car service has been paid. One successful operator, however, reports that he is still getting about 20c. a ton more for his present small output than he was able to get last winter and he is satisfied, though it does not appear that many are doing as well.

Quotations are not much easier to make than they were last week, for prices, though lower, are not at all uniform. One dealer ridicules the prices that another claims to be getting. It is at least agreed that slack and coke are very strong and much higher than they were a year ago. There is no slack making for the lake trade and the coke regions are very short of men, so both should be strong for some time yet.

Nearly former quotations of bituminous are still in effect as follows: $2.60 for Pittsburg three-quarters, $2.50 for mine-run and $2.25 for slack, with coke up to $4.75 for best Connellsville foundry. Allegheny Valley coal is commonly about 25c. lower than Pittsburg, though the difference is not so closely maintained as it sometimes is.

There is next to nothing doing in anthracite. Shippers are getting a few cars now and then and the few consumers who are in the market are taking it at full prices, or at a premium in case of independent stores. The predictions that mining would be resumed soon after the middle of April are not heard now. Not a few coal men are now looking for an obstinate strike before the differences are settled.

Cleveland, Ohio

A general holiday has been in effect during the past week in coal trade. A few straggling cars of coal have come into this market but there was considerable difficulty in disposing of it at any price; fortunately however, the quantities were small, as no doubt this coal was purchased at a high rate just prior to the suspension. At this moment every indication points to the miners going to work in the next week; fully 90% of the men have accepted the two-year scale, proposed by the Cleveland conference of miners and operators, and reports show that work will soon be resumed at the mines.

According to the operators, 1912 promises to be a banner year in the lake trade, owing to the unprecedented cold weather in the North last winter. It is said that every pound of coal at the upper lakes has been disposed of, and with the docks pretty well cleaned up, operations in this trade will start briskly as soon as it is known definately that the lakes are free from ice.

There seems to be a much better feeling shown throughout the country, and operators and jobbers are expecting quite a business revival the coming year. Up to the present there has not been any shortage of coal reported by manufacturers or others, as everybody stocked up in anticipation of a suspension, and it is not expected that there will be any great demand for at least two weeks.

There is very little demand for domestic, as the season for that grade is about over. At present no prices are being quoted owing to the uncertainty, but established prices will probably be made during the week.

Columbus, Ohio

The coal market in Ohio during the past week has been at a standstill. The trade has been waiting the announcement of the result of the referendum vote of the United Mine Workers of America on the wage-scale matter, and unofficial reports show that it has been carried but it will be at least a week and possibly two weeks before the mines in the Ohio fields are again running.

In the meantime, steam users are consuming their surpluses, stored in preparation for the suspension. There is no report of suffering or great inconvenience in any quarter and the supply will un-

doubtedly be ample to last until mines have resumed. Many of the railroad companies have thousands of tons stored, sufficient to last several months.

There are bright prospects for a large Lake trade, as practically no stocks will be carried over in the Northwest. There are also good indications for an active steam business, since there will be little in storage at the beginning of May. The general tone of the market is satisfactory, and operators are looking forward to a good year. It is believed that prices will be somewhat stiffer during the summer than was the case last year.

Operators are taking advantage of the suspension to prepare their mines for the renewed activity when the wage matter is finally settled. A number of new mines will be opened in the Ohio fields, and preparations are being made for an increased output.

One of the features of the trade which will be given attention soon is the domestic demand. Stocks in this branch are generally small, and the stocking season is expected to produce a good demand for the larger sizes. Dealers are already placing their yards in shape for the opening of the stocking season.

Prices which can be said to prevail in Ohio fields are:

Hocking Valley	
Domestic lump	$1.50
¾-in.	1.35
Mine-run	1.15
Nut	1.20
Nut, pea and slack	0.85
Coarse slack	0.65
Pittsburg No. 8	
¾-in	$1.05
Mine-run	1.15
Coarse slack	0.75
Pomeroy Bend	
Domestic lump	$1.55
¾-in.	1.35
Nut	1.25
Mine-run	1.15
Nut, pea and slack	0.80
Coarse slack	0.70
Kanawha	
Domestic lump	$1.50
¾-in	1.30
Mine-run	1.10
Nut, pea and slack	0.80
Coarse slack	0.70

Nashville, Tenn.

The market in the west Kentucky field is in a very healthy condition. This is accounted for by the fact that the union fields have not definitely arrived at a basis of settlement yet, and there seems to be quite an uncertainty as to when they will do so.

The L. & N. R. R. are taking quite a tonnage of coal from all the mines. In view of the fact that the union mines are not working, it is giving the nonunion quite a heavy tonnage which they are very glad indeed to have, as business would naturally be a little quiet if it were not for this, although there is a fair demand for steam coal.

Domestic business is practicaly dead, and it is almost impossible to move any lump coal; consequently there is a very small amount of screenings being produced and the demand for them, as well as the prices offered, are very much greater than has ever been known in this section. Some of the steam plants that are dependent upon screenings, on account of their stokers, are crushing mine-run at an enormous expense. The indications are that prices will be a little better the coming season.

Chicago

The recent disturbances in the coal-mining situation have resulted in a difference of 35 to 60c. between the spot and mine prices on all kinds of steam coal; the average is probably close to 50 cents.

Large shipments have arrived at Chicago, and a very substantial amount has accumulated on demurrage. By forcing this coal on the market, prices have been brought down to from 90c. to $1 a ton below the price paid by the middleman.

There is no particular demand for smokeless lump and egg, and the price is $1.50 at the mines. It has been the experience of dealers that anything on track, with the exception of smokeless mine-run, had to be sacrificed in order to move it. It is understood that the Lake shipping interests will soon reach a decision that the market warrants a price about 10c. a ton over that of last year.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.37@2.62
Steam lump	2.17@2.27
Screenings	1.72@1.77
Springfield:	
Domestic lump	$2.32@2.57
Steam lump	2.02@2.22
Mine-run	1.92@2.02
Screenings	1.67@1.72
Clinton:	
Domestic lump	$2.27@2.52
Steam lump	2.07@2.17
Mine-run	1.87@1.97
Screenings	1.62@1.67
Pocahontas and New River:	
Mine-run	$3.15
Lump and egg	3.55

Coke—Prices asked for coke are: Connellsville and Wise County, $4.85; byproduct, egg and stove, $4.80; byproduct, nut, $4.50; gas-house, $4.85.

Indianapolis

The coal trade in this state is almost at a standstill, owing to the mines, with few exceptions, being closed. The suspension of work is delaying the dealers here and in other cities from the putting into effect of the summer schedule, which averages about 10% less than the winter. The reduction usually comes in April, but owing to the fact that the greater part of this month will be gone before an agreement between the miners and operators can be ratified, there is little chance of the summer rates going into effect until next month, and perhaps later. It is pointed out that the retail dealer has on hand the higher priced coal bought during March, and until the mines open and a reduction is made there is no inducement to summer buyers.

The 5 cents on the ton allowed in the new agreement, even if ratified, is not expected to affect summer prices to any great extent. A number of towns and cities in the state are face to face with a coal famine. In order to avoid closing down factories, the suspension of mining cannot be terminated any too soon.

St. Louis, Mo.

There is no business at all in the St. Louis market, and there is still a considerable tonnage of coal held on track at the mines, while some of the operators on the Illinois Central who stored coal on the ground are now loading it on cars, but there is practically no demand. There is nothing to gage prices by, as the operator will take anything that is offered.

Indications are that the mines will not resume operations now before the first of the month, and possibly not then. There is a small tonnage of smokeless moving in, but it is in excess of the demand, and coke is moving very slowly. There is nothing to indicate that conditions will improve for the next 10 days, as the stock of coal in storage is ample to take care of requirements for practically 30 days yet.

Spokane, Wash.

A general tie-up in the coal fields of Western United States is threatening Washington, Montana, Wyoming and Colorado, according to statements made by local dealers at Spokane. The agreements between the miners and the operators of this district will expire in the summer and the fall, and there seems to be ground for the belief that it will not be possible to effect a settlement. According to E. F. Waggoner, of the Union Fuel & Ice Co., the wages paid by the operators in this territory is the highest mining scale in the United States, and it is believed by nearly everyone that the scale should be reduced. However, the entire situation will depend upon the outcome of the strike in the East.

Although the dealers are laying in a good supply in case a strike does come, they have not changed their prices since last November.

San Francisco

The arrivals of coal by sea for March totalled 41,390 tons, of which 31,402 tons were foreign, viz., 30,372 tons were from British Columbia and 1030 tons from Australia. The balance consisted of one cargo, 5160 tons, of Pocahontas for the U. S. Navy, and two cargoes, 4829 tons of steam coal, from Seattle, for bunkering the navy's coast steamers at this port.

As a whole, the stock situation has materially improved during the past month. Of the British Columbia product, some

25,000 tons only are available for this market, one cargo of over 5000 tons being for transshipment to Alaska. With but 1030 tons of Australian coming in, considerable inroad was made on the supplies, and with but 11,000 tons afloat, delivery of which will be spread over the next three months, there will be none too much of this fuel in the market.

The supply of Rocky Mountain coal has been fairly good, but the dealers are loath to buy except from hand to mouth, since on May 1 a reduction of 50c. per ton off the mine price will come into force. During the past week there has been little, if any, change in the movement of coal. The weather has been mild, and consequently demand for house fuel has been light.

Current rates to the trade are as follows, per ton:

Wellington (British Columbia)	$8.00
Pelau Main (Australian)	8.00
Rocky Mountain	8.50
Cumberland	12.50
Anthracite (Pennsylvania)	15.00

Production and Transportation Statistics

Chesapeake & Ohio Ry.

The following is a statement of the coal and coke traffic over the lines of the C. & O. Ry. for February and eight months ended Feb. 29, 1912, in short tons:

Destination	February	8 Months
Tidewater	299,459	2,605,213
East	190,655	1,477,771
West	971,416	7,451,907
Total	1,461,530	11,534,891
Coke	17,180	135,240
From Connections		
Bituminous	17,650	153,890
Anthracite	4,742	26,646

Norfolk & Western Ry.

The following is a statement of commercial and company coal from mines in the N. & W. Ry. for the month of March, in short tons:

Field	Commercial	Company
Pocahontas	1,061,465	99,501
Tug River	141,582	42,665
Thacker	186,395	57,971
Kenova	62,018	8,316
Clinch Valley	116,581	9,265
Total	1,568,041	217,718

The following is a statement of the coal and coke tonnage from mines on the N. & W. Ry. in the State of West Virginia, for the month of March, 1912:

From	Tipple Coal	Total Coal
Pocahontas	20,344	1,112,468
Tug River	3,378	184,247
Thacker	5,176	244,366
Kenova	6,279	70,334
Total	35,177	1,611,415

Note—Total shipments of coke, originating entirely in the Pocahontas field amounted to 128,816 tons.

Imports

Imports of coal into the United States for February, 1912, totaled 118,921 tons as compared with 133,051 tons for the same month last year. The imports were almost entirely bituminous and 111,669 tons came from Canada, Australia and Tasmania being the next in importance with 6256 tons.

Various Railroads, Rivers and Canals

The following is a comparative statement of the fuel movement on various railroads, rivers and canals for January, 1911-12[1]:

Railroads	1911	1912
Baltimore & Ohio[2]	2,885,330	3,078,209
Buffalo, Rochester & Pittsburg[3]	692,440	755,436
Buffalo & Susquehanna[3]	174,685	174,358
Chesapeake & Ohio[2 4]	1,530,710	1,548,881
Huntingdon & Broadtop Mountain[2 3]	108,481	99,612
New York Central & Hudson River[3]	770,438	769,730
Norfolk & Western[2 3]	1,705,256	1,819,588
Pennsylvania (east of Pittsburg & Erie)[2 5]	5,569,804	5,562,831
Pittsburg & Lake Erie[2 5]	1,088,198	1,415,301
Pittsburg, Shawmut & Northern[3]	139,017	165,338
Southern[4]	358,917	328,257
Virginian[2 3]	218,308	306,766
Western Maryland	286,795	215,973
Rivers and Canals		
Barren River, Lock No. 1	182	80
Black Warrior River, Lock No. 12	135	426
Canals and Falls at Louisville	233,699	42,530
Chesapeake & Delaware Canal	10,956	6,101
Davis Island Dam	574,170	46,925
Green River, Lock No. 1	2,928	1,431
Kanawha River	146,460	28,880
Kentucky River, Lock No. 1	12,600	3,600
Monongahela River	972,861	609,057

[1]Figures throughout this table have been reduced to uniform basis of short tons.
[2]Includes coal received from connecting lines.
[3]Includes company's coal.
[4]December, 1911, figures.
[5]Does not include company's coal hauled free.

Ohio Coal Traffic Statement

Comparative statement of bituminous shipments over the principal Ohio railroads for January, 1911-12, in short tons:

	1911	1912
Hocking Valley	281,250	430,201
Toledo & Ohio Central	120,385	167,430
Baltimore & Ohio	176,979	212,945
Wheeling & Lake Erie	229,721	382,369
Cleveland, Lorain & Wheeling	189,807	268,641
Zanesville & Western	104,021	128,957
Toledo division, Penn. Co.	190,579	221,306
Lake Erie, Alliance & Wheeling	120,889	121,517
Marietta, Columbus & Cleveland Ry	3,498	9,658
Wabash, Pittsburg Terminal Ry	5,931	2,156
Kanawha & Michigan Ry		17,526
Total	1,423,060	1,962,760

Exports

Exports of coal from the United States for February of the current year were 927,339 tons as compared with 931,797 tons for the same month last year, both figures being exclusive of bunker or fuel coal laden on vessels in the foreign trade. Exports of anthracite for February this year were 231,684 tons as compared with 219,831 tons for the same month last year. The total exports of bituminous for February, 1912, were 695,655 tons as compared with 711,966 tons in February of last year, both figures being exclusive of bunker or fuel coal laden on vessels in the foreign trade. More than one-half of the total exports were shipped to Canada. Total bunker or fuel coal laden on vessels in the foreign trade was, for February of the current year, 527,901 tons as compared with 496,602 tons for the same month last year.

Foreign Markets

Germany

The following is a statement of the production, imports and exports in the German Empire for the month of February, 1912, in metric tons:

	Production	Imports	Exports
Coal	14,644,304	642,086	2,721,612
Lignite	6,506,749	570,991	4,239
Coke	2,271,282	41,492	371,454
Briquettes	1,910,639	16,815	207,088

Financial Notes

Among stocks of other companies held by the Consolidation Coal Co. are 13,500 shares of the Northwestern Fuel Co., common stock, 2700 shares Northwestern Fuel Co., preferred stock, and 5011 shares of the Metropolitan Coal Co., common stock.

Details of consolidation of the Birmingham Coal & Iron Co. and the Woodward Iron Co., of Alabama, into the Woodward Iron Co., formation of which is a step in the renewal of the $6,239,200 joint collateral trust notes of the Atlanta, Birmingham & Atlantic R.R. and the Atlantic & Birmingham Construction Co. have been completed. Value of ores and coal properties of the new corporation is $124,435,100. Estimated coal holdings are 380,109,000 tons, valued at $38,010,900.

Indications are that Colorado Fuel & Iron Co. will show a surplus for the year ending June 30 of something like $1,500,000. That would be a substantial improvement over last year, with its surplus of approximately $1,260,000, and an especially fine showing in view of the depression in the steel industry and in comparison with earnings of other steel companies. Earnings for eight months of the company's fiscal year are about $126,000 ahead of last year. This corporation was one of the pioneers in the installation of openhearth furnaces for the manufacture of rails in place of the bessemer process, and the quality of its output has a wide and favorable reputation. Its rail mills are operating at fullest capacity, and orders on the books at present are for capacity nearly 12 months ahead.

The newly formed Woodward Iron Co. in Alabama will have $13,000,000 capital stock, of which $3,000,000 is 6% cumulative preferred and the balance common, and $25,000,000 5% 40-year sinking fund bonds, of which $13,500,000 will be issued. Of the $13,500,000 bonds which mature Jan. 1, 1952, $2,000,000 will be issued to retire a similar amount of first mortgage 5% bonds of the Birmingham Iron Co.; $9,000,000 to pay for properties acquired; $2,500,000 for immediate improvements and expenses of consolidation and $11,500,000 will be reserved for future additions and betterments. The Birmingham Iron Co. bonds are redeemable at 105 and the premium, as well as discount on bonds sold, is to be paid as an expense of consolidation. The Woodward Iron Co., of Alabama, one of the principals in the consolidation, has no notes or debts outstanding except current operating liabilities.

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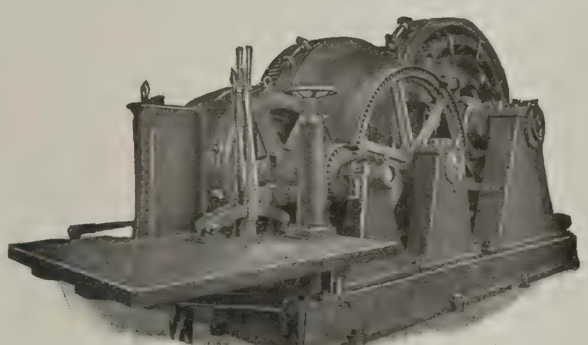

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COAL AGE

Devoted to Coal Mining and Coke Manufacture

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Issued Every Saturday.
Hill Publishing Company.

NEW YORK, APRIL 27, 1912

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CONCRETE WASHED-COAL BIN AND ELECTRIC THIRD-RAIL CHARGING LARRIES.

CA

COAL AGE

Vol. 1 NEW YORK, APRIL 27, 1912 No. 29

So far as unionism in coal mining is concerned, Illinois is the star performer of all states in this country. Last year, in compliance with the check-off system in force in that commonwealth, coal operators paid more than $650,000 into the treasury of the mine workers. Practically every one of the 70,000 colliery employees in Illinois is a member of the union. In the anthracite field, where the "check-off" has not been forced on the operators, a recent report of the U. M. W. of A. showed an enrollment of only 14,000 out of 170,000 hard-coal miners.

It is evident therefore, why the leaders of united labor desire anthracite recognition, such as would be conceded in the proposed check-off system. The difference to them is a matter of increasing their annual income in the hard-coal regions from $130,000 to more than a million and a half. What could they not eventually accomplish if provided such a sum to work with?

The anthracite operators have the Illinois mine owners set before them as an example of what will happen when labor gets the upper hand. Conditions in Illinois have become such that John Walker and his lieutenants practically dictate the policy of the industry in that state. Men cannot be discharged, machinery introduced, nor improved methods inaugurated unless the act is labeled with a union endorsement.

Illinois has 850 mines, operated by 260 companies, and it is this condition that has brought about a policy of "every man for himself, and the devil take the hindmost." As a result, mine owners have lacked unity of purpose, and coal mining in that state has been brought to a deplorable pass. The union is adding to the present burden of the operators little by little, not seeming to realize that by hampering and weakening the employer, the laborer himself will fail to prosper. With highest wages and most favorable working conditions, the Illinois miners receive less per year than do coal hewers in many other fields where the rights and welfare of the men are supposed to be less properly safeguarded.

Unlimited success, therefore, is the danger rock on which the miners' organization and the labor movement as a whole will dash itself to pieces. Human nature is very much the same in the average of mankind. Just as the good swimmer, glorying in his superb strength and skill, goes furthest from shore and perishes through overestimating his own power, so capitalism through the abuse and misapplication of wealth became top-heavy and tumbled from its apparently safe foundation. In like manner, labor unions are piling success on success, using each victory as a stepping-stone to a new demand, until at last the structure built with so much pride and hope will collapse because the architects bungled the plans and ignored the necessity of observing established economic facts.

No matter what color glasses we look through, everyone must recognize that wages cannot be larger than the product of a man's labor; in fact, they must always be less than the product—big enough to give the capitalist his due returns and the employer his living profits. When workmen, acting individually or collectively, attempt by force to refute this certain principle of wages, the result can be no more successful than would be an effort to overthrow the law of gravity.

Production will ever be the only true measure of a workman's pay, and in accord with this idea, the wages-class are entitled to the immediate benefit of every improvement in science and art, every discovery of resources in nature, and every advance in their own industrial character. However, the doctrine of *Laissez faire*, which teaches that the spontaneous action of individuals, each seeking his own interest on his own instance, will attain the best results, is mischievous, and only applicable in special cases. Acceptance of such a principle is certain to bar the way to advances in the industrial condition of mankind; in brief, such a rule, like fire or water, is a good servant but a bad master.

In conclusion, therefore, we uphold the unionization of workingmen when they combine to prevent industrial degradation, and to better their condition in life, but we deprecate the unwise exercise of great power, such as caused the head of a powerful labor organization to declare in New York this week, that unless the demands of his union be granted, he would shut off the food supply of our greatest city in less than seven days. If labor leaders could only discern that the chief danger to their cause lies in the errors of their own ways, the future of the wage earner would be brighter and safer than it is today.

Continuing this line of thought, next week we shall deal with compulsory arbitration, and the recent advances made by workingmen in New Zealand, the world's social experimental ground.

The Sheridan, Wyo., Coal Field

By Jesse Simmons *

This is the second and concluding article describing operations in this field. The Carney Coal Co., one of the properties dealt with, has a mine with a capacity of 4000 tons per 8-hour shift. A detailed account of the Acme Coal Co.'s plant will follow at an early date.

*Deadwood, S. D.

The Carney Coal Co.

The property of the Carney Coal Co. is on the northerly side of Tongue River, embracing 2600 acres of patented land owned by the company and 640 acres of leased land. The Carney bed, as it is locally known, has been developed here to the greatest extent of any point in the district. The mine is opened by two drifts in the river bluffs, about a quarter of a mile apart. The surface plant is one of the most complete in the Sheridan field, comprising two tipples, one of which is of steel and concrete throughout; the other tipple is of frame construction and well equipped. The coal is worked by undercutting with electric chain machines, and broken down to a shale parting which gives a thickness of approximately 10 ft. of clean coal. The plant has a maximum capacity of 4000 tons in an 8-hour day. The mine is worked in 30-room panels, rooms being driven on 45-ft. centers to a length of 300 ft.; electric haulage is used.

The camp, known as Carneyville, includes 163 houses, which were constructed by the company, and are leased to the employees at a nominal rental, a church, store, office building, etc. Every room in the village has electric lights, and every home is supplied with running water from a system maintained at the power plant. C. B. Seymour, Carneyville, Wyo., is general manager.

The Kooi Mine.

Peter Kooi, of Kooi, Wyo., is the owner and manager of the property bearing his name, near the western extremity of the Sheridan field, on the southerly side of the Tongue River, two miles west of the Monarch mine. The Monarch seam is mined, the bed showing practically the same thickness as in the Monarch property, which has been described, and the coal is mined on the same system.

Horses haul the coal from the rooms to the sub-partings, and a Westinghouse 6-ton electric-locomotive takes it to the main parting, from whence a tail-rope haulage system is used to transport it to the tipple. From the pit mouth inward for a distance of 150 ft. the pitch is 4%, and from that point the entry follows the seam on a pitch of about 1.5%. The tail-rope haul is 1500 ft. in length, with a Flory engine for furnishing the power.

A Norwalk 24x24-in. compound, 2-stage, air compressor furnishes air for the 7 Harrison punchers which are used for undercutting the coal. Some modifications are now being made, following the adoption of electric power secured from the Sheridan Electric Light & Power Co. The mine has a capacity of 2000 tons per day during the winter, and Mr. Kooi is proud of the fact that he has done this with a total of 102 mine cars.

Surface Equipment at the Monarch Mine, in the Sheridan District

The Model Coal Co.

Between the Acme and Carney mines, the Model Coal Co. is opening and equipping a new property on the Carney seam, the only shaft mine in this portion of the district. The opening is made by a shaft 12x24ft. and 123 ft. deep. The shaft is timbered with 12x12-in. and 10 x 10-in. square timbers, backed by 4-in. lagging. In addition a sump 12 ft.

in depth has been put down below the coal.

An electric hoist of 100 hp. using alternating current at 440 volts, will be used to hoist the coal. A 12-ft. Guibal fan, operated by a 35-hp. alternating current motor, will furnish air. Electric, shortwall, chain machines will be used for undercutting. Mine water will be handled with a motor-driven pump. A re-screening plant will be erected to prepare the smaller sizes of coal, and trackage, scales, etc., for handling 1000 tons per 8-hour day are being installed. The transformer house will contain transformers for stepping the power down from the line voltage to 440 volts, and a 1000-kw. motor-generator set, developing a 250-volt current for the mining machines, etc. Power is purchased from the Sheridan Electric Light & Power Company.

Surface Plant of the Carney Coal Co.

Puncher Air Machine in the Kooi Mine

The Model Coal Co. is incorporated under the laws of the state of Wyoming. The property is leased under a royalty per ton of coal extracted. The president is Frank W. Smith, Detroit, Mich.; treasurer, John Peters, Williamsport, Penn.; general manager, Stewart Kennedy, Carneyville, Wyo.

The Acme Coal Co.

The Acme Coal Co. operates two properties, the Nos. 1 and 2 openings, which are on a tract of land near the western edge of the field, and the No. 3 opening, which is at the present time the most northeasterly development in the district; the properties are about three miles apart. Nos. 1 and 2 are operating in the Carney seam, and the No. 3 workings are in the Monarch. No. 3 is a new property, and a splendid plant is being rapidly completed and put in shape to make an excellent grade of coal for years to come, while the ultimate end of operations at Nos. 1 and 2 can be but a few years distant.

No. 3 is a drift mine, the entry being made in the northerly bluffs of the Tongue River. The coal is mined by undercutting with Jeffrey mining machines, of both breast and longwall types, operated by 250-volt direct current. The coal is hauled from the main partings to the yards, which are a quarter of a mile from the pit mouth, by Jeffrey electric-locomotives. Here the cars are picked up by a cable-haul and delivered to a second cable-haul which takes them up an incline approach to the top of the tipple, 49 ft. above the yard tracks, where they are dumped in a crossover dump.

The coal, dumped from the mine cars, enters a bin with a movable bottom, by

View of Town and Mine at Carneyville, Wyo.

which it is fed to a shaker-screen of 3000 tons per 8-hour day, capacity. This screen has both lateral and longitudinal motion—something new to the Sheridan district—and makes a very clean product. From this screen coal may be loaded into either open- or box-cars, an Ottumwa loader being used for loading the latter. Covering the screen with steel plates makes it possible to dump mine-run.

The screen has 6-in. circular openings and the product passing over it is the standard lump of the Sheridan district. That portion passing through is either loaded into open cars or carried on a 30-in. belt-conveyor to the re-screening plant. This plant contains a revolving screen 24 ft. long and 6 ft. in diameter. For one-half of this length it is surrounded by a section 7 ft. in diameter. The screen openings are as follows, reckoned from the upper end: 1-in. for the first 12 ft.; 2-in., for 6 ft., and 3½-in. for the remaining 6 ft. The 12-ft. section of outer screen surrounds the inner section of equal length having 1-in. apertures, and has ½-in. openings. The screen is approximately 65 ft. above the ground, and underneath are bins with a capacity of 500 tons. On this screen are made slack, pea, nut and egg. The latter product is the portion coming from the main tipple which passes over the largest openings in the revolving screen. The entire tipple and re-screening plant is operated by electric motors.

Power is secured from the Sheridan Electric Light & Power Co. whose plant is a few rods away from the tipple. This plant is equipped with 3 Heine water-tube boilers having Roney stokers, and 2 Westinghouse Parsons turbines, each of 1250 kw. capacity generating a 2300-volt, 60-cycle, 3-phase, alternating current. The current is stepped up to 22,000 volts for transmission to the city of Sheridan and surrounding mines.

The product from Nos. 1 and 2 mines is dumped over a frame tipple, situated covenient to both openings; both are drift mines. Electric undercutting and electric haulage are used. The plant has a capacity of 1000 tons in 8 hours. Here, also, a well built camp has sprung up to afford accomodation for the employees. A. K. Craig and Ora Darnall are the owners of the capital stock of the Acme Coal Co., both making their headquarters at Acme, Wyoming.

Mine Registration and Checking

By W. A. Davidson*

At the Coleman mine of the International Coal & Coke Co., a loose-leaf record is kept of all employees, past and present, and a most satisfactory system of checking the men in and out of the mines has been installed. The registration and checking systems, the check board, and methods of operation are here described in detail.

*Superintendent and mine manager, International Coal & Coke Co., Coleman, Alta.

At the mines of the International Coal & Coke Co., at Coleman, Alta., Canada, all the underground men are hired by one person, who, on engaging a man, gives him a slip, directed to the timekeeper, showing his name, occupation and the time at which he is to start work. The timekeeper then registers the new employee in the "Mine Register," which is required to be kept in accordance with the Canadian coal mines act. The register at this particular mine is in the form of a loose-leaf ledger, allowing a leaf to each man. When the leaf is filled in, it is inserted in the binder alphabetically. This record is of the form shown in Fig. 1.

If the workman can write, he is required to sign the form himself and the balance is filled in by the timekeeper. The record is almost self-explanatory. "Dependents" and "Dependents' Address" are recorded for convenience in case of serious accidents and for information required in connection with the workman's compensation act, which is in force in Alberta.

The employee is next given an aluminum check with a number on it, called the "identification number." He is instructed to carry this check at all times and is told that it will be necessary for him to present it on pay-day before receiving his pay, and to return it on leaving the employ of the company; also that if lost he will be held responsible for it.

When the man leaves the employ of the company, the date of his time slip is marked on the register and the leaf is removed to a separate binder, kept for that purpose. If, at any time, the man should be rehired, the leaf is again inserted in the "mine register," and, if possible, the same "identification number" is given him, the date of reëmployment being marked on the leaf.

The identification numbers are given out in rotation, and are assigned to the outside men as well as those working inside, but the "pegging-in" board or check board is used only for the inside men. If a "company man," the new employee also is given a brass check with a number, called the "company number."

FIG. 1. LEAF FROM MINE REGISTER

EMPLOYEES' REGISTER

Date .... *Identification No.* ....
Name .... Signature ....
Age ....
Nationality ....
Married or single ....
Dependents ....
Dependents' address ....
Occupation ....
Mine No. or seam ....
Where last employed ....
Previous experience ....
Date of time check ....
Re-hired ....
Remarks:

CHECKING SYSTEM

In this province, a law, commonly called the eight-hour law, is in force. This limits the hours of work underground to eight hours and makes it compulsory to keep a register showing the times of ascent and descent of each shift. It is essential, therefore, to have some good reliable checking system that will show at all times the number of men in the mine and will record at the completion of a shift the number of men, if any, left in the workings. A system of this kind is of great value, especially in the case of serious accidents, when there is so much confusion and when reliable information is so essential. The form of record in use at the Coleman mine is shown in Fig. 2.

The check board, on which is kept a record of the men at work, is made of 1-in. kiln-dried pine, free from all knots or blemishes and straight grained. The accompanying illustration, Fig. 3, shows a part of the board used at Coleman and is almost self-explanatory, but in order to make it as clear as possible a description may be given as follows:

The left side of the board is devoted to keeping track of the No. 2 Seam contract miners. The contracts are numbered from 1 to 60, and opposite each number

FIG. 2. THE "EIGHT HOUR" REGISTER

DATE	Time at Which Shift Commenced to be Admitted to Mine	Time at Which Shift Commenced to Return from Mine	NAME	Hours Worked in Excess of Time Fixed by Act	Cause of Time Being Worked in Excess of That Fixed by Act	REMARKS	SIGNATURE

are holes for 10 pegs, which amply provide for the men on each contract. Alongside the contract numbers on the board, room is left to tack a small piece of celluloid on which can be printed the location of each particular contract. When one working place is finished, the celluloid can be cleaned off easily and the new place marked on.

Above each line of holes, a light piece of cardboard, divided into ten parts, is slipped through three or four common staples. Each division corresponds to a hole on the board, and on this cardboard the men's names are written. If a man is shifted from one contract to another, this record can easily be changed.

On the lower left-hand side of the board (not shown in Fig. 3), the same arrangement is followed out for contract miners working in No. 4 seam, and the contract numbers here run from 101 to 160, inclusive. This arrangement is necessary because there are two seams being worked, No. 2 and No. 4.

On the right side of the board is kept a record of the company men, the No. 2 men on top and the No. 4 men below. Practically the same system is followed here as for the contract miners, except that the company men are divided into the various classes of inside labor, such as bratticemen, trappers, firebosses, transportation men, trackmen, chute loaders, timber packers, laborers and development men—the latter including all men employed on new work, such as driving rock tunnels, etc., and work chargeable to capital account.

Each hole on this side of the board is given a number (company number). The No. 2 men are all given numbers beginning with 2, and the No. 4 men, numbers beginning with 4. This gives ample room for expansion, 1000 numbers for each seam thus being available. A piece of cardboard, bearing the names of the men, is slipped through staples above the holes in the manner previously noted. The number on the board corresponds to the number on the company check, which is given to a man when he registers.

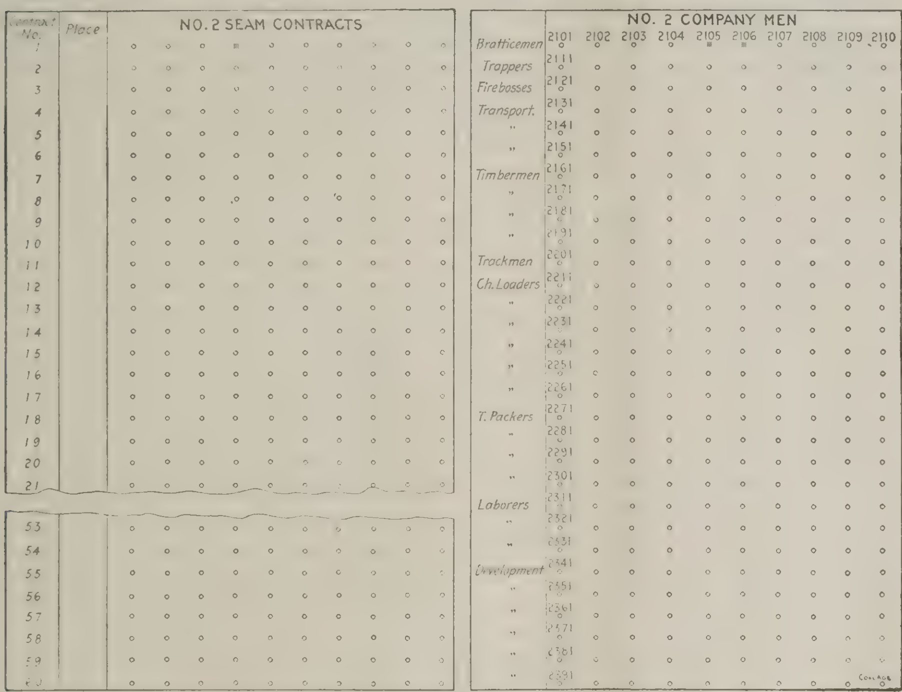


Fig. 3. Check Board for Operations in No. 2 Seam

Checking the Men In and Out

When a contract miner enters the mine, he calls his name and contract number and a peg is put in under his name. When he comes out, he calls out the same information and the peg is removed. A company man simply calls his number, as, for instance, 2262; otherwise the procedure is identical.

Some of the advantages of this checking board are as follows: When the shift has passed, going out, if any pegs are left in the check board, it becomes known immediately that someone is still in the mine, and the board tells who it is and where he was working. Similarly, when the shift is going on, the board at once shows the absentees and their working places, which can be filled from the "open links." The working time is transferred directly from the board to the books. All surface men who go into the mine temporarily to do repair work, have their names placed on the board and are

FIG. 4. UNDERGROUND OPERATIONS

Underground Operations Date......................

		Mining							Ventilation					Transportation					
Seam	Shift Goes On	Pit Bosses	Con. Miners	Open Link Miners	Timber Men	Timber Packers	Chute Repairs	Company or Rock Miners	Helpers	Laborers	Fire Bosses	Brattice Men	Trappers	Chute Loaders	Engineers	Brakemen	Horse Drivers	Track Layers	Total
No. 2 Seam																			
Total																			
No. 1 Seam																			
Total																			
Development																			
Total																			

Boys Men

required to check in and out in the same way as underground men, so, as stated before, the board shows at all times the men actually below ground.

In addition to booking the time, a daily record is kept of each shift, showing the number of men employed. This is obtained by simply counting the pegs on the board after the shift has passed, and the result is entered on the form shown in Fig. 4. The classification of labor on this sheet is the same as on the board. Such a record is of immense value to the mine manager, as can be understood without further explanation.

Keeping Track of Several Shifts

When two shifts overlap, as in the case of one shift starting at 7 o'clock and another at 9 o'clock, a different style of peg is used for each shift. In this particular case it has been found necessary to use only two kinds of pegs. The common brattice nail, along with the ordinary 3-in. spike, cut off somewhat, serve the purpose well enough. The 3-in. spike, being a little brighter and slightly longer than the brattice nail, makes the distinction quite evident. For conditions more complicated, different colored pegs could be used.

A person standing centrally in front of the board can easily reach all parts of it, and the pegs can be worked quickly, as are the keys of an instrument, so that if all the men of a shift follow one another closely, the board can be cleared accurately in two minutes.

At this mine there are two checking-in stations, No. 1 and No. 2. No. 1 is the main station. Exactly the same system is followed at Station No. 2 as at No. 1, but the board is not quite so large, because the board at No. 1 includes the record for No. 2. After the men check in at No. 2, the result is telephoned to No. 1 and their pegs are also put in No. 1 board. At the end of the shift, No. 1 station is informed whether or not No. 2 is clear, so that the board at Station No. 1 covers the whole mine and shows at all times the total number of men below ground. This system has been found to be entirely satisfactory, and there is no reason why any number of stations could not be worked in the same way—each reporting to No. 1.

The Jamison Coke Plants, Greensburg

By R. Dawson Hall

These plants make only 72- and 96-hour coke. Ovens are now supplying waste gas to two boiler plants. Over 20 horsepower is supplied by each oven and no coal is fed to the boilers even on Mondays. The coke made by the waste-gas ovens is superior to the ordinary beehive coke, being free from black butts and a trifle lower in sulphur.

The subject of the utilization of the waste gas from coke ovens has been so much discussed and yet so little comparatively has arisen from the discussion that it is thought that the following article may be of value to those who still retain the old bee-hive oven methods. There is no question but that the waste-heat boiler has come to stay wherever coke is made in bee-hive ovens and the problem is now what is to be done with the excess heat after all the needs of the colliery as regards power production are provided.

Those who have studied the use of waste heat are convinced that the logic of the situation favors the installation of means to utilize it at least to a degree sufficient to meet the full demands of the colliery where the coke is made. The sale of excess power is a larger question. It is to be hoped that some means may be found enabling the operator to sell this power, which costs him nothing except a comparatively small initial outlay.

Jamison Plants

The Jamison Coal and Coke Co., John M. Jamison, president, and W. W. Jamison, vice-president, at their Greensburg operations, mine approximately 2,500,000 tons per annum. They also have large interests in West Virginia, but the matter of this article is confined to a consideration of three coke-oven plants of the following names, locations and equipments: No. 1 at Luxor with 401 ovens, No. 2 at Hannastown with 516 ovens and No. 4 at Crabtree with 492 ovens, a total of 1409 ovens. The coal mined is the Pittsburg and runs from 7 ft. 6 in. to 8 ft. thick in this section.

When the coal comes from the mines, all which passes through a 4-in. screen is shipped. The balance is washed after crushing and made into coke, the analyses of the materials at the various stages being as follows:

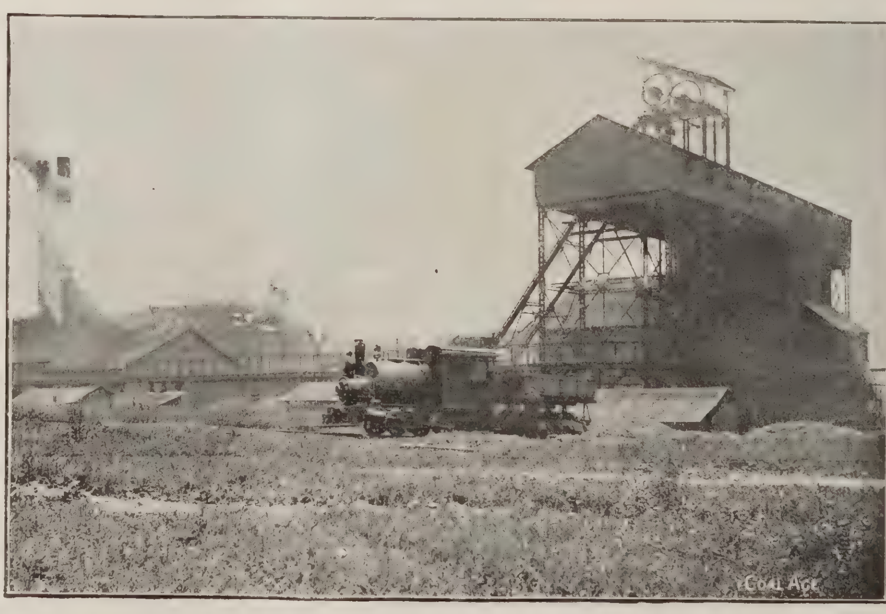
ANALYSES OF COAL AND COKE
JAMISON PLANTS

	Ash	Sulphur	Moisture	Volatile Matter	Fixed Carbon
Screened coal	7.45	1.28	0.70	32.95	58.90
Washer slack	10.00	1.40			
Washed coal	7.50	1.10			
Coke	9.80	0.88	0.16	1.00	89.04

It may be noted, though it is a trite observation, that the slack, which at these plants goes to the washer, is not as good as the coal which is shipped to market. This is always the case, the bulk of the impurities being found in the disintegrated coal.

The slack is washed in Stein-Boericke and Luhrig jigs and the cleansed product is discharged into one of two large tanks. These tanks at plant No. 2 are of iron, lined with brickwork, the joints being filled with cement. At the other plants they are of reinforced concrete. They are filled on alternate days. Elevators remove the slack from one tank at a time and empty it into bins for charging into larries.

By this means the washed coal is rendered comparatively dry before charging. This drying not only avoids an important waste of heat, but practically extends the coking period one hour and as it results in the heat of adjacent ovens not being



Jamison Mine No. 2 Hannastown, Penn.

A Row of Ovens at Jamison Mine No. 2

absorbed unduly by ovens newly charged, it provides for an oven temperature suitable for the manufacture of the strongest and densest coke. It is probable that some sulphur leaves the coal during the interval of storage, because the water drawn off is quite strongly impregnated with sulphuric acid. The pyrites can be entirely robbed of its sulphur by oxidation and solution, whereas the heat of the oven can only drive off 50 per cent. of it. Consequently it would seem that a leaching process, which is not carried far enough to destroy the coking power of the coal, should be advantageous. I have not seen any data on the subject, but it would appear to be a fertile field for investigation. The generalized symbol for pyrites is Fe_nS_{n+1} and that symbol still remains applicable after heating the mineral. The factor n, however, progressively becomes so great that it practically equals $n + 1$ and FeS_2, after being strongly heated, becomes FeS.

Foundry Coke

The Jamison plants aim to make nothing but foundry coke. Instead of charging each oven every alternate day except Sundays and drawing furnace coke four days in the week and foundry coke on Mondays and Tuesdays, each oven is charged but once in three days, and if Sunday intervenes the coal remains in the oven four days. So all the ovens are producing either 72- or 96-hour coke. Three grades are made, A, B and C, the first, A, is No. 1 foundry, B is No. 2 foundry and C is furnace coke. There is a large amount of the product sold on a guarantee that the sulphur content shall be less than 0.90 per cent.

The following are the input and output of 72- and 96-hour charges:

CHARGE AND OUTPUT OF COKE OVENS

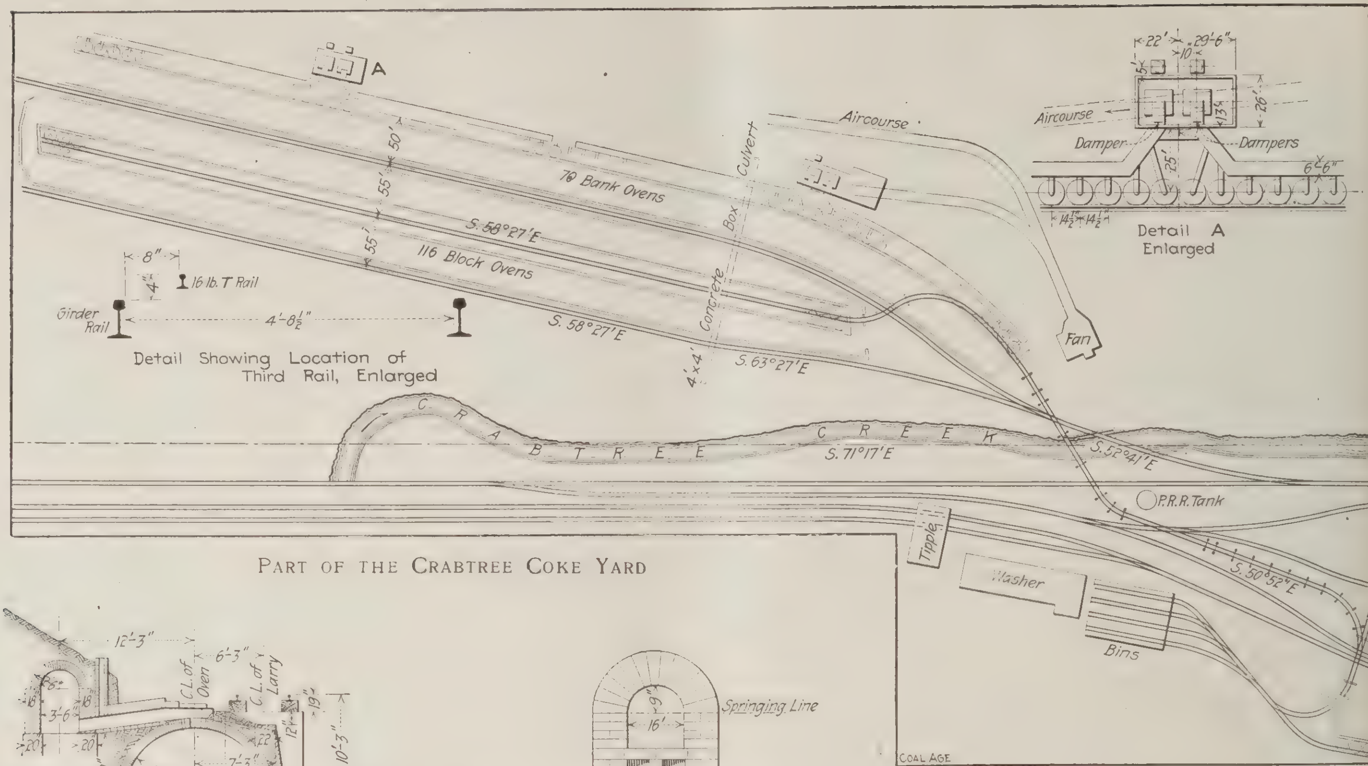
	72-hour Charge		
Material	Pounds	Per Cent. of Charge	Per Cent. of Output
Washed coal	15,680	100.00	132.09
Good foundry coke	9,528	60.76	80.27
Culls	1,706	10.88	14.37
Breeze	636	4.06	5.36
Total output	11,870	75.70	100.00

	96-hour Charge		
Material	Pounds	Per Cent. of Charge	Per Cent. of Output
Washed coal	17,655	100.00	136.42
Good foundry coke	10,330	58.51	79.82
Culls	2,044	11.58	15.79
Breeze	568	3.21	4.39
Total output	12,942	73.30	100.00

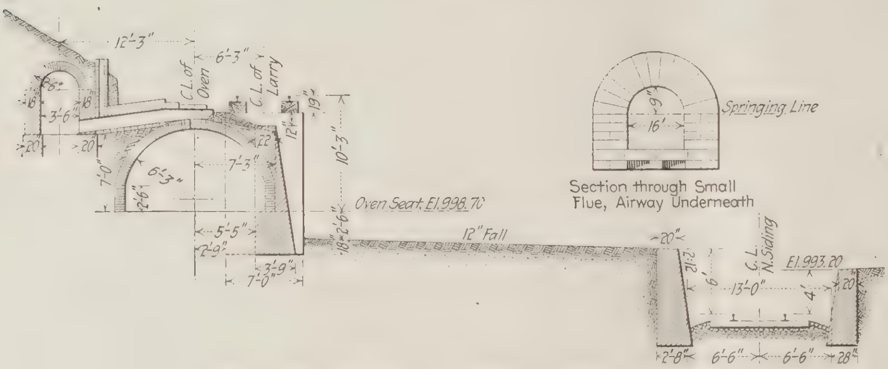
A 96-hour charge stands about 40 in. deep in the oven, and after coking it will be found shrunken to about 28 in. When coal is taken direct from the washer to the ovens, without the delay in the tanks, of which mention has been made, it is two hours before it begins to coke; but as a result of the opportunity the coal has to drain off, the time at the Jamison works is reduced to one hour. The door of the oven, which is only built about half way up to the soffit of the arched opening, is after this hour raised almost to the full height, the bricks being plastered with wet loam to exclude all air, except such as can enter above the coal. This prevents wasteful oxidation or burning of the charge.

The bricks forming the door are wet, to the full height of the slack bed, due to the dampness of the charge. As coking takes place, the bricks gradually dry, and when the coking reaches the oven floor, the entire door ceases to show evidences of moisture. This requires about 36 hours. Such coke, however, is light and weak, and the additional time given the process completes the driving off of the volatile matter and makes a heavier and stronger product. It may be noted that there is a deposit of carbon on those parts of the coke through which the rising gases escape, and the amount of this deposit varies from 3 to 5 per cent. The coke ovens at plant No. 1 are not at present in operation, and No. 2, though producing the best of coke, does not embody all the latest features of coke-making economy. Steam locomotives are used for hauling the larries to the oven and no use is made of the waste gases. It is the intention, however, to make the coke ovens supply the heat for operating this plant and the change will be made without delay because the test at No. 4 has shown that the waste-heat coke oven is a gilt-edged investment.

Waste Heat Ovens and Boiler House Plant No. 4



Part of the Crabtree Coke Yard



Part Cross Section of Oven, Tracks and Yards

Detail of Waste Heat Ovens Showing Flues

Each Oven Makes 22 HP., One Man Oversees 1600 HP.

At plant No. 4, seventy ovens are supplying all the heat needed for the operation of four 400-hp. boilers. In order to shorten the flues leading to these, there are two boiler houses set just back of the line of ovens, each house being connected with 35 ovens. By these arrangements a more even draft is secured for each oven, than if the boiler houses were combined and set at one end of the long line.

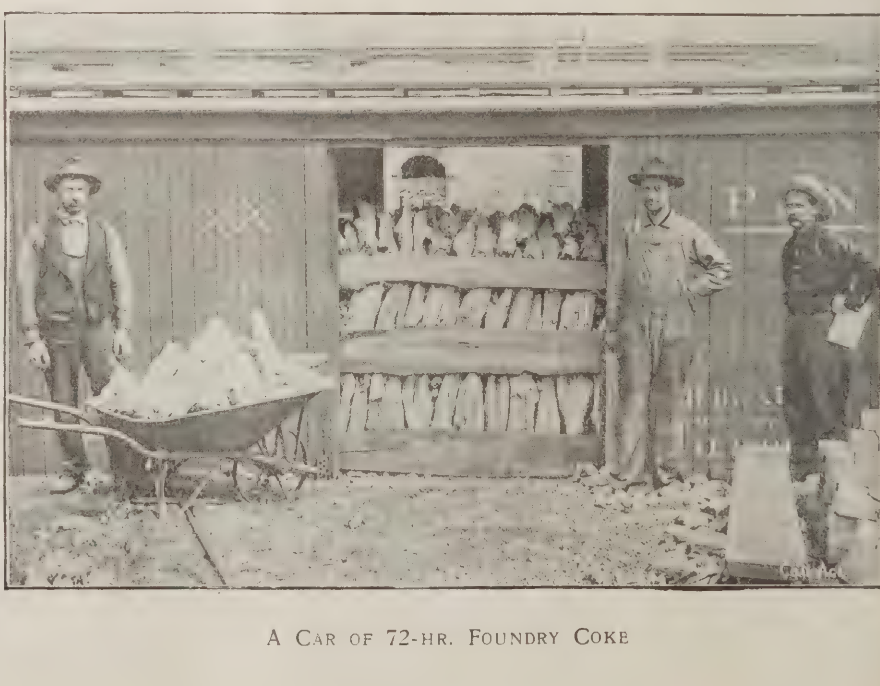
One man attends to all four boilers and watches the fan engine. He does not have much to occupy him physically or mentally and a high-priced man is not needed. Liberal allowances for interest, depreciation and repair leave a margin of about $20,000 over the coal firing. The cost of installation, including flues, boilers, steam lines, water lines complete, was approximately $350 per oven.

It will be seen that each oven provides about 22 hp. It is not thought that the continuous making of foundry coke changes the heat output in any material degree. It is true that the ovens are less frequently charged but, at the same time, larger charges are used and thus the conditions are not so unequal as might at first appear.

Any Oven Should Provide 20 HP.

An oven operating on the regular cycle, but of like diameter to those at the Jamison plants (12 ft. 6 in.), is charged every week with two chargings of about five tons each, and on Friday or Saturday with 6½ tons, a total of 16½ tons per week. It will be seen that the amount fed to the ovens at the Jamison plants with a two-charge system is 16⅔ tons. So that on the whole, there is no reason to believe that the three-charge system with its smaller charging loads will not give almost equivalent results. In fact it has been the experience of the H. C. Frick Coke Co., and the Ellsworth Coal Co., that 20 hp. is to be expected from a single coke oven.

The method of utilizing the waste gases has been developed by several experiments during the last few years. The heated gas is taken from the trunnel-head. This head can be covered by a large firebrick lid. When this is closed the gas passes through a conduit built on



A Car of 72-hr. Foundry Coke

a slightly descending grade toward the main flue. When first installed the small flues were covered by the slope of the bank of earth by which the main flue was protected, but it was found later to be a better plan to leave them uncovered as in the sectional elevation shown, because the intense heat did not then have as great an effect on their firebrick arches.

Closing off Boilers

The large brick flue at the back of the oven leads the gas away to the nearest boiler house. Should it be desirable to clean any boiler or to shut it off for repairs, a damper provides the means and a cross-flue between the flue to the right-hand boiler and that to the left permits the gases from one flue to be sidepassed from the boiler they normally heat to that which under ordinary conditions is heated by the adjacent stack of ovens.

Edward Soppitt

It is, of course, possible to overheat an oven, and this is not desirable, as the coke is thereby rendered brittle and valueless. But if the temperature be too low, the coke has black butts near the oven floor and is discolored in other places. As this half-coked coal and soot are undesirable, a sufficient heat to eliminate them and make them into a solid, shining body of coke is needed. Moreover, an intensely heated oven will eliminate somewhat more sulphur than one of lower temperature. But the present arrangement with a chimney about 130 ft. higher than the oven bed gives somewhat too much draft if not regulated, and reduction in height is proposed as remedy for this condition.

In conclusion, the ovens are giving excellent results, the coke made by them is better than that of ovens without provision for the use of the waste gases. The coke is brighter and harder and somewhat lower in sulphur. The success attained is evidenced by the fact that some of the ovens at plant No. 2 are to be made over. It is believed that the expense for maintenance where this system is installed will not be heavy. The main flue has stood two years without needing any repair.

It may be noted that the third-rail system of transmitting power is adopted and electric larries built by the Scottdale Foundry and Machine Co., are used to convey the coal from the washery bins, an ordinary 16-lb. rail, set with its upper surface 4 in. above the track rail being used for transmission purposes. The voltage is 250 volts. The electrical equipment was furnished by the Westinghouse Electric and Manufacturing Co.

The writer is indebted to Edward Soppitt, general superintendent Pennsylvania district; C. E. Cowan, chief engineer, and John McClarren, general foreman of the coke yards, for information and assistance in preparing the article.

Diamond Vale Disaster

The explosion which occurred at Merritt, B. C., was given a short notice in Coal Age in the issue following the unhappy event. The report of the coroner's jury being now at hand, a further statement seems timely. Merritt is situated in the Cariboo District of British Columbia, on the Nicola River, a branch of the Fraser, and is one of the stations of the Canadian Pacific Railway.

Report of Coroner's Jury

The conclusion reached by the jury was that the seven men who were killed "met their death by the explosion of gas combined with coal dust coming in contact with a naked light." This statement is easy to understand despite its ill expression. The jury finds that the management was guilty of gross negligence in not having provided efficient equipment and that the company showed a disposition to evade the requirements of the Coal Mines Regulation Act. .The inspector, Morgan, was also censured for not demanding a more careful compliance with the law. In addition to the seven men killed, two were injured, out of the 18 men working in the mine.

It appears that the development was new and was regarded more or less as a prospect rather than as a working mine. The equipment was such as suited an operation of little importance and one of which the future was in doubt. This was the excuse of Benjamin Browett, the superintendent, when taxed with the inadequacy of the plant. He stated that he did not think the mine was at such a state of development as to make it subject to the law and that he thought he could not be held to be amenable to its provisions without formal notification from the inspector.

Slow the Fan to Permit of Haulage

It was said, but denied by the engineer, that the fan could not be kept running when the haulage engine was working because the power provided was insufficient to actuate both at one and the same time.

The fireboss, Henry Grimes, one of the victims, was not a certificated man. He went into the mine at 6.45 a.m. and the men entered at 8. It was asserted that he had plenty of time to make an inspection of the limited area under operation The fireboss was in the habit of stationing himself where the men would pass him on entering and he would notify them if their places were in an unsafe condition. He did not write his report till he came out of the mine at dinner time. He seems to have been a well meaning man and several witnesses among the miners commented favorably on his efficiency.

Evidently the mine generated gas. Open lights were used but safety lamps were carried by some of the men. Some carried both, using the former for testing purposes when gas was suspected. One man was waiting to tell the superintendent of the presence of gas when the explosion occurred. It seems as if the fireboss was active enough in the discharge of his duties but did not have a clear comprehension of the dangers to be avoided in a gaseous mine, nor was he strict enough in controlling those who would carelessly brave them.

"Not an Explosion, Only an Inflammation"

James Ashworth, Fleet Robinson, the Dominion mineralogist and Chief Inspector Thomas Graham made a report stating that there was no explosion, but merely an inflammation of the gas followed by a burning of the coal dust. Mr. Ashworth testified that in his belief the temperature resulting from the combustion did not exceed 900 deg. F. He stated that in case of an explosion the temperature would have been 3000 deg. In support of his conclusion he brought samples of coal dust, caked but not burned, and the cap, which was worn by William Herd, one of the deceased, at the time of the accident. This was charred a little on the outside but the paper on the inside was unburned.

However, it must be questioned whether gas could ever have burned so generally through the mine without an explosion. In fact there was evidence given that sufficient force was developed to turn over a car, damage the return airway and "blow out the fan." Moreover, most of the surviving men heard the explosion, though all said the noise was faint.

As to deductions from temperatures, these are unsafe because the intensity of heat is not equal, especially when the exploded gases are small in quantity.

Accidents in Anthracite Coal Mines

By Frederick L. Hoffman*

Tabulations showing the number of persons killed and injured and the nature of the accidents occurring in each inspection district of the Pennsylvania anthracite region from 1906 to 1910. It is shown that a great difference exists between districts and that a general average does not give a true idea of any one section.

In order to understand fully the accident problem in coal mining, it is necessary to consider the bearing of particular causes in their relation to the number of persons employed. Separating at the commencement of such an inquiry, the inside from the outside employees, a marked contrast in accident liabilities can be shown. This result suggests the inadequacy of general fatality rates, since the proportions of inside and outside employees may vary substantially for different mining fields.

TABLE I. ACCIDENTS IN THE NORTHERN ANTHRACITE COAL FIELD OF PENNSYLVANIA, 1906–1910

Year	Employees	Fatal Accidents	Rate per 1000 Employe's	Non-fatal Accidents	Rate per 1000 Employees
Inside Accidents					
1906	67,852	290	4.27	587	8.65
1907	69,459	385	5.54	699	10.06
1908	73,347	366	4.99	605	8.25
1909	73,976	316	4.27	526	7.11
1910	72,993	337	4.62	505	6.92
Total.	357,627	1694	4.74	2922	8.17
Outside Accidents					
1906	24,148	49	2.03	107	4.43
1907	24,046	55	2.29	116	4.82
1908	23,889	49	2.05	109	4.56
1909	23,108	27	1.17	98	4.24
1910	22,523	30	1.33	74	3.29
Total.	117,714	210	1.78	504	4.28
All Accidents, Inside and Outside					
1906	92,009	339	3.68	694	7.54
1907	93,505	440	4.71	815	8.72
1908	97,236	415	4.27	711	7.34
1909	97,084	343	3.53	624	6.43
1910	95,516	367	3.84	579	6.53
Total.	475,341	1904	4.01	3426	7.21

In the northern anthracite coal fields of Pennsylvania, for illustration, the average proportion of inside employees is 75.2 per cent., and of outside employees 24.8 per cent., against 65.4 per cent. and 34.6 per cent., respectively, for the combined middle and southern fields. Obviously, the fatality rates, to be trustworthy, require to be corrected for this element of error, which may, more or less, impair the trustworthiness of all general fatality tables. Unfortunately, the number of inside and outside employees of many states is not separately stated, even though the accident returns may make the distinction, but of course, without the required numbers of employees under and above ground, the data are of no practical utility.

Looking over the many items in the various tables accompanying this article, it will be readily seen that the rate for accidental death and injuries is different in the northern fields from that in the two lower areas. Moreover, the accidents are different not only in number but also in nature—the character of the life hazard varying from field to field.

The most marked difference in the fatality rates, as calculated for various

TABLE II. ACCIDENTS IN THE MIDDLE AND SOUTHERN ANTHRACITE COAL FIELDS OF PENNSYLVANIA 1906–1910

Year	Employees	Fatal Accidents	Rate per 1000 Employe's	Non-fatal Accidents	Rate per 1000 Employees
Inside Accidents					
1906	47,146	166	3.52	416	8.82
1907	48,390	216	4.46	450	9.30
1908	50,886	230	4.52	351	6.90
1909	49,296	174	3.53	328	6.65
1910	48,549	172	3.54	379	7.81
Total.	244,267	958	3.92	1924	7.88
Outside Accidents					
1906	27,029	52	1.92	102	3.77
1907	26,879	52	1.93	104	3.87
1908	26,381	33	1.25	105	3.98
1909	24,815	50	2.01	82	3.30
1910	24,110	62	2.57	92	3.82
Total.	129,214	249	1.93	485	3.75
All Accidents, Inside and Outside					
1906	74,175	218	2.94	518	6.98
1907	75,269	268	3.56	554	7.36
1908	77,267	263	3.40	456	5.90
1909	74,111	224	3.02	410	5.53
1910	72,659	234	3.22	471	6.48
Total.	373,481	1207	3.23	2409	6.45

TABLE III. OUTSIDE FATAL ACCIDENTS IN THE ANTHRACITE COAL MINES OF PENNSYLVANIA, 1906–1910

District	Employees	Cars	Rate per 1000 Employed	Machinery	Rate per 1000 Employed	Boiler Explosions	Rate per 1000 Employed	Electricity	Rate per 1000 Employed	Suffocated in Chutes	Rate per 1000 Employed	Other Outside Accidents	Rate per 1000 Employed	Total Outside Accidents	Rate per 1000 Employed
Northern coal field:															
1	10,762	9	0.84	11	1.02		..	.	....	..	....	4	0.37	24	*2.23
2	13,118	14	1.07	1	0.30	1	0.08		....	..	....	3	0.23	22	1.68
3	11,450	4	0.35	6	0.52			.	....	..	....	2	0.17	12	1.05
4	10,743	5	0.47	4	0.37	1	0.09	1	0.09	2	0.19	4	0.37	17	1.58
5	11,331	7	0.62	4	0.35				....	3	0.26	6	0.53	20	1.77
6	12,618	11	0.87	6	0.48	.	...	2	0.16	6	0.48	8	0.63	33	2.62
7	12,455	8	0.64	3	0.24	.	...	.	....	1	0.08	5	0.40	17	1.36
8	11,572	7	0.60	7	0.60	.	...	.	....	1	0.09	6	0.52	21	1.81
9	12,072	3	0.25	4	0.33	.	...	.	....	..	....	6	0.50	13	1.08
10	11,593	15	1.29	7	0.60	.	...	.	....	..	....	9	0.78	31	2.67
Total........	117,714	83	0.71	56	0.48	2	0.02	3	0.03	13	0.11	53	0.45	210	1.78
Middle and Southern coal fields:															
11	19,962	17	0.85	14	0.70		...	.	....	1	0.05	11	0.55	43	2.15
12	12,472	7	0.56	8	0.64	.	...	.	....	..	....	4	0.32	19	1.52
13	16,181	12	0.74	13	0.80	.	...	.	....	2	0.12	7	0.43	34	2.10
14	10,569	9	0.85	7	0.66	.	..	.	....	1	0.09	5	0.47	22	2.08
15	12,468	7	0.56	7	0.56	.	.	.	....	1	0.08	4	0.32	19	1.52
16	11,660	5	0.43	4	0.34	1	0.09	.	....	..	...	4	0.34	14	1.20
17	11,108	11	0.99	9	0.81	.	....	.	....	4	0.36	8	0.72	32	2.88
18	12,949	14	1.08	5	0.39	.	....	.	....	1	0.08	10	0.77	30	2.32
19	12,862	12	0.93	3	0.23	.	....	.	....	..	....	7	0.54	22	1.71
20	8,983	8	0.89	..	....	.	....	.	....	2	0.22	4	0.45	14	1.56
Total........	129,214	102	0.79	70	0.54	1	0.01	.	....	12	0.09	64	0.50	249	1.93
Grand total...	246,928	185	0.75	126	0.51	3	0.01	3	0.01	25	0.10	117	0.47	459	1.86

*Statistician, Prudential Insurance Co. of America, Newark, N. J.

TABLE IV. INSIDE FATAL ACCIDENTS IN THE ANTHRACITE COAL MINES OF PENNSYLVANIA, 1906–1910

District	Employees	Falls of Coal or Roof	Rate per 1000 Employed	Mine Cars	Rate per 1000 Employed	Explosions of Gas or Dust	Rate per 1000 Employed	Suffocated by Gas	Rate per 1000 Employed	Explosions of Powder, etc.	Rate per 1000 Employed	Premature Blasts	Rate per 1000 Employed
Northern coal field:													
1	32,324	83	2.57	23	0.71	...		.	...	6	0.19	9	0.28
2	41,902	90	2.15	21	0.50	13	0.31	.		3	0.07	25	0.60
3	40,159	100	2.49	27	0.67	...	...	..	....	6	0.15	38	0.95
4	34,492	89	2.58	27	0.78	14	0.41	..	..	1	0.12	25	0.72
5	31,043	82	2.64	18	0.58	1	0.03	1	0.03	1	0.03	5	0.16
6	35,739	93	2.60	20	0.56	21	0.59	2	0.06	10	0.28	23	0.64
7	35,381	93	2.63	45	1.27	19	0.54	9	0.25	10	0.28	21	0.59
8	34,049	93	2.73	27	0.79	20	0.59	2	0.06	3	0.09	18	0.53
9	38,246	83	2.17	26	0.68	26	0.68	9	0.24	5	0.13	17	0.44
10	34,292	72	2.10	26	0.76	21	0.61	15	0.44	4	0.12	16	0.47
Total	357,627	878	2.46	260	0.73	135	0.38	38	0.11	52	0.15	197	0.55
Middle and Southern coal fields:													
11	37,266	61	1.64	28	0.75	2	0.05	1	0.03	7	0.19	19	0.51
12	25,596	58	2.27	17	0.66	7	0.27	1	0.04	4	0.16	15	0.59
13	25,450	42	1.65	17	0.67	10	0.39	4	0.16	13	0.51	5	0.20
14	17,125	20	1.17	7	0.41	2	0.12	1	0.06	2	0.12	5	0.29
15	28,003	52	1.86	15	0.54	13	0.46	1	0.04	4	0.14	17	0.61
16	23,900	53	2.22	12	0.50	1	0.04	1	0.04	4	0.17	10	0.42
17	20,267	18	0.89	15	0.74	5	0.25	3	0.15	9	0.44	6	0.30
18	23,862	43	1.80	17	0.71	10	0.42	10	0.42	9	0.38	11	0.46
19	22,678	35	1.54	4	0.18	7	0.31	..	....	1	0.04	10	0.44
20	20,120	24	1.19	16	0.80	..	.	2	0.10	7	0.35	4	0.20
Total	241,267	406	1.66	148	0.61	57	0.23	24	0.10	60	0.25	102	0.42
Grand total	601,894	1284	2.13	408	0.68	192	0.32	62	0.10	112	0.19	299	0.50

District	Falls Into Shafts, etc.	Rate per 1000 Employed	Crushed at Batteries	Rate per 1000 Employed	Kicked by Mules	Rate per 1000 Employed	Machinery	Rate per 1000 Employed	Electricity	Rate per 1000 Employed	Other Inside Accidents	1000 Employed	Total Inside Accidents	Rate per 1000 Employed
Northern coal field:														
1	1	0.03	..	....	2	0.06	.	....	..	....	3	0.09	127	3.93
2	12	0.29	..	....	1	0.02	.	....	..	....	4	0.10	169	4.03
3	6	0.15	..	....	2	0.05	.	....	1	0.02	3	0.07	183	4.56
4	3	0.09	..	....	2	0.06	1	0.03	2	0.06	2	0.06	169	4.90
5	4	0.13	..	....	1	0.03	2	0.06	.	....	...	....	115	3.70
6	7	0.20	..	....	1	0.03	.	...	.	....	9	0.25	186	5.20
7	1	0.03	..	....	..	....	1	0.03	..	....	12	0.34	211	5.96
8	6	0.18	..	....	..	....	1	0.03	2	0.06	7	0.21	179	5.26
9	2	0.05	..	....	2	0.05	.	....	..	....	8	0.21	178	4.65
10	10	0.29	..	....	1	0.03	2	0.06	1	0.03	9	0.26	177	5.16
Total	52	0.15	..	....	12	0.03	7	0.02	6	0.02	57	0.16	1694	4.74
Middle and Southern coal fields:														
11	7	0.19	1	0.03	2	0.05		....	1	0.03	10	0.27	139	3.73
12	8	0.31	4	0.16	..	....	.	....	..	....	6	0.23	120	4.69
13	1	0.04	..	....	..	....	.	....	1	0.04	13	0.51	106	4.17
14	2	0.12	2	0.12	..	....	.	....	..	....	4	0.23	45	2.63
15	2	0.07	..	....	1	0.04	.	...	..	....	6	0.21	111	3.96
16	9	0.38	2	0.08	..	....	.	....	..	....	1	0.04	93	3.89
17	3	0.15	1	0.05	4	0.20	.	....	5	0.25	15	0.74	84	4.14
18	8	0.34	2	0.08	2	0.08	.	....	..	....	9	0.38	121	5.07
19	7	0.31	..	....	..	....	.	....	..	....	6	0.26	70	3.09
20	5	0.25	1	0.05	1	0.05	.	....	..	...	9	0.45	69	3.43
Total	52	0.21	13	0.05	10	0.04	.	....	7	0.03	79	0.32	958	3.92
Grand total	104	0.17	13	0.02	22	0.04	7	0.01	13	0.02	136	0.23	2652	4.41

TABLE V. OUTSIDE NON-FATAL ACCIDENTS IN THE ANTHRACITE COAL MINES OF PENNSYLVANIA, 1906–1910

District	Employees	Cars	Rate per 1000 Employed	Machinery	Rate per 1000 1000 ployed	Boiler Explosions	Rate per 1000 Employed	Electricity	Rate per 1000 Employed	Other Outside Accidents	Rate per 1000 Employed	Total Outside Accidents	Rate per 1000 Employed
Northern coal field:													
1	10,762	28	2.60	9	0.84	.	....	.	....	18	1.67	55	5.11
2	13,118	17	1.30	4	0.30	.	....	.	....	11	0.84	32	2.44
3	11,450	13	1.14	10	0.87	.	...	.	....	17	1.48	40	3.49
4	10,743	9	0.84	5	0.47	1	0.09	1	0.09	13	1.21	29	2.70
5	11,331	22	1.94	6	0.53	.	....	.	....	17	1.50	45	3.97
6	12,618	19	1.51	12	0.95	.	...	.	....	31	2.46	62	4.91
7	12,455	30	2.41	13	1.04	1	0.08	.	....	27	2.17	71	5.70
8	11,572	18	1.56	13	1.12	.	....	.	....	29	2.51	60	5.18
9	12,072	11	0.91	3	0.25	2	0.17	.	....	24	1.99	40	3.31
10	11,593	29	2.50	11	0.95	.	...	.	....	30	2.59	70	6.04
Total	117,714	196	1.67	86	0.73	4	0.03	1	0.01	217	1.84	504	4.28
Middle and Southern coal fields:													
11	19,962	41	2.05	22	1.10	.	....	.	....	44	2.20	107	5.36
12	12,472	6	0.48	6	0.48	.	....	.	....	3	0.24	15	1.20
13	16,181	11	0.68	16	0.99	.	....	.	....	18	1.11	45	2.78
14	10,569	11	1.04	16	1.51	.	....	.	....	26	2.46	53	5.01
15	12,468	6	0.48	7	0.56	.	....	.	....	10	0.80	23	1.84
16	11,660	13	1.11	9	0.77	1	0.09	.	....	20	1.72	43	3.69
17	11,108	15	1.35	4	0.36	.	....	.	....	23	2.07	42	3.78
18	12,949	19	1.47	12	0.93	2	0.15	.	....	38	2.93	71	5.48
19	12,862	14	1.09	8	0.62	.	...	.	....	12	0.93	34	2.64
20	8,983	24	2.67	9	1.00	.	....	.	....	19	2.12	52	5.79
Total	129,214	160	1.24	109	0.84	3	0.02		....	213	1.65	485	3.75
Grand total	246,928	356	1.44	195	0.79	7	0.03	1	0.00	430	1.74	989	4.01

causes, are in the accidents due to falls of coal and roof. The respective rates were 2.46 per 1000 of inside employees for the northern coal fields, against only 1.66 for the middle and southern fields. In none of the other causes are the differences of enough importance for record, except possibly explosions of gas or dust, the rate for which in the northern coal field was 0.38 per 1000, against 0.23 in the middle and southern coal fields.

The returns of non-fatal accidents, in table IV are of doubtful accuracy and completeness and are limited probably to the more serious injuries causing extended incapacity for work. The marked differences in the non-fatal accident rates between the northern field and the middle and southern coal areas, are probably due more to methods of reporting them than to actual differences in the true non-fatal accident liability of inside employees. It is suggestive, however, to find a marked difference in the non-fatal accident rate due to mine cars, which was 2.14 per 1000 for the northern coal fields and only 1.35 for the other two. In contrast, the non-fatal accident rate due to explosions of gas and dust was only 0.90 per 1000 in the northern, against 1.52 in the middle and southern coal fields.

Although the non-fatal accident returns are more or less untrustworthy, the data have some value if only to emphasize the fact that in all probability only the more severe accidents are at present reported. There can be no question of doubt that if a drastic workmen's compensation act were to be adopted by the State of Pennsylvania, and applied to the mining industry, the results would be the same as observed in England, namely, that the non-fatal accident rates would increase largely on account of the fact that complete reports would be made of every injury, however, trifling, which resulted from an accident incidental to mine work.

This comparison clearly emphasizes the local incidence of fatal and non-fatal accidents in anthracite coal mining, and the method is applicable to every coalfield of North America. For a full understanding of the underlying causes responsible for the occurrence of fatal and non-fatal accidents it is of the utmost importance that the correct incidence should be localized as much as possible and that attention should be directed to specific facts rather than to widely generalized conclusions.

The non-fatal accident rate in the northern anthracite coalfields is reported as 7.21 per 1000, the highest rate bèing for the eighth district, where it was 10.85 per 1000, and the lowest for the second district, where it was 4.69 per 1000. The highest and lowest non-fatal acci-

TABLE VI. INSIDE NON-FATAL ACCIDENTS IN THE ANTHRACITE COAL MINES OF PENNSYLVANIA, 1906–1910

District	Employees	Falls of Coal and Roof	Rate per 1000 Employed	Mine Cars	Rate per 1000 Employed	Explosions of Gas or Dust	Rate per 1000 Employed	Explosions of Powder, etc.	Rate per 1000 Employed	Premature Blasts	Rate per 1000 Employed
Northern coal field:											
1	32,324	123	3.81	63	1.95	...	....	8	0.25	14	0.43
2	41,902	91	2.17	67	1.60	11	0.26	5	0.12	26	0.62
3	40,159	102	2.54	79	1.97	15	0.37	5	0.12	38	0.95
4	34,492	124	3.60	73	2.12	8	0.23	10	0.29	47	1.36
5	31,043	100	3.22	58	1.87	13	0.42	9	0.29	21	0.68
6	35,739	103	2.88	75	2.10	68	1.90	12	0.34	35	0.98
7	35,381	103	2.91	101	2.85	37	1.05	12	0.34	30	0.85
8	34,049	125	3.67	113	3.32	73	2.14	25	0.73	53	1.56
9	38,246	78	2.04	70	1.83	78	2.04	10	0.26	20	0.52
10	34,292	92	2.68	67	1.95	19	0.55	3	0.09	20	0.58
Total	357,627	1041	2.91	766	2.14	322	0.90	99	0.28	304	0.85
Middle and Southern coal fields:											
11	37,266	122	3.27	62	1.66	46	1.23	24	0.64	45	1.21
12	25,596	38	1.48	15	0.59	31	1.21	11	0.13	9	0.35
13	25,450	53	2.08	19	0.75	34	1.34	8	0.31	13	0.51
14	17,125	42	2.45	34	1.99	35	2.04	7	0.41	6	0.35
15	28,003	26	0.93	19	0.68	4	0.14	4	0.14	10	0.36
16	23,900	107	4.48	42	1.76	38	1.59	19	0.79	22	0.92
17	20,267	16	0.79	23	1.13	47	2.32	6	0.30	16	0.79
18	23,862	88	3.69	51	2.14	62	2.60	11	0.46	42	1.76
19	22,678	42	1.85	20	0.88	57	2.51	8	0.35	10	0.44
20	20,120	64	3.18	45	2.24	17	0.84	11	0.55	9	0.45
Total	244,267	598	2.45	330	1.35	371	1.52	109	0.45	182	0.75
Grand total	601,894	1639	2.72	1096	1.82	693	1.15	208	0.35	486	0.81

District	Falls Into Shafts, etc.	Rate per 1000 Employed	Crushed at Batteries	Rate per 1000 Employed	Kicked by Mules	Rate per 1000 Employed	Machinery	Rate per 1000 Employed	Electricity	Rate per 1000 Employed	Other Inside Accidents	Rate per 1000 Employed	Total Inside Accidents	Rate per 1000 Employed
Northern coal field:														
1	..	....		....	7	0.22	..	....	1	0.03	21	0.65	237	7.33
2	..	....		....	10	0.24	1	0.02	.	....	15	0.36	226	5.39
3		....		....	8	0.20	..	....	.	....	21	0.52	268	6.67
4	1	0.03		....	11	0.32	6	0.17	.		25	0.72	305	8.84
5	..	....		....	2	0.06	2	0.06	.	....	17	0.55	222	7.15
6	1	0.03		....	4	0.11	3	0.08	.	....	28	0.78	329	9.21
7	1	0.03		....	8	0.23	1	0.03	.		44	1.24	337	9.52
8	..	....		....	13	0.38	5	0.15	.		28	0.82	435	12.78
9	..	....	..	....	5	0.13	1	0.03	.	....	49	1.28	311	8.13
10	8	0.23	1	0.03	7	0.20	..	....	.	....	35	1.02	252	7.35
Total	11	0.03	1	0.00	75	0.21	19	0.05	1	0.00	283	0.79	2922	8.17
Middle and Southern coal fields:														
11	7	0.19	1	0.03	3	0.08	..	....	.	....	39	1.05	349	9.37
12	..	....	..	....	1	0.04	1	0.04	.	....	10	0.39	116	4.53
13	5	0.20	..	....	1	0.04	..	....	.	....	19	0.75	152	5.97
14	4	0.23	12	0.70	7	0.41	1	0.06	.	....	16	0.93	164	9.58
15	2	0.07	..	....	1	0.04	1	0.04	.	....	16	0.57	83	2.96
16	4	0.17	..	....	2	0.08	3	0.13	.	....	17	0.71	254	10.63
17	16	0.79	5	0.25	1	0.05	2	0.10	.	....	21	1.04	153	7.55
18	16	0.67	..	....	3	0.13	..	....	.	....	32	1.34	305	12.78
19	2	0.09	..	....	1	0.04	3	0.13	.	....	19	0.84	162	7.14
20	19	0.94	2	0.10	3	0.15	..	....	.	....	16	0.80	186	9.24
Total	75	0.31	20	0.08	23	0.09	11	0.05	.	....	205	0.84	1924	7.88
Grand total	86	0.14	21	0.03	98	0.16	30	0.05	1	....	488	0.81	4846	8.05

dent rates do not coincide by districts with the corresponding fatal accident rates, which were highest in the seventh district and lowest in the fifth.

The average non-fatal accident rate for the middle and southern coalfields was 6.45 per 1000, the rate having been highest in the eighteenth district, or 10.21 per 1000, and lowest in the fifteenth district, or 2.62 per 1000. The highest non-fatal accident rate coincides with the highest fatal accident rate in the middle and southern anthracite coal fields, but there is no complete conformity in the rates, which, of course, may be due to local conditions rather than to defects in the returns.

TABLE VII. FATAL ACCIDENTS IN THE ANTHRACITE COAL MINES OF PENNSYLVANIA, 1906–1910

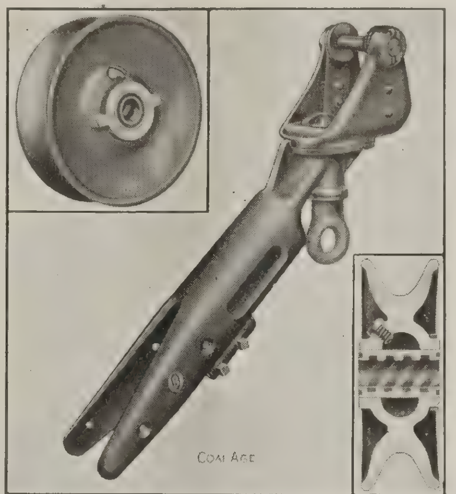
District	Employees	Fatal Accidents	Rate per 1000 Employed
Northern coal field:			
1	43,086	151	3.50
2	55,020	191	3.47
3	51,609	195	3.78
4	45,235	186	4.11
5	42,374	135	3.19
6	48,357	219	4.53
7	47,836	228	4.77
8	45,621	200	4.38
9	50,318	191	3.80
10	45,885	208	4.54
Total........	475,341	1904	4.01
Middle and Southern coal fields:			
11	57,228	182	3.18
12	38,068	139	3.65
13	41,631	140	3.37
14	27,694	67	2.42
15	40,471	130	3.21
16	35,560	107	3.01
17	31,375	116	3.70
18	36,811	151	4.10
19	35,540	92	2.59
20	29,103	83	2.85
Total........	373,481	1207	3.23
Grand total..	848,822	3111	3.67

TABLE VIII. NON-FATAL ACCIDENTS IN THE ANTHRACITE COAL MINES OF PENNSYLVANIA, 1906–1910

District	Employees	Fatal Accidents	Rate per 1000 Employed
Northern coal field:			
1	43,086	292	6.78
2	55,020	258	4.69
3	51,609	308	5.97
4	45,235	334	7.38
5	42,374	267	6.30
6	48,357	391	8.09
7	47,836	408	8.53
8	45,621	495	10.85
9	50,318	351	6.98
10	45,885	322	7.03
Total........	475,341	3426	7.21
Middle and Southern coal fields:			
11	57,228	456	7.97
12	38,068	131	3.44
13	41,631	197	4.74
14	27,694	217	7.84
15	40,471	106	2.62
16	35,560	297	8.35
17	31,375	195	6.22
18	36,811	376	10.21
19	35,540	196	5.51
20	29,103	238	8.18
Total........	373,481	2409	6.45
Grand total...	848,822	5835	6.87

Mine Trolley Harp and Wheel

Probably no single piece of machinery in use around the mines is liable to more hard knocks and general abuse than the trolley of the average mine locomotive. With well known frequency its wheel leaves the wire and bangs up against the roof for a distance, catching, perhaps, on timbers, beams and other obstacles. No little ingenuity has been displayed by various manufacturers in designing trolley poles, harps, etc., in an effort to minimize mishaps of the nature indicated and one of the most recent designs of harp and wheel is that of the Ohio Brass Co., shown in the accompanying illustration.



TROLLEY HARP AND WHEEL

A special feature of the harp is the provision made for rotating it by hand, thus enabling the motorman to guide it easily through frogs and over particularly uneven places in the trolley. The pivot bolt, fastened to the harp casting, passes through the pole-end casting and is provided at its lower end with an eye which rotates with the harp. A stick or strap, attached to this eye, enables the operator to control the harp at all times.

In addition to the feature of manual operation, the harp is designed to work automatically; the center of the wheel axle is set back from the pivot point so that a trailing action is imparted to the wheel, causing it readily to follow irregularities in the trolley wire and take sharp curves without pulling from the wire.

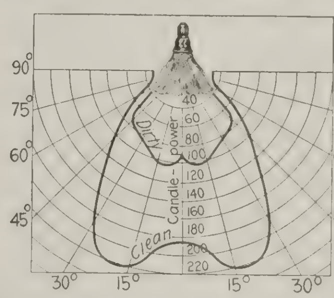
A rib on the top of the pole-end casting prevents the harp from catching on overhead I-beams in case the wheel leaves the wire. It is made either entirely of malleable iron, Sherardized, or with bronze harp casting and malleable iron pole-end, and will take all standard 4-in. mine trolley wheels with $\frac{1}{2}$x$1\frac{1}{2}$-in. hubs.

The wheel is designed to give maximum wear, having heavy flanges which will resist bending and a heavy section of metal at the bottom of the groove where the wear is greatest. Lubrication is provided for by an oil reservoir, in addition to a Bound Brook type bushing, with graphite inserted in grooves in the special bearing metal of which it is made. The bushings are $1\frac{1}{2}$ in. long and $\frac{1}{2}$-in. bore and the wheel will fit any standard harp.

Lamp Efficiency

Every mining man is familiar with the dirty, greasy and neglected incandescent lamps commonly found in some obscure part of breakers, fan-houses or mines. To those who are responsible for this condition, the following excerpt from an article on "Upkeep of Shop Lighting Systems," in the *American Machinist*, will no doubt prove a revelation:

The serious loss of light when globes and reflectors are allowed to go for long periods without cleaning, is shown in the accompanying figure. This set of curves resulted from a test on a glass



CURVES SHOWING LOSSES DUE TO UNCLEAN LAMPS

reflector (commonly called a shade) used with a tungsten lamp. The one curve shows the value of the light given by the lamp at different angles when the lamp and reflector are clean, while the smaller curve shows the enormous reduction of light after the lamp and reflector had been in service for about four months without being cleaned.

In this particular case, which is a typical one, the loss of light at the end of the four months amounted to nearly 50 per cent. The cost of electrical energy in the shop where this test was made was such that the loss of light during the four months amounted to about 12c., while the total cost of taking down, washing and replacing this reflector amounted to about 3c., so that the economy of a fairly frequent attention to the cleaning of such reflectors, even if the improved condition of the light in itself be ignored, is at once apparent.

When handling coal in a breaker great care should be taken to reduce breakage to a minimum. Sloping chutes should be curved to prevent the coal going too fast; all corners should be rounded so there are no sudden drops or sharp angles; perpendicular chutes or shafts should be constructed shelf-like to deflect the coal from side to side, thus overcoming the straight drop which is a great source of breakage.

The Consolidated Fuel Co. of Utah

By Benedict Shubart*

A description of a characteristic mountain coal operation and some of the difficulties encountered. A gravity plane, nearly two miles long, is in use, the grades on which are so light that the data given form a valuable addition to the technical literature on this subject. The tipple is equipped with a gravity rotating dump and has a capacity of 3000 tons per 8-hour day.

*Boston Building, Denver, Colo.

Up to three or four years ago, one of the least known coal fields in the United States was that lying south of the town of Price, Carbon County, Utah. For many years past, the Utah Fuel Co. has been operating on the northern edge of this field, at Sunnyside, and on the western edge, at Castle Gate, Winter Quarters and Clear Creek. The southern body of the coal, however, lies in a very rugged country, and engineering difficulties connected with the railroad construction, deterred investigators from attempting the opening up of this field. In fact, the operators first occupying the field claimed that all the available coal was controlled by them, and that no new mines could be opened up.

Preliminary Work

Some five or six years ago, Arthur A. Sweet, of Salt Lake, a promoter of great ingenuity and daring, entered the field, bought up several thousand acres of coal land in Miller Creek Cañon, and started the construction of what is now the Southern Utah R.R. Encountering many unforeseen difficulties, both in engineering and financing, he surrendered the managership of the company to his brother, Fred A. Sweet, also of Salt Lake, who had just successfully completed the construction of the American Falls Canal, in Idaho. Under his guidance the railroad was pushed through, and the development of the Consolidated Fuel Co.'s Hiawatha mine was carried through to its present state of completeness.

By careful location, the railroad, 16 miles in length, from Price to Hiawatha, was built, with a maximum grade of 4 per cent., and this only for a short stretch. The railroad, having no grade against the loaded trains, is capable of handling a large tonnage.

Geologically, the seam now being worked is a continuation of the Sunnyside seam. It lies almost level and varies in thickness from 17 ft. to 35 ft. The coal is quite clean, has a fine, glossy fracture, and stands handling better than any Western coal I have ever examined. The coal east of the circle defined by Sunnyside, Castle Gate, Clear Creek, Hiawatha and Mohrland has been eroded. The southern boundary has not been thoroughly determined, but the field is so extensive that its exhaustion is a matter of many years.

The next five years will probably see immense developments in this field. Railroad lines are being surveyed to give an outlet to southern Utah, and it is decidedly probable that one of the large systems will swing its line south, to intercept the field.

Fig. 1. Some Heavy Work on the Gravity Plane

Fig. 2. General View of the Stone Power House

The Gravity Plane

While not the first independent operator on the Sunnyside seam, the Consolidated Fuel Co. is the first to open up the southern portion. The tipple is situated at the southern end of the railroad and the mine is two miles farther up Miller Creek, and is connected with the tipple by means of a gravity plane.

The flatness of this plane makes it worthy of consideration. With a total length of 10,400 ft., starting with a 9 per cent. grade and ending up with a 4 per cent., it has been found thoroughly practicable to operate and land the trip without difficulty upon the tipple. Of course, in order to secure these results on such flat grades, it was necessary to construct a track of the highest quality, to use very efficient and frictionless sheaves, and pit cars with very low rolling friction. A special design of roller-bearing wheels, made by the Watt Mining Car Wheel Co., is used, and the first design tried was found to require a considerable amount of correction. Small troubles cropped out, and it was only after a great deal of patient work that the company evolved a satisfactory and successful roller bearing. The rope rollers are of manganese steel, very light, and mounted on Hyatt roller bearings. The gravity sheaves were specially designed by the Denver Engineering Works Co. The magnificent roadbed of this gravity plane is shown in the accompanying halftone, Fig. 1. Running through a cañon as

rugged as can well be imagined, this tramway was completed with only two curves.

System of Mining and Haulage

As the seam is intercepted by the cañon, two mines have been opened up, the No. 1 at the left and the No. 2 at the right, as will be seen in Fig. 3, which shows the head of the incline with the hoist house and the transformer house.

The mines were originally opened up on the double-entry system, but are now being changed to a four-entry system. The coal is mined by the room-and-pillar system, with pillars about 55 ft. thick, and rooms about 25 ft. wide. A bench of about 9 ft. of coal is taken down first, and the balance of the roof coal, together with the pillars, will be brought back later when the rooms on the entry are finished.

The ventilation is obtained by a 7½-ft. Stevens fan, belt driven by a Ridgway variable-speed motor; the variable speed gives great flexibility to the air supply. A 6-ft. Jeffrey propeller fan is used to assist until the two mines are connected.

The entire haulage in the mine is done by electric motors, 6-ton Goodman being used for gathering the coal, and 10-ton

Fig. 3. The Top of the Gravity Plane

Goodman locomotives being used for the main haulage. The trips are delivered by the locomotives to the head of the incline, from which point they are handled by means of auxiliary hoists and the main gravity sheave.

All machinery is, as far as possible, electrically operated. In the power plant, shown in Fig. 2, are two 200-kv.-a., 220-volt, three-phase, 60-cycle, Ridgway alternators, direct-connected to Ridgway engines. These furnish the power for the entire mine. All the tipple apparatus is operated by means of three-phase, General Electric motors. In the hoist house, at the head of the incline, are two 200-hp., motor-generator sets, which furnish 250-volt current for the mine. These were furnished by the General Electric Co. and the Ridgway Dynamo & Engine Company.

The Tipple

The tipple, which was designed by the Link-Belt Co., presents a number of interesting features. Instead of using the old style crossover dump, a gravity rotating dump is used. The coal is discharged into a 20-ton hopper, from which it is automatically fed in an even stream on to the shaking screen. The results obtained with this feeder are so good that when running at the rate of 3000 tons per day, practically all the under size is taken out on the first 6 ft. of the screen. The slack is rescreened in a revolving screen, so no dust is shipped.

In order to prevent undue breaking of coal, a special apron is used for the lump screen. It takes the form of an adjustable, shaking chute, which is practically a continuation of the shaker screen. The delivery end can be raised, lowered or extended, so that open cars or box cars can be loaded with a minimum drop of the coal. This is necessary, due to the mixed character of the cars obtainable. The railroad furnishes anything from a 30,000-lb. to a 100,000-lb. gondola car, 30,000-lb. box cars to automobile cars, and it is often necessary to load hopper-bottom cars with sides as high as 10 ft. 6 in. above the rail.

The mine has now been in operation for 18 months. Its daily production is in excess of 1800 tons, and with the equipment now on hand, 3000 tons per 8-hour day can easily be handled. It is interesting to note that over the two-mile incline, in spite of the flat grade, coal has been repeatedly run for several hours at a time at a rate in excess of 4000 tons in eight hours.

Report on the Landslide at Frank, Alberta

On Apr. 29, 1903, a landslide occurred at Frank, Alberta, causing the loss of 70 lives in the town and the destruction of much property, including 7000 ft. of the Crows Nest Ry. The slide occurred on the north side of Turtle Mountain, which is due south of the town. As it appeared quite possible for further sliding to take place, which might not only destroy the town, but shut off the coal mines west of Frank and perhaps permanently close the Crows Nest pass, a commission was appointed by the Department of Mines, of Canada, to make an investigation. The report[1] of the commission, which consisted of Reginald A. Daly, W. G. Miller and George S. Rice, has recently been published and recommends the abandonment of the Frank townsite.

The geological profile of Turtle Mountain shows that the foot on the northern side is made up of beds of sandstone interbedded in shale. The beds dip toward the west at a steep angle. These beds are bounded on the north by a thrust plane dipping westward at an angle of about 50° and which is the plane of contact of the shale-sandstone beds with the limestone that forms the major portion of the upper part of the mountain. The limestone dips to the west at an angle of about 50° and lies unconformably on the shale. A short distance above the thrust plane the limestone beds are contorted in what are known as the contorted zones. The limestone is jointed, the joints running at right angles to the dip and continuing to the thrust plane.

Two coal mines are operated along the foot or east base of Turtle Mountain. The seam is nearly vertical and is in the shale series. Both mines are the property of the Canadian Coal Consolidated, Ltd., and formerly belonged to the Canadian-American Coal & Coke Co. The strike of the seam is north and nearly parallel to the long axis of Turtle Mountain. Mining was started in 1901 and prior to Apr. 29, 1903, the walls of part of the worked out portion of the southern end of the seam had caved. The joints in the limestone appear from the profiles prepared by the commission, to dip directly toward, but not to continue as far as, the main coal seam. The slide seems to have taken place in a direction approximately parallel to these joints.

The commission regards the slide as having been caused by natural conditions and by the mining operations in the coal seam. Excepting at the places known as the North Peak block and South Peak block and the fissured ground between them, the commission is not of the opinion that the danger of more heavy slides into the Frank Valley is imminent, but states that it is impossible to deny the existence of danger in certain places. The course of future slides would probably be in the already mined and now uninhabited area covered by the 1903 slide. It has designated a certain area of the coal seam as lying within a zone of danger from further landslides, and on account of the unstable condition from natural causes, has recommended the abandonment of the townsite of Frank whether the coal seam is worked in the danger zone or not.

Dispatches from Frank on Mar. 30 state that serious slides are taking place. Much alarm is being felt in the town and many people are reported to be moving out of the danger zone.

Note—From the "Engineering and Mining Journal."

[1]Memoir No. 27, Canada Department of Mines.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Anthracite Coal Freights

The following abstract is made from a series of editorials on the anthracite freight situation, appearing in the *Scranton Times,* of recent date:

It is difficult to conceive of a more desirable class of freight than anthracite coal as it comes to the railroads which center in this region. General freight is delivered to the railroads in boxes and bales, largely in less than carload lots. If it does not constitute a complete carload, it must usually be handled by the railroad at both termini. Much of it is perishable or fragile and subject to damage by accident or wreck. The average carload of freight weighs only 22 tons.

Anthracite coal, on the contrary, comes to the railroads, not in part or full carloads, but in sufficient quantities to make up the burden of a full train. The coal is loaded and unloaded at no charge to the railroad. It requires no station attention. It is neither perishable nor fragile. Even if there is a wreck and the cars are reduced to kindling wood, the maximum loss on the coal is the labor of shoveling it into another car. The average carload weighs about 40 tons.

And yet this easily and cheaply handled commodity, originating in such quantities as to form the major portion of the traffic of, at least, five railroads, the Lackawanna, the Reading, the Delaware & Hudson, the Central Railroad of New Jersey and the Lehigh Valley, suffers the imposition of a high rate, if not the highest rate charged for any commodity.

According to the reports we have, the most extortionate freights on anthracite coal are charged by the Reading railroad, which imposes a tariff of $1.70 a ton on prepared coal from Pottsville to Philadelphia, a distance of 93 miles, or 1.83c. per ton-mile, while some of the roads of this country carry bituminous coal at one-fifth of that ton rate. We are disposed, however, to tell of the conditions of anthracite coal transportation between the Lackawanna Valley and New York, because we have at hand a recent publication giving accurate figures on the subject. In large part they are from the freight schedules of the railroads themselves.

From this we learn that the rates for transporting coal from Scranton to Hoboken are:

Coal Sizes	Rate	F.o.b.
Prepared coal	$1.58	Hoboken
Pea coal	1.43	Hoboken
Buckwheat	1.28	Hoboken
Smaller sizes	1.35	Hoboken
Lackawanna average on smaller sizes	1.13	Vessel

The operators tell us that 60 per cent. of the coal mined is of prepared sizes and 40 per cent. steam sizes. The rate on prepared sizes, Scranton to Hoboken, is 1.089c. per ton-mile. It is shrewdly surmised that the percentage of prepared sizes is greater. But taking the word of the railroad men for it, the average tariff of anthracite coal per ton-mile is 0.837c., while the average tariff on all other merchandise is 0.696c. The cheapest and most easily handled freight is, therefore, rated 25 per cent. or more above the costlier freight, which requires greater care and attention.

The relative earnings of a trainload of coal and a trainload of general freight have been estimated as follows, figuring a $1.50 rate for prepared coal and $1.30 for smaller sizes. The load of a coal train is 1670.7 tons, and of a general freight train 504.44 tons, which includes coal loadings of 40.8 tons per car, as compared with an average loading of 22 tons. The haul is 145 miles.

60 per cent. of 1670.7 tons = 1002.42
40 per cent. of same = 668.28

Hence for a coal train:

1002.42 tons @ $1.50 per ton = $1,503.63
668.28 tons @ $1.30 per ton = 868.76

Total earned per train of coal $2,372.39

For a general freight train:

504.44 tons hauled 145 miles @ $0.00696 per ton-mile = $509.08
Coal earnings per train load exceed merchandise earnings $1.863.31

It will thus be seen that the Lackawanna company earns over four times as much on a train of coal from Scranton to Hoboken as on a train of general freight. And the cost of handling is less.

But the discrimination is more markedly shown when comparing the charges for carrying coal and other commodities between Scranton and nearby towns.

All small towns suffer from discriminatory rates, as may be noted from the instances cited above. The most flagrant instance, however, is Montrose, only 49 miles away from Scranton, which pays a freight rate of $1.65 a ton on anthracite, or 7c. more than Hoboken, which is 145 miles away. It may be noted here that no independent operator may sell at points along the line. He consequently does not profit in those high prices, being given 65 per cent. of the tidewater price as his sole compensation.

RELATIVE FREIGHTS

Freight	From	To	Distance, Miles	Rate
Prepared coal	Scranton	Moscow	12	$1.15
Sand	Moscow	Scranton	12	0.40
Prepared coal	Scranton	Nicholson		1.50
Wall stone	Nicholson	Scranton		0.40
Prepared coal	Taylor	La Plume	16	1.25
Manure	Taylor	La Plume	16	0.56

It is quite generally conceded, except by anthracite railroad officials, that the work entailed in the hauling of anthracite coal is about as great as in performing the same service with regard to bituminous coal. But the railroads hauling the latter exact a much lower tariff, as will be seen by the table at the foot of this page.

One has only to compare the rate per ton-mile in this table with the rate on anthracite coal to appreciate the wide disparity between the two.

We do not even have to go to the rates on bituminous coal to prove the discrimination which the coal roads are enabled to impose upon anthracite between the mines and tidewater, by reason of their control of the business. It was only recently that the Pennsylvania R.R. had a rate of 0.520c. per ton-mile on prepared coal from the heart of the anthracite coal regions to Hoboken, against the Lackawanna's rate, 1.089c. per ton-mile for a similar service. When anthracite coal goes beyond the limits of the railroads which produce it, it loses its preferential rate, foregoes the fancy prices and is car-

BITUMINOUS COAL RATES

Region	Railroad	Destination	Distance	Rate	Cents per Ton-mile
Myersdale	B. & O.	Baltimore	215.0	$1.18	0.549
Myersdale	B. & O.	Philadelphia	310.8	1.25	0.402
Myersdale	B. & O.	St. George	390.6	1.55	0.396
Pocahontas	N. & W.	Norfolk	377.0	1.40	0.371
Thurmond-New River	C. & O.	Newport News	418.0	1.40	0.335
Handley-Kanawha	C. & O.	Newport News	457.0	1.50	0.328
Marrowbone-Kentucky	C. & O.	Newport News	673.0	1.70	0.253
Beach Creek	N. Y., C., P. & R.	Port Reading	308.0	1.55	0.503
Beach Creek	N. Y., C., P. & R.	Philadelphia	229.0	1.25	0.546
Clearfield	Pennsylvania	Baltimore	242.2	1.18	0.487
Clearfield	Pennsylvania	South Amboy	322.5	1.55	0.481
Clearfield	Pennsylvania	Philadelphia	262.2	1.25	0.477

ried at a rate quite as low as bituminous coal. This is proved by the following table, showing rates from Buffalo westward:

RATES BEYOND FROM BUFFALO WESTWARD

To	Distance	Rate	Cents per Ton-mile
Louisville	516	$2.10	0.406
Cincinnati	446	1.50	0.336
Cleveland	183	0.85	0.464
Indianapolis	466	1.60	0.343
Terre Haute	593	2.00	0.337
Ft. Wayne	403	1.50	0.372
Logansport	478	1.75	0.366
Peoria	650	2.00	0.307
Detroit	151	1.00	0.662
Toledo	296	1.00	0.337

It has been truly said that there has never been an increase of wages by which the coal-carrying companies do not profit. The passing along to the consumer of the cost of a 10 per cent. advance in wages will add to the public coal bill about $25,000,000 a year, of which about $15,000,000 will go to the miners and $10,000,000 to the big corporations, to swell present satisfactory gains, if the present system continues to prevail.

The statements which follow show not only how prosperity has accrued to the anthracite coal roads since 1899, but how this prosperity has not been duplicated in other Eastern roads not participating in such traffic.

STOCK PRICES OF EASTERN RAILROADS

ANTHRACITE ROADS

	Market Value 1899	Div. 1899	Market Value 1912	Div. 1912
Delaware, Lackawanna & Western	194	7%	560	20%
Delaware & Hudson	125	7%	175	9%
Lehigh Valley	30	0%	186	10%
Reading	25	0%	164	6%
Central of New Jersey	126	4%	357	12%
Lehigh Coal & Navigation	91	4%	180	8%

OTHER RAILROADS

	Value 1899	Div. 1899	Value 1912	Div. 1912
Pennsylvania	142	6 %	123	6 %
New York Central	145	5 %	110	5 %
N. Y., N. H. & H.	222	8 %	136	8 %
Boston & Maine	215	6¼%	100½	5 %
Baltimore & Ohio	85	2 %	106⅞	6 %
Boston & Albany	282	8¾%	220	8¾%

It will be readily admitted that the railroads above mentioned are standard roads, operating in the same part of the country as the coal roads, and most of them touching more and larger towns with better chances to get more general freight and passenger traffic than the coal roads. Yet with a single exception the quotations for shares are very much lower in 1912 than they were in 1899, while the coal shares have made a marvellous increase. The one exception in which the quotation of shares of the other roads is greater than in 1899 is the Baltimore & Ohio. Its prosperity may be attributed to the fact that in the year 1903, the Baltimore & Ohio purchased more than $30,000,000 of the stock of the Reading R.R., when it ranged in price from 33 to 50, and has ever since been enjoying a return approximating 18 per cent. on its cash investment. So that even this showing of prosperity comes from anthracite coal.

Perhaps a table showing the value of these great properties in 1899, and their value in 1912, as shown by the stock quotations, together with the increase between these two years, will more impressively bring to the average reader an idea of the magnificent gains that have come to those fortunate owners of anthracite coal and the railroads which transport it.

It will be seen that, though, during the last 12 years there have been mined from the lands of these companies some 700,000,000 tons of coal, which is gone forever, and on which the corporations have their profits, the aggregate value has increased more than threefold. The Lackawanna R.R. is looked upon as a phenomenon, but it has increased in value only a little more than threefold, while the Reading has increased sixfold and the Lehigh Valley ninefold. The Central Railroad of New Jersey shows almost a threefold increase. The only new money put into any of these corporations is $20,000,000 into the Lehigh Valley and something over $2,000,000 into the Lehigh Coal & Navigation Company.

INCREASE IN VALUE OF RAILROAD PROPERTIES

Railroads	Value 1899	Value 1912	Increase
Delaware, Lackawanna & Western	$ 50,828,000	$169,551,200	$118,723,200
Delaware & Hudson	53,000,000	74,200,000	21,200,000
Lehigh Valley	12,000,000	112,720,880	100,720,880
Reading	35,000,000	229,600,000	194,600,000
Central of New Jersey	34,569,363	97,749,376	63,180,013
Lehigh Coal & Navigation	17,290,000	47,804,210	30,514,210
Totals	$202,687,363	$731,625,666	$528,938,303

The amount of dividends paid by these corporations during the 12 years from 1899 to 1912 is also a matter of interest in connection with this subject. The cash dividends only are shown in the following table:

DIVIDENDS DECLARED, 1899 TO 1912

Railroads	Per Cent.	Total Dividends
Delaware, Lackawanna & Western	213	$57,500,500
Central Railroad of New Jersey	100	27,436,800
Delaware & Hudson	92	39,008,000
Lehigh Valley	53	23,450,473
Reading	31½	44,100,000
Lehigh Coal & Navigation	72½	13,775,000
Total		$205,270,773

This does not include the stock dividend of 15 per cent. declared by the Lackawanna in 1909, nor the stock dividend by the same company in 1911 of 35 per cent. in stock of the Lackawanna Railroad of New Jersey, nor of the recently authorized issue of $12,000,000 additional stock which will probably go out as a stock dividend. It does not include the $2,000,000 of stock of the Lehigh Coal & Navigation Co. issued at par, nor the 15 per cent. scrip dividend of the same company convertible into stock. Nor does it include the valuable right to stockholders of the Lackawanna and the Lehigh Valley to subscribe at par for $6,000,000 stock in the respective coal companies, worth more than $200 a share, and yielding 10 per cent. dividends. With these included, the total would be considerably swelled.

Electricity in British Mining

In a paper on the use of electric power in the working of coal mines, read before the Manchester (England) Geological and Mining Society, Charles D. Taite said that the aggregate horsepower supplied to collieries in Lancashire by the Lancashire Electric Power Co. is at present about 3000, and this will shortly be increased by work in hand to about 4000. For some reason Lancashire has been slower to adopt electrical methods than other colliery districts. To the mines around Newcastle three power companies are supplying electrical energy at the rate of over 55,000,000 units per annum. In South Wales 12,500 hp. is being taken from the power company's mains, and a further 3500 hp. is contracted for. In the Clyde Valley district about 8500 hp. is either connected up or arranged for, while in Yorkshire the present connections deliver 4000 hp., with an additional 2000 hp. contracted for. Among other machinery using this energy are three electric hoists and three more are to be installed. Possibly the greater age of the shafts has something to do with the backward condition of Lancashire collieries electrically, compared with other British mine installations, but where coal is most difficult to extract the most modern methods are essential in order that the costs may be kept at the lowest possible figure.

The temperature of maximum weakness in a burning briquet is located between the melting point of the binder and the caking of the coal. For use with coals that cake at a high temperature binders must also have a high temperature melting point if they are to give good results when burning. Non-caking coals must be mated with non-melting binders. Starch gives the best burning results with such coals, but it is not waterproof. Soluble binders mean soluble briquets.

Shooting off the solid in bituminous mines is a dangerous and wasteful proceeding; dangerous, in that it is productive of windy or blowout shots which often cause dust explosions, and wasteful because it greatly increases the slack and fine coal, which is useless except where it can be used for coking purposes.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

Famed as the home of Joe Cannon, bounded on the north by Lake Michigan and largely underlaid with 6 ft. of fairly decent commercial coal, is the great State of Illinois. Forty per cent. of the entire population staked out their homes on the lake front in a large community called Chicago, which latter town was created solely to supply Marshall Field with a dry-goods market and to furnish consumers of coal for Francis Peabody's City Fuel Co.

More than 800 Illinois coal mines have been opened by some 250 operating companies, which corporations are conducted in the interest of John Walker and 70,099 other miners who have contracted to relieve the owners of all responsibilities in the way of management of the properties; only requiring that the operators make good all working deficits, and be liable in case of accidents due to negligence on the part of an employee.

Out in this broad, flat, Middle West country, it originally cost about as much to open a coal mine as it did to start a corner grocery, and nearly as many people devoted their money and attention to mining as to selling canned goods and fresh vegetables. All the Coal Barons could remember how once upon a time a certain fellow made money mining coal in Illinois, and everyone labored on in the belief that the golden era would return.

Even the miners caught the fever, and four or five dozen coöperative coal companies were formed to develop that field lying across the river from St. Louis. However, when the supposedly huge profits that had been flowing into the coffers of the individual owners were divided up among the "producers of the wealth," there wasn't enough *to* go around, and failures came with greater regularity than dividends. But hope dies hard, and always there were those who were willing to repair the wreck and benevolently carry the work forward.

It is from great ruins that noble structures rise, and before many years have passed the coal industry in Illinois will be placed on a sane and satisfactory basis, and owner, miner and consumer will profit thereby. One of the men who will help bring about the new order of things is C. M. Moderwell, of Chicago, president of the United Coal Mining Co., and a man of force and vigor.

Mr. Moderwell is a native son of Illinois, having been born in Geneseo in 1868. His early training was secured

C. M. MODERWELL

in the high school of his home town. Following this preliminary education, he went to Wooster, Ohio, where he finished a general course in the University of Wooster, a Presbyterian school.

Having completed his theoretical training, Mr. Moderwell secured employment in Chicago, working for a railway association and devoting his attention and time to the Bureau of Joint Rate Inspection. In 1892 "C. M." became connected with the coal business, serving as a clerk in the office of the Montana Coal & Coke Co., a West Virginia concern controlled by the Watsons of the latter state. Three years later he was appointed Western sales agent for the West Virginia company, and served in this capacity until, in 1902, he entered business for himself, forming the National Coal & Coke Co., a corporation designed principally to do a jobbing business.

In 1905, when H. B. and W. P. Utley, partners in the business, retired from the firm, Mr. Moderwell formed the C. M. Moderwell Co., still doing a jobbing business. This same year he obtained options on a considerable coal acreage in Franklin County, Illinois, and commenced operating this tract under the name of the United Coal Mining Co. At the same time the C. M. Moderwell Co. continued to handle other coals than those produced by the United company, until at the present time "C. M." has built up and supplies a market of considerable importance.

A new mine that has just been opened by the United Coal Co. at Christopher, Ill., is properly conceded to be one of the most modern and best equipped properties in the state. The same company also has a small mine in Indiana, at Mecca in Parke County.

Although Mr. Moderwell does not control a great number of mines and an unusually large production, he certainly "cuts a lot of ice" in the councils of the Illinois coal operators. At the recent meeting of the Mining Congress in Chicago he and Carl Scholz were the leading spirits in effecting arrangements for the conference, and the success of this most recent meeting was largely due to his efforts.

Mr. Moderwell firmly believes that conditions in the coal industry in Illinois are certain to get very much worse before they finally improve. Like other men who are well informed as to the true situation in that state, he attributes the present unsatisfactory conditions to the lack of a united front and common understanding on the part of mine owners. "C. M." points out that consolidation is the probable cure, and cites the case of Indiana where six companies control about 75 per cent. of the output.

Due to suicidal competition, Illinois mines last year worked only 182 days, and there is little hope of a betterment in the situation until a few powerful interests have secured control of affairs. The miners themselves, notwithstanding the fact that they have forced greater concessions from owners in Illinois than from operators in any other state, have failed to profit through their seeming victories, for last year the average wages of each mine employee working in one of the collieries of the state was less than $600.

As to sociological work among the miners, Mr. Moderwell holds ideas that are ultra-modern, and he firmly believes that mine owners are often prevented from carrying out a definite plan of welfare work by the unnecessary suspicions of the men themselves. It frequently occurs that an operator is prevented from effecting an improvement at his mines, because of the belief on the part of many employees that there is a "nigger in the woodpile." War has been waged so long in Illinois that the miner cannot realize that the "enemy" may have an unselfish interest in his erstwhile foe.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

Mining Methods and Labor

There is but little opposition today to the introduction of machinery in coal mines. The American workingman takes quite a sane view of its use, and realizes that it increases his earnings and lightens his toil. It is remarkable the change in view which has taken place even in the last decade, for there are few workmen at present who seriously entertain the foolish notion that machinery impoverishes labor. Yet a certain amount of education on the attitude of labor to machinery is needed, and it is not unreasonable to hope it will be effected if sober counsels prevail.

The average miner who works with or after machinery has altogether too much hard lifting and pushing to do. The work referred to is not continuous, but it is hard. The machinery is cumbersome and not much of it is equipped so as to be self-propelling. A common type of machine has to be loaded on a truck, with perhaps a board, flexible hose and other paraphernalia. It has to be pushed to the face of a long room and disembarked. The board is placed and the machine dragged onto it and a sumping cut is made. After a few straight cuts are completed, the machine and board must be pulled back across the face and reloaded, and the truck with its load pushed down the room and up along the heading to the next chamber, ready for cutting. Then all the work detailed has to be duplicated in another room. With machines of other types, the methods are but little different and are often still more laborious. It is to be hoped for the sake of the miner that much of this hard work will be eliminated.

All these difficulties are faults, not of the machines but of our disjointed methods of mining. In many cases, they are the outcome of the room-and-pillar method. This latter plan never was a thoroughly satisfactory system, and the advent of the machine has only made it increasingly undesirable. The more a single cutter will accomplish, the more undesirable it is to provide such meager opportunities for its action.

Gradually we are learning how the many roadways needed for approaching a multitude of working faces makes it hard to maintain any one road in proper shape. Little by little we are grasping the idea that more powder is consumed and more danger incurred when shooting in a tight place. Slowly it dawns on us that the multiplicity of roadways excludes the use of a large car in a thin bed. We are beginning to realize that this old method makes necessary excessive supervision and much work for shotfirers, ribbosses and timbermen.

Moreover, we are commencing to see how hard it is to ventilate the ragged line along which the coal is attacked. Valuable fuel is being lost and the difficulties of drainage and general development are multiplied. We are feeling our way to a point where we shall deplore the inability to use machines for shoveling and conveying.

Hampered in every direction, as in the distribution of power (knowing that one machine will work only from one-third to one-half time), we buy grudgingly, enough cutters to mine the needed coal, but we rarely arrange for sufficient power to operate all the machines at the same time. At least we do not purchase pipes or leads large enough to permit of synchronous working of the machines. So now and then we find a scarcity of power.

But if the machines could cut all the time on a longwall face, this difficulty and all the others would disappear. Our territory would be more compact, more readily supervised, better timbered, piping and wiring costs would be lessened, the ventilation would be better, the coal more easily shot, new types of machinery could be used, large cars loaded and more work done per man employed. Drivers and motormen would not be delayed by the transference of machine trucks along the haulage roads and larger coal would be obtained. Moreover, in thin beds, which now have wide rooms, a double shoveling of coal would be unnecessary. It is true

that the longwall workings of English mines have the disadvantages of high timbering costs and of that increased expense which results from continued road renewals, but the retreating-longwall-by-panels system, now in use in a few American mines, should not involve any of this expense.

However, if the wage rate to the cutter per ton undermined is to be as high on several small working faces as on a long cutting face, if the payment of the loader per ton removed is to be the same whether much or little powder is consumed, and whether conveyer machines are used or not, then every change which benefits labor is to be at the entire expense of capital, and the latter will make no move.

There must be on the part of labor a desire to hasten the introduction of every form of machinery and a willingness to share fairly in the product of lessened effort. The worker must be willing to concede a fair proportion of the advantages of a scheme which lightens his labor and makes possible a greater output per day, seeing that the improvement will be brought about by the expenditure of no little money. The miner should be ready to welcome the opportunity afforded him, not only to make a greater daily wage, but also to work less hard and should not wish to monopolize the just dues of commercial enterprise. Otherwise the cutter, scraper and loader will continue to act as boosters and as mules, and will be delayed and harassed in their work by ill adjusted conditions.

As conditions in unionized districts now exist, it does not seem advisable to adopt elaborations requiring expensive machinery of unusual type, and a reconstruction of the mines with a sure increase of dead work and extra day labor, if the share of the operator in the proceeds is only what can be obtained from the use of a somewhat larger car and the obtaining of somewhat less broken coal. Where coal is weighed before screening, the obtaining of large lumps might alone justify the new methods of working and the introduction of machinery appropriate thereto, but where payment is based on the screened product, it is hard to see what important gain the operator could make unless he received a concession in wage. The use of the face conveyor involves the hiring of car loaders, machinists, engineers and firemen, and as these men all assume a part of the work of the loader, it is but right that a reduction of loading price, not necessarily proportionate, however, should be conceded by him; but always, on the condition that under the new arrangement he shall be assured a chance to earn a better wage than under the old *régime*.

The Pittsburg Rate Case

We have refrained from commenting on the decision of the Interstate Commerce Commission, rendered in the Pittsburg-Lake rate case, until a careful analysis of the text of the verdict could be made. This decision, in its effects on the coal industry, is by far the most important ruling yet made by this court. It is broad in scope, conclusive in its results, conservative to a fault and, most important of all, will become effective almost immediately without further litigation.

We are firm advocates of an equable geographical distribution of the coal markets, and believe that any principle by which the railroads attempt to increase their tonnages or excite unprofitable competition by the imposition of unfair tariffs, is directly contrary to the basic intent of our Constitution. In the opinion of the Commission it was the intention of the railroads to promote such conditions by gradually advancing the Pittsburg rate, "not to bring it up to the level which the carriers might have regarded and defended as reasonable, but to let certain competing coal fields into the lake trade." This disposition on the part of the railroads to be the ruling factor in the destiny of any coal field is a distinct imposition on the industry and one long resented by it.

The ruling provides, in brief, for a reduction in the Pittsburg rate of 11 per cent. and an increase in rates from the Thacker and Pocahontas fields averaging 9 per cent., making a differential on the existing schedule of approximately 20 per cent. What the real material benefits, accruing to the Pittsburg operators will amount to, is problematical. As is well known, the Fairmont and Kanawha fields are the most important competitors in the lake trade and no revision in rates from these districts has been made. On the other hand, it is estimated, on the basis of past shipments from the Pittsburg district, that the reduction will effect a direct saving to the operators of over a million dollars annually. Aside from this, many mines heretofore unable to ship profitably to the lake market will now be in a position to compete actively in this trade. That the ultimate effect will be a marked change and a radical readjustment in long established channels of commerce, is hardly to be questioned.

A careful analysis of the findings of the Commission shows a decided (and commendable) leaning toward conservatism. While the court is of the opinion that on the basis of a ton-mile rate, the differential should be even greater, it says, in part:

> When we consider the disturbance in established differentials, the possible deflection in the currents of coal trade and the effects on the carriers directly involved, we are forced to the conclusion that a rate lower than this would not be just.

And from the further fact that the ruling is made effective only over a period of two years, shows the tentative way in which the Commission regards its finding, and the possibilities of a reversal should it fail to bring forth the desired results.

Dissatisfaction with the decision of the Commission has been expressed in some quarters. There are those who point to the Pittsburg rate of 5.5 mills per ton-mile as compared with the Kanawha rate of 2.4 mills and believe that the revision should be made on this basis. Railroad tariff is a question which has occupied the attention of some of the keenest intellects in the country, and a solution of the problem along these lines has been generally conceded impossible. When it is remembered that the rate on a carload of steel plates from Pittsburg to Chicago is nearly double that on a carload of pianos from New York to Chicago, the utter absurdity of such a contention is at once evident.

The foreman is the chief factor in the prevention of mine accidents. On his personality depends the discipline of the mine. In order to fulfil all the requirements of the ideal foreman a man should have had practical experience in mining, good judgment, enough initiative and strength of character to stand by his ideas and make others respect them. He should possess sufficient tact and knowledge of human nature to control the men under him, and be temperate and truthful.

Colliery Notes and Comments

Practical hints gathered here and there, and condensed to suit the busy reader

The Appalachian coal field is the richest coal deposit in the world. It produces nearly one-third of the world's coal.

Lethbridge and the Pass district produced over 6,000,000 tons of coal last year. Fifteen years ago the same region produced less than 200,000 tons a year.

A succession of small shots is much better than a few large ones. Holes should be drilled so that advantage may be taken of all partings. Load the coal out before firing a second charge.

A Scotch device for removing dust from coal mines consists of electrically-worked air-jets and a suction-device which simultaneously raise and withdraw the dust.

Experience has shown that the wet zone method of preventing the spread of an explosion is not to be depended upon. With very intense heat, thoroughly wet zones, 150 ft. long, have been crossed by the flame.

A method of removing carbonic dioxide sometimes employed in English mines, is to spray the mine with hypochlorite mixtures in liquid form. The hypochlorites of the alkalies have the property of absorbing carbonic dioxide when such is present.

Experiments made in France have shown that watering thoroughly for 10 yards in front of shot holes in dusty mines will greatly reduce the dangers resulting from blowout shots. While ignition was not always prevented, it in no case extended more than seven or eight yards.

Precautions to prevent gob fires are: (a) So far as is possible, withdrawing all timber from the gob; (*b*) stowing the waste with all the dirt available; (*c*) giving great attention to the building of gate-side pack-walls; (*d*) leaving no pillars or ribs of coal; (*e*) keeping the workings cool by means of ventilation, but excluding the air from the gob.

Leaders of rescue corps should bear in mind that while rules and regulations are desirable for intelligent action, it is impossible to lay down hard and fast rules for rescue work at explosions and mine fires, as circumstances vary and each mine and each fire or explosion furnishes a different problem in itself, and nothing can replace individual intelligence and decision on the part of the leader of the corps.

Developments in mining, in Alberta province, Canada, during the past five or ten years, have produced great changes. Seven large and well equipped collieries now dot the plains, and some of these are said to have the most up-to-date steel tipples in the world. There has been, in this time, a vast development of coal areas in the "Pass," known better as the Crows Nest Pass, on the C. P. Ry., and on the line dividing the provinces of Alberta and British Columbia.

Pure calcium chloride will absorb as much as 1.15 times its weight of water. When intended for use on dusty roadways, gobs, or floors of entries, it should be bought in the granulated form as it is then much easier to spread evenly and is more effective than when either in the solid or dissolved form. But for use on ribs, roof, and timbers five or six pounds should be dissolved in 100 lb. of water and this mixture sprinkled by means of the water car and hand pump.

Discussing the types of available breathing apparatus, Mr. Blackett says there are two forms from which to choose, namely, (a) that which maintains its supply of oxygen from steel cylinders containing the gas compressed to, say, 120 atmospheres, and which has the expired carbonic-acid gas absorbed by such a substance as caustic potash, and (b) that which depends upon liquid air boiling off and being discharged into the surrounding atmosphere, instead of being, as it were, regenerated.

Spontaneous combustion is now recognized as the greatest problem to be overcome in connection with the storage of bituminous coal. One good method of detecting an incipient fire is to have all storage bins fitted out with temperature tubes, using 4-in. galvanized pipes, about 20 ft. long, set in the floor of the bins in such a manner as to project upward into and through the coal pile. Each tube should be provided with a thermometer which is capable of indicating temperatures over 150 deg. F. Run a circuit from each of the tubes to an alarm bell in the office of the yard superintendent so that if the coal is heating an alarm will at once be sounded.

Great Britain has no law touching the kind, or length of service of hoisting ropes. The law limits itself to holding the mine owner personally responsible for any mistake he may commit which results fatally, but so far as the law is concerned any kind of rope may be used and may be kept in use as long as the mine management desires. Superintendents are obliged to report all rope breakage regardless of whether any persons were either killed or injured. In the last 10 years Great Britain has had only 38 fatal accidents due to the breakage of hoisting ropes. Only a few British mines test their ropes themselves; the tests are made by the rope manufacturers. It is far less customary to test the finished rope than the individual wire.

Prussian mining authorities prescribe the following tests for hoisting ropes used in shafts where men are lowered and hoisted. Each rope must be subjected to tensile and bending tests performed on a 40-in. length cut from the rope. The tests must be applied to each wire in the rope, except the core wires of the several strands and of the entire rope. Each wire must be loaded to its breaking point and its limit of flexion must be ascertained by bending it through an angle of 180 deg., on a 5mm. (0.2 in.) radius until it breaks. The number of bends must be counted. Each test for flexibility is carried out by bending the wire alternately from right to left, through an angle of 90 deg. from the vertical to the horizontal position and on to the vertical position. The carrying power of the whole rope is calculated by adding together the weight required to break each individual wire, with the exception of the cores, leaving out of consideration all wires whose carrying strength is 20 per cent. below the average of the whole. Ropes made of wire, other than plain section must have their carrying power determined by straining the whole rope or whole strands to the breaking point. All hoisting ropes must be tested at least once every three months. When the strain on the rope is light, longer intervals may elapse between testings, by cutting off at least 10 feet from the end attached to the cage, above the capping; 40 in. of the top part of the cut-off portion must be tested for tensile strength and resistance to flexion in the same manner as prescribed for new ropes. Every hoisting rope must exhibit at least a margin of safety of 6, referred to the maximum load carried when hoisting animals. When hoisting men the weight on the cage must not be more than ½ the weight carried when hoisting coal.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Spontaneous Combustion

Under the above caption much has been written and said by many experts and scientists. Yet it seems there are a few practical things picked up in a life's experience around mines, that might be said. The reason some coals ignite without the application of fire, and others do not, is as mysterious and paradoxical as the coking qualities of coal.

Most writers agree that iron pyrites (FeS) is the principal cause of spontaneous combustion, but I do not agree with this theory. Although the bisulphide of iron is always found in gob fires, I have always understood that no fires have ever taken place in coal piles or gobs except where proto sulphides were also present, as for example in the Yorkshire and South Wales tests. This is true at least, in all cases where these gobs and coals have been subjected to ultimate analysis. Also, quite a number of experts do not seem to distinguish between the gases that compose the coal and those occluded in it.

Furthermore, few people have considered the nature of these occluded gases sufficient to thoroughly understand the origin of the gob fire. Most writers seem to infer that the temperature of spontaneous combustion is quite high, about 700° to 1000° F.; to this again I cannot agree. Many men who have traveled over gobs and the waste in abandoned workings have no doubt noted the extra heat of the top coal, slack and bituminous slates.

This, I understand, to be spontaneous combustion in its initial stage; it may be as low as 80° F. or so hot you cannot hold your hand on it, yet the actual fire is not yet due by many degrees. It seems possible that, in the disintegration of the coals, enough heat is generated to throw off one S from the FeS_2, thereby forming the proto-sulphide FeS and SO_2. At any rate I am positive, there is plenty of this sulphurous oxide generated long before any glowing fire appears.

Your correspondent stated that water or vapor helped the combustion and it may be the HO is given off, and with the free S forms the SO_2. However, I do not think so, as it always has been my experience that the drier the gobs the more liable they were to fire, and I have never seen a fire in a wet gob. But to return to the temperature, I believe that when combustion has advanced enough to produce large quantities of SO, it may be stopped and the temperature made normal.

I firmly believe that, if waste workings were thoroughly ventilated, there would be no gob fires. At our mines here four years ago we holed a butt heading out to daylight. On the rise side of this heading was old workings about 2000 ft. by 1500 ft., all abandoned; through this heading we hauled the coal from another mine by electric motors. The mine inspector and I had often noticed the dry SO_2 coming along this haulageway in the suction of the trip; there was enough to make you cough and sneeze. Beyond these workings there was a large block untouched, which it became necessary to develop. We discharged into the old workings 35,000 cu.ft. of air per min., as per the state mine inspector's report. The result is that the pungent odor is gone, and the old entry that once fatigued you, and made your eyes ache in a 1000-ft. travel can now be traveled with impunity.

Therefore, my firm opinion is, that the cause of the most of the spontaneous ignition in mines is principally the lack of proper ventilation. I have such faith in the theory that I have recently suggested a plan to ventilate coal stock-piles.

JOSEPH VIRGIN.

Plymouth, West Va.

[Our correspondent has presented some interesting, and we believe original theories, on this much discussed question. He has, however, evidently been misinformed or been referring to unreliable authorities. The most recent investigations on this subject are embodied in a paper presented by permission of the Director of the U. S. Bureau of Mines at a joint meeting of the New York sections of the American Chemical Society, American Electrochemical Society and the Society of Chemical Industry, New York City, Nov. 19, 1911. On the subject of spontaneous combustion this paper says:

> Oxidization (probably in the main an absorption of oxygen by unsaturated chemical compounds) begins at ordinary temperature in any coal, attacking the surfaces of the particles and slowly developing heat. In a small mass of coal this heat can readily dissipate itself by radiation and no rise in temperature results. If radiation is restricted, however, as in a large pile densely packed, the temperature slowly rises. Now, the curve of oxidation rates, plotted against temperature, rises with great rapidity, and when the storage conditions are such as to allow the temperature of about 100° C. to be exceeded, the rate of oxidation is great enough ordinarily, so that the heat developed overbalances the heat radiated. Then the temperature rises to the ignition point if the air supply is adequate.

According to this hypothesis, spontaneous combustion is accelerated by the exclusion of air until the temperature of 100° C. is reached, after which combustion is aided by the admission of air. We would be pleased to hear from other readers on this very important subject.—EDITOR.]

Testing for Gas with a Normal Flame in the Wolf Lamp

In my experience with a Wolf lamp burning naphtha, I have observed that when a ¾-in. or normal flame was used for testing purposes the lamp would not give any indication of the presence of gas, except that the flame became somewhat smoky. In one instance, recently, there was a uniform mixture of 3½ to 4 per cent. of marsh gas in the air at the time of making the test. In using the normal flame, I could get no indication of gas. When the flame of the lamp was reduced, however, to what may be called a standard or capping flame, a ⅜-in. to ½-in. cap was formed. I would like to know if others have had the same experience in the use of the Wolf lamp.

After studying the matter, I came to the conclusion that the air or mixture of air and gas, which entered the lamp through the gauze ring below the flame, was only sufficient to support the flame and burn a very small amount of gas that acted to keep the height of the flame constant. My idea was that when a larger flame was used, the air entering the lamp was not sufficient to produce complete combustion, which fact caused the smoky appearance of the flame; and this, together with the brightness of the large flame, obscured the cap. It is a common practice among some firebosses to test for gas with the normal flame in the Davy lamp; but this lamp has a large intake area providing a better circulation in the lamp than is true for the Wolf lamp. When using the normal flame in testing for gas, to obtain reliable results the flame, in gas, should reach to the top of the globe, in the lamp, or nearly so. To determine the percentage of gas, however, a reduced or standard or capping flame should be used.

BENJAMIN HARTILL.

Johnstown, Penn.

[In this connection, the article "Estimating Gas Percentages," COAL AGE, Dec. 2, p. 250, is of interest.—EDITOR.]

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Motive Column and Velocity

I want to ask (a) what will be the height of motive column produced by the difference of temperature in two shafts of equal depth and area, the depth of each shaft being 700 ft.? The temperature of the downcast is 40° F. and that of the upcast 65° F. (b) What would be the velocity of the air current?

INQUIRER.

(a) The height of motive column depends only on the difference of temperature in the two shafts, the density of the air and the depth of the shafts. The area does not affect the motive column. The upcast air being the lighter, a motive column of this air will be longer, for the same conditions, than a column of the heavier downcast air.

Downcast air

$$M = 700 \times \frac{65 - 40}{460 + 65} = \frac{700 \times 25}{525} = 33\tfrac{1}{3}\ ft.$$

Upcast air

$$M = 700 \times \frac{65 - 40}{460 + 40} = \frac{700 \times 25}{500} = 35\ ft.$$

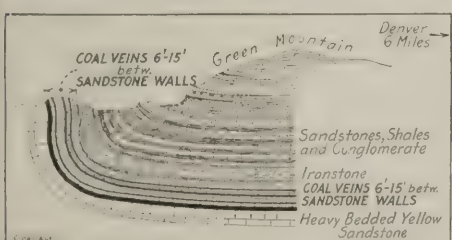
(b) The theoretical velocity due to the head of air column in either case is given by the formula

$$v = \sqrt{2\,gh} = \sqrt{2 \times 32.16 \times 35}$$
$$= 47.4 + ft.\ per\ sec.$$

This, however, has no practical bearing, here, as it represents the rush of upcast air into a vacuum only; and has nothing whatever to do with the velocity of the upcast current in the shaft.

Thick Vertical Coal Seam

I was greatly interested in the inquiry of Chas. M. Sherman, COAL AGE. Apr. 6, p. 851, asking for a discussion of the best method of developing a vertical coal seam, 16 ft. thick, 1000 ft. deep and



GEOLOGICAL CROSS-SECTION OF COAL SEAMS

one mile long. This is a pertinent question and one we also would like to see discussed, inasmuch as we are facing a similar proposition here, having just opened a vein that could be described in the same words. At the present writing, we have sunk a 5x8 ft. prospect shaft, 110 ft. deep, and from the bottom of this shaft have driven entries, each way, 300 ft., in the coal. The seam measures 16 ft. thick and stands at an angle of about 87°; it extends downward fully 1000 ft. and has a width of 2 miles on the property.

We shall watch with much interest the replies to this question. We inclose a sketch showing the cross-section of the formation here, taken from the report of the Geology of Colorado Coal Fields.

W. B. HOUSE, GENL. MGR.
The Rooney White Ash Coal Co.
Denver, Colo.

Detection of Carbon Monoxide Gas in Mines

Among the questions answered in COAL AGE, Mar. 9, p. 720, I notice one asking how to detect mine gases, or rather, to describe the effect of the different mine gases on the flame of a safety lamp.

I would like to ask if the manner in which this gas is commonly described, especially with regard to its action on the flame of a lamp, is not a dangerous and misleading way of putting it. All text books, in speaking of carbon-monoxide gas, refer to the lengthening of the flame in the gas and add, the flame burns more brightly in this gas than in air. This must be true since *all* books on mining say the same thing; but they do not give the percentage of gas necessary to produce this effect. My question is, does not this statement lead the miner to depend upon his lamp to show this gas and often cause him to lose his life in the attempt to rescue friends, after an explosion?

If I am not mistaken, it takes 3 per cent. of CO to show this effect; but ½ of 1 per cent. of this gas is fatal to life. If this be true, a man would die before his lamp would reveal the danger. I do not wish to be understood as a critic, but I have seen foolish men lose their lives in the manner stated, depending on the light to show this gas. It may have been because of the books they had read; but I think this matter should be made clear by an article on this gas alone, especially as so few miners understand the danger to which they are exposed in its presence.

JAMES R. CAVANAUGH.
State College, Penn.

Our correspondent has drawn attention to an interesting and important point. While it is probably true that more has been written, of late, drawing attention to the dangerous character of this gas than can be said of any of the other mine gases. much of what has been written is misleading in the daily practice of mining, because undue emphasis has been placed on the physical properties of the gas, the effects of which, in most cases, are not understood by the ordinary miner.

The answer to the question to which our correspondent refers, however, in COAL AGE, Mar. 9, p. 720, distinctly states: "However, it is unsafe to rely wholly on these indications for its (CO) detection. Other means should be used, as the blood test or the canary or mouse test." The answer to the question immediately preceding this one draws attention to its dangerous character, which is due chiefly to the fact that lamps "continue to burn brightly in the presence of this gas".

In regard to the percentage of gas required to produce the effect described, it is impracticable to say; because, the gas being combustible, its presence in the air surrounding a flame adds to the combustion and maintains a higher temperature over the surface of the flame. A very small percentage of the gas increases the brightness visibly, and the effect is greater as the percentage of gas is higher. Just at what point the effect becomes appreciable depends on the quickness of the observer to detect the change.

Furthermore, the presence of fine coal dust floating in the mine air will produce the same effect, lengthening and brightening the flame, when no carbon monoxide is present except that which may be generated by the burning of the dust in contact with the flame. On the other hand, the presence of blackdamp destroys the effect of carbon monoxide on the flame more or less completely, while it does not, to the same extent, destroy the toxic effect (effect on life).

For these reasons the effect produced by this gas on flame, as commonly described, though true for even low percentages, must not be taken as a safe guide or test. The same remarks apply, though less forcibly, to the detection of firedamp, the flame test being modified here also by the presence of other gases. A dangerously explosive mixture of marsh gas, carbon dioxide and air (flashdamp) is frequently mistaken for a harmless body of gas or overlooked entirely, because the cap only appears as a momentary flash on the lamp and is gone.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Ellsworth Mining Institute, Tennessee

MINE FOREMEN'S CLASS, QUESTIONS

Ques.—Describe, in a general way, the duties of mine foreman, superintendent and all other employees inside of a mine.

Ans.—The mine foreman is the responsible man in the operation of a mine. He has full charge of the mine, its equipment and supplies. His duties are to direct and supervise the entire work of the mine, examine and control its ventilation, inspect all machinery and the inside workings, provide the necessary supplies and receive the daily reports of the men in his charge. He must personally superintend the prompt removal of all known dangers or order the men to withdraw from the mine.

The superintendent plans the work, receives and files all daily and monthly reports, fills all orders for supplies made by the mine foreman, inspects the mine maps, time sheets and all bills of expense, directs the loading and shipment of coal, and regulates the output to meet the demand.

The fireboss examines the mine for gas and to discover any dangers or unsafe conditions before the men enter the mine in the morning and during the day while the men are at work in their places. He should place danger signals where such are needed, give all necessary instructions to miners, regarding the use of their lamps, the drilling of holes for blasting, charging and firing shots, and the timbering of their places, loading of cars, and whatever may be necessary to safeguard life and property.

The boss driver directs the other drivers in the work of transporting the coal from the working face to the parting or shaft bottom. The timbermen and trackmen look after the timber and track in all roadways, take down loose rock and lay room switches as these are required.

It is the duty of miners to carefully inspect their own working places and set any timber that may be required before starting any other work. All employees should report promptly any dangers they may find to the mine foreman or his assistant.

Ques.—What quantity of air is passing in an airway 5x7 ft. when the velocity is 250 ft. per min., and what record should be made in the mine-record book of such measurements?

Ans.—The area of the airway is

$$a = 5 \times 7 = 35 \text{ sq.ft.}$$

The quantity of air passing is then

$$q = av = 35 \times 250 = 8750 \text{ cu.ft. per min.}$$

The date of the observation, sectional area of the airway, anemometer readings, velocity of the current and the calculated quantity of air passing should all be promptly recorded in the book kept for that purpose and the entry signed by the one who made the observation.

Ques.—What is meant by splitting the air current in a mine, and what effect has it on the total volume of air in circulation?

Ans.—By splitting the air in a mine is meant dividing the air current into two or more separate currents. By this means the total volume of air is increased, assuming the power producing the circulation remains unchanged. Owing to this increased volume of air having to pass through the fan, the shafts and the main airways, its velocity in each of these is increased in proportion to the increased volume of air, but the velocity in each of the splits is decreased somewhat. However, owing to the number of splits the total quantity of air in circulation is always increased.

Ques.—If a current of 30,000 cu.ft. of air is passing into a mine and you find only 5000 cu.ft. at the working face, how would you account for this loss and how can it be prevented?

Ans.—The loss in the volume of air that reaches the working face is due to leaky stoppings, doors, air bridges and brattices used to conduct the air throughout the mine. If these are not made air-tight the current or a certain portion of it will be short-circuited at such points and pass into the return, thus failing to reach the face. It can be prevented by repairing or rebuilding all stoppings, doors, brattices, etc., that leak air.

Ques.—If an airway 2000 ft. long and 6x8 ft. in section is passing 50,000 cu.ft. of air per minute, and another airway of equal size is added, what will be the total quantity of air passing per minute in the two airways, the pressure remaining constant?

Ans.—The question is a little indefinite as to its meaning. Assuming, however, that the airway added is another and separate split affected by the same pressure as the original airway, the total quantity of air will be doubled, since each airway will then pass 50,000 cu.ft. per min.

On the other hand, if the new airway is an extension of the original airway, whose length will thus be doubled, the quantity of air that will then pass through this long airway will be decreased. For the same pressure per square foot the quantity varies inversely as the square root of the length. More simply, for the same pressure, the quantity ratio is equal to the square root of the inverse-length ratio (the cross-section of the two airways being the same). Thus, the length ratio in this case being 2, and calling the required volume of air x,

$$\frac{x}{50{,}000} = \sqrt{\frac{1}{2}} = \sqrt{0.5} = 0.707$$

$$x = 50{,}000 \times 0.707 = 35{,}350 \text{ cu.ft. per min.}$$

Ques.—What provision should be made inside a mine to insure its being properly ventilated?

Ans.—All stoppings, brattices, doors and air bridges must be made air-tight. Doors must be substantially built and hung so as to close with the air. Double doors must be used at all main points separating the main intake and return airways. Other doors on haulage roads where much coal is passing should be trapped. All air crossings should be built as overcasts and not undercasts. Airways and crosscuts should be kept free of all obstructions of any nature; empty or loaded cars should not be stood in airways, but in the mouths of rooms or on partings where they will not obstruct the flow of air. The air current should be distributed so as to proportion the quantity of air in each split to the requirements therein. Special brattices should be used to make the air current sweep the face of each working place. The velocity of the current, at the face, should always be sufficient to sweep away all gases and prevent their accumulation in any void or abandoned places. The velocity in the workings should not exceed 480 ft. per min.

Correction

The answer to the last question, Pumping Calculation, COAL AGE, Apr. 13, p. 887, made the actual discharge greater than the theoretical discharge, which, of course, is wrong. The answer should read.

(b) Actual discharge,

$G = 0.85 \times 705 =$ say, 600 *gal. per min.*

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The House Committee on Mines and Mining has reported favorably on the Foster bill, which provides for the creation of a Commission of Mining Industry, with power to undertake a general investigation of mining conditions throughout the country. The commission is to be composed of 11 persons, as follows: Two members from the Senate and two from the House, two representatives of the operators, two representatives of the miners, two engineers and a representative of the Bureau of Mines.

It is to be the special duty of this commission to inquire into labor conditions in the mining industry and to seek to discover and point out the underlying causes of dissatisfaction, also to inquire into mining methods with regard to their safety and efficiency, and the general conservation of mineral resources.

Rates on Colorado Coal

A decision by the Interstate Commerce Commission in the case of the Nebraska State Railway Commission vs. the Chicago, Burlington & Quincy R.R. Co. *et al.* explains that in the application of rates on coal from the Walsenburg district of Colorado to numerous points in Nebraska the defendants provide a rate of $3.50 per net ton to one group of stations and a rate of $3.75 to a second group. The complainant, in substance, asks that certain points now taking the $3.75 rate be included within the $3.50 rate group, and the certain points taking the $3.50 rate be divided into two new groups to which shall apply rates of $3 and $3.25, respectively. The rates involved have been considered, and it is held:

(1) That the defendants subject Minden "K" to undue and unreasonable prejudice in charging a higher rate than applies at Minden, and that for the future the rate to Minden "K" should not exceed the rate contemporaneously maintained to Minden.

(2) That, under the readjustment required by this finding, the rate to Minden "K" should not be exceeded at the intermediate stations of Keene, Wilcox, Ragan, Huntley, Alma, Orleans, Carter, and Sacramento.

The Commission further explains that:

A careful analysis of the reports filed with the Commission by the defendants, the Chicago, Burlington & Quincy R.R. Co., the Colorado & Southern R.R. Co. and the Denver & Rio Grande R.R. Co. shows that the operating expenses per ton-mile over these lines is so high that we hesitate to make changes in the rates now under investigation other than those noted.

Alabama

Birmingham—The coal operators of Alabama are making an advance in wages, effective May 1, amounting to 2½c. per ton mine-run for pick mining in the Pratt seam of coal, which is the basing seam for the state. This will advance the Pratt pick-mining rate from 52½c. per ton to 55c., and other seams will be advanced in proportion. The yardage and day rates will be advanced about 5 per cent.

Tests have been made recently by Chief Mine Inspector Nesbitt to determine the percentage of gas in the air of several Alabama mines. The apparatus used was that installed here lately by the government. The samples were taken largely from the Flat Top and Indio mines and, in most cases, showed less than one-half of 1 per cent. of explosive gas.

Colorado

Denver—A proposed increase of 35c. per ton in the freight rates on coal from the Walsenburg district in Colorado to points of destination in Kansas, Oklahoma and Texas, was suspended, Apr. 10, by order of the Interstate Commerce Commission, until Aug. 12. The new rate was to have become effective Apr. 14.

By a recent decision, the Interstate Commerce Commission has ordered a reduction in freight rates on coal from the Walsenburg field to points along the Burlington road as far east as Oxford Junction, Nebraska. A reduction of 25c. per ton is applicable to the stations of Ragan, Huntley, Wilcox, Sacramento and Minden. The following stations between Minden and Superior must continue to pay the old rate: Superior, Edgar, Clay Center and Harvard.

Illinois

Chicago—The Illinois United Mine Workers have voted to accept an increase of approximately 5c. per ton of screened coal and to return to work May 1.

Mount Vernon—The Chicago Coal Co., of Chicago, has procured options on 3000 acres of coal land in Jefferson County, and it is reported that the purchasers expect to open a number of mines during the present year.

Coal City—The head works of mine No. 3, at Tower Hill, were blown over by the storm, Apr. 21, which did great damage in this vicinity.

Belleville—One hundred and twenty-eight miners have brought suit against the Royal Coal & Mining Co., the Wilharmil Coal & Coke Co., and R. W. Ropiequet, for $12,800, wages due them.

Columbia—The East St. Louis-Columbia-Waterloo Electric Ry. has obtained a permit to extend its line through East St. Louis, to enter St. Louis over the Eads bridge. The line will extend from East St. Louis to Waterloo, and will tap coal fields that at the present time have no freight facilities.

Peoria—The scale committee and executive board of the Illinois United Mine Workers arranged to meet the Illinois coal operators, including those from the Fifth and Ninth districts, in conference here on Apr. 23. Differences between the miners and operators will be discussed and any agreement which may be reached will be submitted to a referendum vote of the miners of the state.

Articles of incorporation were recently issued to the Mid-Valley Coal Co., which is capitalized at $80,000, with offices in Peoria. The new company has purchased 500 acres of coal land four miles north of Chillicothe and will begin operations as soon as the suspension of work in the coal mines is over.

Hillsboro—It is reported on good authority that the New York Central R.R. has purchased, or is about to purchase, 15,000 acres of coal lands in and around Ohlman. The field is that optioned a few months ago by Harry S. Hargrave, and sold to St. Paul coal-land men. The mining conditions at Ohlman are more like those at Pana than at Hillsboro, and therefore are not quite as good as conditions here. The vein is about 7½ ft. thick.

Indiana

Indianapolis—The completion of the work of the tellers of the United Mine Workers shows that the bituminous miners have ratified the Cleveland compromise agreement, governing Illinois, Indiana, Ohio and western Pennsylvania, by a vote of 109,709½ to 32,139½. Thus 77 per cent. of the 141,849 miners who voted at the referendum balloting, Apr. 10, favored the agreement. Not later than May 1, it is said at the international headquarters, the 240,000 bituminous miners

will be back in the mines. Approximately 150,000 of these are idle at the present time. The formal signing of the contract which is to bind operators and miners in the four-state field until Mar. 31, 1914, is expected to take place this week. In only one district in the country was the majority of votes cast against the agreement. That was in the Kentucky field, where a total of 1220 votes was cast, 566 of these being for and 654 against the agreement. Of the miners in the districts in Pennsylvania, Ohio, Indiana and Illinois, the four states governed by the contract, 82,066 voted for the agreement and 23,300 against it.

Brazil—The Crawford Coal Co. has begun the work of sinking a new mine northeast of this city, along the Chicago & Eastern Illinois R.R. When completed it will employ 200 or more miners. This enterprise will prove a big help to Brazil, commercially. The new mine is in the Clay County block-coal field and bids fair to run for many years.

Bloomington—Although Monroe County has never been known as a coal producing district, John H. Koontz, who owns a large farm 8 miles west of Bloomington, has found a 4-ft. vein of bituminous coal of excellent quality on his land. It is announced that a company is being formed to develop the find.

Terre Haute—The convention of the Indiana United Mine Workers, which adjourned early in March, pending the interstate conference at Cleveland, reassembled here Apr. 17. The scale committee has prepared a contract to be submitted to the operators at a joint conference. A mutual casualty-insurance agreement will be discussed by both bodies. The operators offered to take up the matter several years ago, but the miners then believed they would succeed in obtaining a state law similar to the one in Illinois.

Kentucky

Whitesburg — The Consolidation Coal Co. has bought 76 acres of coal lands near Jenkins for $19,700. This is at the rate of a little more than $250 an acre—perhaps the largest price ever paid for mountain coal lands.

Louisville—While a final settlement of the difficulties between the union miners and the operators of western Kentucky has not been reached, the only points at issue now are minor questions in regard to working conditions. The wage scale agreed upon has been submitted to a referendum vote. The union miners of southern Indiana have refused to raise funds to be used in an endeavor to organize the non-union territory of western Kentucky.

The entrance of the Norfolk & Western into the eastern Kentucky coal fields is a development of interest. It will make the move through the Williamson & Pond Creek R.R., which was recently organized. This road will be built from Williamson, W. Va., along Pond Creek to a point near Elkhorn City, which is the center of the new coal territory now under development. It is largely for this reason that the Norfolk & Western is rebuilding its bridge over the Ohio at Kenova, W. Va., as it expects to handle a large tonnage of coal as soon as its new connection is built. The Carolina, Clinchfield & Ohio is building from Dante, Va., to the Elkhorn field, while the Chesapeake & Ohio is also entering that district.

Henderson—The Keystone Mining & Manufacturing Co. has filed a suit against the Louisville & Nashville R.R. Co., in which damages of $50,000 are asked. The company's claim is that the road failed to furnish it with cars and to quote reasonable rates on the shipment of coal from the mines to the city of Henderson, and that as a result it was found necessary to close down the mines.

Madisonville—An explosion of gas in the Coil Co.'s mine near this city, the night of Apr. 21, set the mine on fire and probably caused the death of Joseph Hallowell, a mine foreman, and four negroes. Flames were found issuing from the entry and one of the cages was blown out by the explosion. The mine is a new one, about 200 ft. below the surface and only about half a mile long. Only the five men were in the mine.

Greenville—J. W. Lam, Greenville, has purchased the coal mine of the Dovey Coal Co. at Mercer. The purchase price was $75,000. Mr. Lam is one of the creditors of the company, which is in bankruptcy, with liabilities of $100,000.

Missouri

Kansas City—A sub-committee of six members, representing the coal operators and the miners, respectively, in the fields of Kansas, Oklahoma, Missouri and Arkansas, began negotiations, Apr. 16, for the writing of a new two-year contract. The conferences were held in the offices of the Central Coal & Coke Co. An early settlement of the differences between the two sides is expected. The miners by a referendum vote have approved the Cleveland agreement, and it only remains now to agree on the contract. The only serious obstacle in writing the contract pertains to the arbitrator in matters of dispute. The miners desire to eliminate this clause and the operators desire to retain it.

St. Louis—The freight traffic officials of the various railroads entering St. Louis, have practically decided upon a new coal arbitrary, making the rate on all coal the same to St. Louis as to East St. Louis.

Ohio

Zanesville—Fire broke out, Apr. 18, in the shaft mine No. 302, near Congo, Ohio, in which 400 miners were employed until the suspension of work on Apr. 1. A hundred men at once started to work in an effort to check the flames, and several of the fire fighters were overcome by the fumes.

The announcement was made recently in Columbus, that capitalists of that city have leased 8000 acres of coal lands between Durant and Blue Rock. This is one of the biggest coal deals in the history of this section of the state. It was further announced that the old Stone mine at the mouth of Coal Run will soon be purchased and operated.

Columbus—Figures given out from Indianapolis, show that the proposition of remaining at work in accordance with the Cleveland agreement was ratified by the United Mine Workers in western Pennsylvania, Ohio, Indiana and Illinois. The vote against the proposition was unexpectedly large, and hard to account for. The Hocking Valley field is expected to be one of the first to resume operations, as everything is in readiness for resumption. The eastern Ohio field will also resume work soon, and the same is true of the Pomeroy-Bend field. It may be a little time before operations are resumed in the Massillon and Crooksville fields. According to the Cleveland agreement there should be no difficulty in working out the district rulings. The agreement provides that nothing shall be changed to make the cost of mining greater, and, on the other hand, nothing shall be changed to decrease the earnings of the miners.

The Symmes Coal Co., of Ironton, has been ordered by Judge Corn, of the common pleas court of that district, to liquidate claims amounting to $705,204 within the next 45 days. Failure to comply will result in a sheriff's sale of valuable coal lands, owned by the company in Lawrence and Gallia Counties. Of the indebtedness, $700,000 is for outstanding bonds and the balance for notes and court costs.

Bridgeport—President John Moore, of the Ohio miners, with the subdistrict officials, on Apr. 16, visited the towns of Bradley, Piney Fork and Plum Run, where serious riots occurred recently, when pumpers and other repair men working in the idle mines were assaulted by foreigners.

Coshocton—A 5-ft. seam of coal was uncovered recently in the new entry of the Locust Grove Mining Co.'s mine, just south of town. A number of additional men will be employed as soon as the entry is put in shape to start operations.

St. Clairsville—It is not believed the mines of eastern Ohio will resume operations before May 1. While the returns from Indianapolis announcing the majority in favor of returning to work, will al-

low the miners to proceed toward making contracts, vet it is believed the operators are not desirous of resuming.

This is due to reports that none of the large consumers is out of coal and also because many of the markets are still overstocked. Should the mines resume at once the operators would be unable to get the normal price for their coal. With the opening of the Lake trade, however, it is expected all the 17,000 miners in the eastern Ohio field will resme work

Pennsylvania

Bituminous

Pittsburg—The annual convention of District No. 5, United Mine Workers, broke up in disorder and a "rump" meeting, Apr. 18. The 50,000 idle miners in western Pennsylvania will return to work at once. It was announced that notifications had been sent to the various locals to have the men return to work.

Dubois—The joint scale committee of District No. 2, United Mine Workers, after two weeks of deliberation, reached an agreement, Apr. 20. The scale is somewhat lower than the miners demanded, particularly in regard to dead work. It is signed for two years and is as follows: Pick mining per gross ton, 72c.; pick mining per net ton, 64.29c.; machine loading per gross ton, 42c.; machine loading per net ton, 37.23 cents.

Boswell—A fire, on the morning of Apr. 12, destroyed the large outside barn at the Merchants' Coal Co.'s mine, and a number of mules were burned to death. The loss, including damage to a nearby dwelling, is estimated at $3500.

Charleroi—In accordance with instructions posted, Apr. 17, nearly all the mines of the Monongahela River Consolidated Coal & Coke Co., the Vesta Coal Co. and various other smaller companies with mines along the Monongahela River, resumed operations Apr. 18. This ended a suspension lasting since Apr. 1.

Brownsville—The Knob mine of the Monongahela River Consolidated Coal & Coke Co., idle since Apr. 1, resumed operation, Apr. 19. The Albany and Chamouni mines of the same company resumed work, Apr. 22. About 1500 men are affected.

Connellsville—The Connellsville coke trade is in the unfortunate position of not being able to supply the demand because of inadequate and uncertain labor conditions. While labor has been coming into the coke region slowly, it has not come in sufficient volume to meet the requirements of the situation. Production for the week ending Apr. 13 fell off 52,175 tons, as compared with the week before, the total being 363,289. The decrease was evenly divided between the furnace and merchant ovens, that of the furnace ovens being 26,356 tons, their total being 230,732, while the merchant ovens fell off 25,819 tons, their total being 132,913.

Anthracite

Scranton—Following a conference with the board of directors of the Scranton Board of Trade and a committee from the West Scranton Board of Trade, the city council recently received a resolution directing the city solicitor to prepare an ordinance putting into effect the police powers of the city to prevent mine caves. The resolution was referred to a committee and will probably be passed at the regular meeting of council.

A pumpman at the Moosic Mountain colliery, near Jessup, was shot from ambush while on his way to work, Apr. 16. The attack was made near the point where the railroad tracks were dynamited some days ago. This workman had been sticking to his post during the suspension, in accordance with the arrangement between mine workers and operators. It is thought that some of the miners regarded him as a strike breaker.

More than 300 men and women, gathered at the Raymond colliery at the "Ridge," Archbald, at 6 o'clock in the morning of Apr. 20 to enforce the suspension order. When the men began to report for work the crowd chased home every workman except pump-runners, engineers, stable men, firemen and necessary repairmen permitted to work under the suspension order. There was no rioting or lawlessness, the crowd simply asking the workmen to go home and the workmen obeying the request.

Wilkes-Barre—The Plymouth Coal Co. has complained to the Interstate Commerce Commission of the rates on anthracite coal in carloads from the Dodson colliery and the Black Diamond colliery and other points on the line of the Pennsylvania R.R., to South Amboy, N. J. The commission was asked to reduce these rates and award reparation to the complainants.

The committee, which is conducting the negotiations between anthracite miners and operators, reconvened in New York, Apr. 16, and has since continued its deliberations in that city. Up to the present writing, no definite news has been given out concerning the progress made by this committee toward reaching an agreement. It is currently reported, however, that the discussion of all questions has been fully and freely entered upon, and that an amicable settlement of present diffculties is expected. As has been anticipated, it is said that the demand of the miners for recognition of their organization forms the chief obstacle in the way of reaching a settlement.

Mt. Carmel—A miners' accommodation car on the Reading railroad, near the Philadelphia & Reading Coal & Iron Co.'s Alaska shaft, was blown to pieces, Apr. 17, by dynamiters. A passenger train had passed the siding on which the car lay one minute before the explosion occurred. A detail of coal and iron police are hunting for the dynamiters.

West Virginia

Moundsville—An injunction was granted here, Apr. 16, restraining members of the United Mine Workers from interfering with the operation of the Mound coal mine, where a strike has been in progress for some time, following the refusal of the company to recognize the union. A renewal of the rioting, in which nine men were injured, is anticipated.

Charleston—Only about 40 of the 15 mines in the Kanawha district are now working, as a result of the failure of the miners and operators to agree on a wage scale, and between 8500 and 9000 miners are on a strike. The final disagreement came when the operators refused to grant more than the agreement called for last year, while the miners demanded an unlimited check-off.

The mines closed down include all those along the Kanawha & Michigan R.R. in West Virginia. This takes in several thousand miners in Fayette County and a similar number in Kanawha County. Also, all mines are closed along the Chesapeake & Ohio in the Kanawha district, and along the branch lines, with the exception of those on the Cabin Creek branch, and the Coal River extension of the Cabin Creek branch, about 40 in number.

The Kanawha district has about 13,500 miners, so that the number now out represents approximately two-thirds. As far as it has been possible to learn, none of the mines are closed in the New River district nor in the Norfolk & Western district, but it is reported that a number of those in the northern section of the state are shut down.

Fairmont—The Consolidation Coal Co. has received an order to ship 50,000 tons of coal to Egypt to be used on the state railways. This is the second such order this company has received recently. The company is still shipping coal to England in spite of the fact that the coal strike there has been declared off. The order for Egypt will be shipped within a short time from Baltimore.

Washington

Palouse—A. E. Sever, president of the Palouse Coal & Oil Co., M. M. Waters, and C. E. Allen, who was engaged during the last winter prospecting on the land of the Palouse Coal & Oil Co., have secured a lease on ground in the vicinity of Glenwood, where indications of the existence of coal seams have recently been found. It is the intention of the lessees to prospect the new fields at once.

Personals

M. M. Bardwell, general manager of the North Jellico Coal Co., of Louisville, Ky., is at Atlantic City, recuperating from a recent illness.

Robert Lake, of Jackson, Mich., president of the Michigan-Ohio-Indiana Coal Association, was a recent visitor in Columbus, where he called upon a number of coal men.

J. C. Colsom, coal operator and president of the Indiana Operators' Association, is seeking nomination as a candidate for state senator from Vigo County to the next Indiana legislature.

C. W. Adams, vice-president of the St. Paul & Western Coal Co., a subsidiary of the Sunday Creek Coal Co., of Columbus, was recently a caller at the office of the parent company.

C. R. Leake and H. A. Turner, engineers and coal experts of Birmingham, Ala., recently made an examination of the coal-land holdings of the Cullman Coal & Coke Co., at Bremen, Alabama.

Congressman Bowman, of Pittston, Penn., has been elected vice-president of the Roden Coal Co., of Marvel, Ala., of which company his son-in-law, B. F. Roden, is president and general manager.

A. W. Fleugel, superintendent of the Island Creek Coal Co.'s docks at Duluth and Superior, recently returned from a trip to Milwaukee and other points, where he inspected various dock properties and equipment.

J. D. O'Neill, president of the United Coal Co., of Pittsburg, Penn., in company with W. S. Kuhn and W. E. Moore, large stockholders in the company, recently made a trip of inspection to the plant of the Merchants Coal Co., at Boswell, Penn., a subsidiary concern.

Chester W. O'Neill, for the past five years general sales agent of the Independent Coal & Coke Co., at Salt Lake City, has been appointed general Western sales agent for the company and will open permanent offices in San Francisco. Mr. O'Neill will be succeeded in the Utah-Idaho-Montana field by William Gorton, who hitherto has been located at the company's mines in Kenilworth, Utah.

Morris H. Bush, general superintendent of the Woodward Iron Co., has succeeded A. H. Woodward as a member of the mine casualty and mining institute committee of the Alabama Coal Operators' Association following the election of Mr. Woodward to the executive committee of the association. Benjamin F. Roden, of Marvel, Ala., has succeeded C. P. Ludwig, general superintendent of the Alabama Consolidated Coal & Coke Co., on the mine-casualty committee, on account of the withdrawal of the Alabama Consolidated Co. from the association.

Obituary

Edward Avery, aged 78, president of the Avery Coal & Mining Co., with mines in the vicinity of Marissa, Ill., died at his home in St. Louis, Apr. 10.

Charles Clark, a capitalist and one of the founders and directors of the Kansas & Texas Coal Co., died in St. Louis Apr. 18. Mr. Clark was 80 years of age.

George F. Huff, former congressman, banker, coal operator and philanthropist, of Greensburg, Penn., died at his winter residence in Washington, D. C., Apr. 18, after a lingering illness.

Mr. Huff was born July 16, 1842, at Norristown, Penn. He attended the public schools at Norristown until he was 17 years old and then the family moved to Altoona. At the latter place he entered the repair shops of the Pennsylvania R.R. and learned the trade of a car finisher. At the age of 20 years, he entered the banking house of Julian M. Lloyd & Co., Altoona. With his employer he organized a bank at Ebensburg, Cambria County. He was successful, and two years later came to Greensburg and organized a banking house, known as Lloyd, Huff & Co. Later this company was changed to the Greensburg Deposit Bank.

During the years Mr. Huff was engaged in the organization of banking houses he became interested in coal lands. He was president of the Keystone Coal & Coke Co. at the time of his death. The Keystone Coal & Coke Co. is composed of a number of coal companies, all of which originally were organized by Mr. Huff. They are the Greensburg Coal Co., Alexandria Coal Co., Mountain Coal Co., Mutual Mining and Manufacturing Co., Manor Gas & Coal Co., Madison Coal Co., Salem Coal Co., Latrobe Coal Co. and the Carbon Coal Co.

Mr. Huff organized and constructed the Southwest Pennsylvania R.R., which operated lines from Greensburg to the various coal towns in Westmoreland County. He also organized and constructed the Greensburg Electric Street Ry., the Greensburg Electric Light Co. and the Westmoreland Light and Heat Co.

Mr. Huff began his political career in 1881, when he was elected as a national delegate to the Republican convention at Chicago. In 1884 he was elected state senator and in 1888 he was elected Congressman, from the district which consisted of Westmoreland, Indiana, Armstrong and Jefferson counties and was re-elected in 1890 and 1893. In 1894 he was chosen Congressman-at-large. He was elected to Congress again in 1904, 1906 and 1908, and refused the nomination in 1910.

Mr. Huff spent his summers in Greensburg, where he owned an estate of 500 acres, and the winters in Washington. He is survived by his widow and four children.

Construction News

Brownsville, Penn.—Two hundred coke ovens are being installed at the Alicia mines near here, owned by W. H. Brown, of Pittsburg.

Willmar, Minn.—The Harmon Coal Co., of Chicago, contemplates building here a large coal-storage and distributing plant of 500,000 tons capacity.

Lonaconing, Md.—Louis Stanton, of Frostburg, Md., has purchased the property of the Georges Creek Coal Basin Co. for $20,000 and will open a new mine.

Crewe, Va.—The Southern Timber Co. is organizing to develop 10,000 acres of coal land and will install equipment for 2000 tons daily capacity; contracts not yet awarded.

Philadelphia, Penn.—The Pennsylvania R.R. Co. will construct a new coal pier at Greenwich Point. Estimated cost, $200,000. Alexander C. Shand, Philadelphia, is chief engineer.

Philadelphia, Penn.—The Philadelphia & Reading Ry. Co. plans making extensive improvements to its coal pier at Port Richmond. W. Hunter, Philadelphia, is chief engineer.

Burgettstown, Penn.—Smith & Lewis, engineers, Oliver Bldg., Pittsburg, are receiving bids for the erection of buildings for the Atlas Coal Co., Burgettstown; also for piping and other equipment.

Williamsburg, Ky.—The Proctor Coal Co. is opening new mines at Red Ash, in Whitley County, near here, and is purchasing equipment. Charles Finley, Williamsburg, is president and general manager.

Pine Hill, Ky.—The Kentucky Portland Cement & Coal Co., Munsey Bldg., Baltimore, Md., will develop 1200 acres of coal land for daily capacity of 500 tons; cement plant and coal mine equipment to cost $900,000.

Maben, Ala.—Improvements contemplated by the Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., for the Bessie mine, at Maben, include two new boilers, increasing the boiler capacity 400 hp., also one air compressor.

Columbus, Ohio—The Provident Coal Co. is prepared to let contracts for construction work in connection with opening its new mine at Fairpoint. Contracts will be awarded for grading, laying tracks, mine openings and concrete construction.

Barbourville, Ky.—The Knox Coal Mining Co., of Louisville, Ky., recently incorporated with $1,000,000 capital stock, will develop 40,000 acres of coal land and will soon be open for bids for mining machinery and plant. Address company at Barbourville.

Coeburn, Va.—H. F. Whitehead, general superintendent, Virginia Iron, Coal & Coke Co., contemplates various improvements at its coal mines, doubling their capacity. It is proposed to equip the mines with new motors, erecting a steel tipple near Sexton and Thelma and to build dwellings.

Harlan, Ky.—Contracts are now being let by the Harlan Coal Co., which is developing a tract of 10,000 acres of coal lands near here. A 5-mile extension to the mines is being built by the Louisville & Nashville Ry. Machinery at the plant will be electrically operated. Kenneth Meguire, of the Snead & Meguire Coal Co., Louisville, Ky., is one of the officers of the company.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

Readjustments in market conditions have advanced to a point where the trade is again in an approximately normal condition. Some uncertainty is still felt over the anthracite situation, but it is the general belief that an agreement will be effected at an early date. The continued and apparently harmonious sittings of the wage-scale committees substantiate this belief. Bituminous mines resumed operation under curtailed capacity, Apr. 22, as was expected. Consumers are not in the market for much tonnage, as most large steam users were prepared for a 30-day suspension, and it will be two weeks before production is brought up to normal.

Wholesalers in the East are reluctant to see the market drop back to normal, as many still have considerable high-price speculative coal on hand. Comparatively little fuel is coming forward, but even these small arrivals are difficult to dispose of, as the trade is apathetic with little or no demand at full circular prices. Only about 50 per cent. of the mines in the Pittsburg district have resumed operations and production will not be up to full rated capacity for two or three weeks. West Virginia mines are supplying what little demand there is in Ohio, the trade there being quiet in every respect. Interest is now centering on the lake trade and coal fleets are preparing to sail.

Supplies in the Middle West have held out well, and the market is heavy and slow. The speculative coal, with which Chicago was swamped a few weeks ago, has been cleaned up, and there is some demand in screenings. The large tonnages, stored on the ground in anticipation of a strike, are being loaded, and a few shipments of Kentucky coals are coming in. There is a perceptible evidence of hesitancy in the trade generally.

Boston, Mass.

There has been little change in the market this week. Wholesalers are naturally reluctant to drop back, but trade in bituminous is fast settling down to an everyday basis. Cargoes from Hampton Roads are still arriving with high-priced coal and heavy demurrage charges, and in most cases where there are unsold balances they are hard to dispose of. The buyers have little interest in a receding market.

Georges Creek is being freely shipped but Pennsylvanias are getting heavy. Aside from shipments here and there to relieve those who were unable to get supplies earlier, or more likely to fill orders entered on a "panic" basis there is relatively little coal coming forward, and sales are few. On contract there is some inquiry but apparently it will be difficult to get spirit into the trade until the season is further advanced. The Virginia loading is improving rapidly, and Pocahontas and New River are quoted at near normal prices.

Freights are dull and on tonnage from Hampton Roads individual charters are matters of barter. On Long Island Sound from New York the market is off to the summer basis of 45@50 cents.

Soft coal, all-rail is coming through in large quantities, probably a clearing up of last month's mining. Speculators are having difficulty in placing this coal and since buyers are more fussy about quality than they were a month ago some low prices are heard.

Anthracite seems to be marking time. Large premiums are no longer paid, and a good volume of stock coal, especially in egg and chestnut, is being let into the market. The spring weather makes the retail demand light. Prevailing prices are:

Clearfields, f.o.b. mines	$1.20@1.40
Clearfields, f.o.b. Philadelphia	2.50@2.75
Pocahontas, New River, f.o.b. Hampton Roads	2.75@2.80

New York

The extent to which storing was carried on in anticipation of a protracted shutdown at the mines is now becoming evident by the total absence of buyers. Arrivals here so far this month have been much below normal, but there is scarcely any demand, and while prices are fairly strong, there are few transactions.

In bituminous the consumers appear to be heavily stocked, and there are few or no requests for spot coal. The railroad movement is good, water freights easier, and the arrivals steadily improving with the general resumption at the mines. Contrary to reports from West Virginia, the larger companies here say there is no labor shortage at the mines. Ordinary grades of bituminous are quoted at $2.80 f.o.b., with the better grades bringing $3.25, but there are few transactions and prices fluctuate rapidly.

It is now evident there will be no resumption at the anthracite mines by May 1, and it is generally believed it will be May 15, and possibly later, before the mines are again in operation. Work at present is confined entirely to keeping the mines unwatered; some of the larger companies in transferring coal from one colliery to another, created the erroneous rumor that they were again shipping.

There is little activity in the anthracite market at present, but it is believed the supplies are now pretty well exhausted and another week will show a decided tightening of the market. Wholesale anthracite quotations, f.o.b. New York, are as follows:

Egg	$5.00
Stove	5.50
Chestnut	5.20
Pea	3.75
Buckwheat	3.25
Rice	2.25
Barley	2.00

Philadelphia, Penn.

After almost four weeks of idleness at the mines, the anthracite industry in this city still continues in rather an apathetic condition. All dealers report that what business they are doing comes in one- and two-ton lot orders, and careful inquiry elicits the information that nearly all the dealers are in fairly good condition as regards their supply of the domestic sizes. In fact, many of them have considerably more than they want, when there are rumors that an adjustment of the difficulty between the miners and operators seems to be nearing a conclusion, and they are all hoping that the suspension will continue until they have worked off most if not all of the high-priced coal.

It almost goes without saying that there wil be some reduction in prices by the wholesale operators in the event of an early settlement of the present difficulty, but even if they do reduce the prices, it does not necessarily follow that the retailers will do the same; it might be a matter of protection to the dealers to continue present prices until their stocks of winter coal are disposed of. However, no action has as yet been taken by either one or the other, the trade as a unit waiting the final settlement of the labor controversy.

Our previous prediction that mining would not be resumed until the middle of May seems to be confirmed, as any arrangements looking to settlement during the coming week, would hardly become operative until about that time. Very little anthracite coal is coming to this market, just small odds and ends, which some of the little washeries in the

regions are able to turn out, and there is not a particularly good market for it. Dealers are looking askance at coal now at the full circular prices ruling during the winter months, and unless they are in actual need, are not disposed to buy. Steam coals, of which there is little offering, seem to fare better, but the amount is so small that it hardly deserves mention.

Pittsburg

Bituminous—The Cleveland wage scale adjustment was accepted by the miners and arrangements completed for opening the mines Monday, Apr. 22. The opening, however, was far from general, as demand for coal was so light. Large consumers had laid in stocks to carry them fully 30 days, and dealers were also fairly well stocked, so that there has not only been no pressure to obtain coal, but even an absence of the normal current demand. Probably less than one-half the capacity of the Pittsburg district has been put in operation, but production is expected to increase steadily, and to reach normal proportions within two or three weeks.

Shipments in the lake trade will begin nominally May 1, when the reduced rate of 78c., against 88c. last season, goes into effect. They will hardly be large at the start, but the season as a whole is expected to make a new record. As far as can be learned no regular selling has been done in the lake trade.

There is no demand, but producers are naming prices on a basis 7½c. higher than last year's regular or official basis, as follows: Mine-run and nut, $1.22½; ¾-in., $1.32½; 1¼-in., $1.47½; slack, 82½c. These prices constitute the quotable market at the moment, but whether they will hold is another matter. Last year's prices, based on $1.15, were shaded during the major portion of the season.

Connellsville Coke—The market is quiet, but prices are not easier as coke is scarce. We quote: prompt furnace, $2.60 @ 2.65; prompt foundry, $3; contract foundry, $2.65 @ 2.75.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Apr. 13 at 363,-289 tons, a drop of 52,000 tons. This was due to celebration of the Easter holidays by the foreign workmen. Some interests in the trade estimate that the actual decrease was larger than shown in the figures quoted, pointing out in addition that the *Courier* figures show very little greater drop in the lower Connellsville region than in the upper, whereas the lower Connellsville labor is almost entirely foreign, and in the upper region a large percentage is American. Shipments were reported at 4210 cars to Pittsburg, 5477 cars to points West and 1346 cars to points East, a total of 11,-033 cars, a decrease of 1300 cars.

Baltimore, Md.

Although some of the larger companies are still doing a fairly active business, the majority of the operators report the Baltimore coal market heavy during the past week. The demand was not near as good as in previous weeks, and, of course, prices took a further drop. A careful survey of the situation here shows that operators have, in most instances, not been able to get any better price than they obtained early in January or late last fall.

The general belief in Baltimore is that the coal trade will not show much life again until there is a more decided improvement in the business world. With the large industries running full time, the demand for coal would be increased, and as Baltimore usually holds its own in a competing market, when there is any business to compete for, local operators would probably obtain their share.

There are indications that this improvement in general business conditions will take place. The steel mills, which are large consumers of coal and coke, are operating at a greater capacity, and as steel may be said to reflect the general business condition, it would apepar that a gradual improvement in trade is taking place. Operators believe that inquiries for coal will be increased shortly, and that these inquiries will develop into deliveries.

The Consolidation Coal Co. is apparently not suffering any ill effects because of the slow market. During the past week, this well known concern forwarded 5000 tons of fuel to Egypt, for use on Egyptian Railroad. The entire contract closed in this country, calls for a delivery of about 50,000 tons. The Consolidation has numerous large orders on hand, and business is about as active now with this company as it was three or four weeks ago.

The Davis Coal & Coke Co. is now preparing to begin shipments on its contract with the Bethlehem Steel Co., and the first delivery will probably take place some time in June; the contract runs for 20 years. In order to supply the necessary fuel to the Bethlehem company, the Davis company has opened up three additional mines in the vicinity of Thomas, W. Va.

Complaint is still heard of a shortage of miners in West Virginia. It was stated in local coal circles during the week that the operators in that state could easily use 1500 additional men.

Buffalo, N. Y.

The demand for bituminous coal is light and matters are about as badly unsettled as ever, with very little prospect of any immediate change for the better. The operators are not anxious for an early resumption and are not at all pleased to find that quite a percentage of the mines in the Pittsburg district are already in operation. There is a good prospect that this new-mined coal will be on the market before there is any demand for it.

There is not much mining in the Allegheny Valley; a great part of the mines closed on the first of April and most of the others shut down on Apr. 15. The miners have been holding meetings in the valley and have issued a long list of demands, but the operators will make no further concessions than were made at the rate meeting at Cleveland last month.

There was to have been a meeting of the Allegheny Valley Operators' Association at East Brady on Apr. 19, but it was postponed. The fact is that if these mines are opened now there will be no market for the product and it is pretty close to that now. For this reason there will be no haste to get the men back to work, though there is no great expectation of saving the trade from the low prices of last year.

Buffalo operators in the tidewater trade claim it would be suicidal to make any further concessions to the miners, for they find the West Virginia product already commanding that market. If the demands of the miners were conceded, it is said that the cost of mining would be increased more than 30c. a ton.

As in recent seasons the Buffalo bituminous market will accept the prices made by the Pittsburgh Coal Co. as a basis, though it may be a hard matter to obtain them sometimes. The prices named, with freight to Buffalo added, are $2.67½ for Pittsburg select lump, $2.57½ for three-quarter, $2.47½ for mine-run and $2.10 for slack, with Connellsville coke as strong as ever and best foundry advanced to $5.

The lake fleet is preparing to sail at the end of the week, but it may be delayed by ice. There is soft coal for shipment from Erie and the Ohio ports, but nothing from Buffalo and none to be looked for at present.

There is so little demand for anthracite that dealers are getting a local supply, but shipping agents are receiving no regular amount. It now looks as though the anthracite miners would be idle for some time.

Cleveland, Ohio

The coal business continues practically at a standstill, because the miners are still out and also because of the large stocks the consumers acquired in anticipation of a strike. There is a little coal coming to Cleveland from the small mines which remained at work after the agreement expired, but this is very hard to dispose of. By the time the mines resume operations and get in full running order, it is hoped the supply will

be nearly exhausted, but nothing heavy is expected until about the first of June, at which time the stocks on hand should be used up, and the large tonnage going up the Lakes will put the market in a normal condition.

It is rumored that a large number of the Pittsburg operators will resume work on Apr. 22, and this coal will come to the Lake ports for shipments north as soon as boats are available. It is generally conceded that a very heavy tonnage will be shipped north this summer. On account of the extreme winter they have exhausted all the supplies on the docks, and will not only have to meet current demands, but will also have to restock the docks, which in the past few years they did not have to do.

Columbus, Ohio

The coal trade in Ohio during the past week has been quiet in most respects. There is not much demand for tonnage, even when all the mines have been closed down, and what demand there is has been taken care of by jobbers with West Virginia connections. Prices are ruling rather soft, which is difficult to explain, as the amount on hand is not considered very large for this season of the year.

The prospects are bright for a general resumption in all of the Ohio fields by May 1, and possibly there will be some coal mined before then. Operators are taking advantage of the suspension to place their mines in good condition, and they will be in a position to produce a large tonnage from the start.

Consumers of steam grades, who stocked up previous to Apr. 1 in fear of an extended suspension, are not renewing contracts. Many of the consumers seem to prefer taking chances on securing fuel in the open market and probably a number will not make contracts at this time.

The outlook for the future is considered good, and preparations are being made for a renewed activity in every line when the miners resume. The matter of prices is still a question of conjecture, and it is believed that quotations will rule rather low for some time. Prices which seem to prevail in Ohio fields are:

Hocking Valley	
Domestic lump	$1.50
$\frac{3}{4}$-in.	1.35
Nut	1.25
Mine-run	1.10
Nut, pea and slack	0.80
Coarse slack	0.70
Pittsburg No. 8	
$\frac{3}{4}$-in	$1.20
Mine-run	1.05
Coarse slack	0.75
Pomeroy Bend	
Domestic lump	$1.55
$\frac{3}{4}$-in	1.35
Nut	1.25
Mine-run	1.20
Nut, pea and slack	0.80
Coarse slack	0.70
Kanawha	
Domestic lump	$1.50
$\frac{3}{4}$-in	1.35
Mine-run	1.10
Slack	0.75

Indianapolis

The present indications are that the miners will not return to work Apr. 22, and possibly not on May 1, pending the final ratification of the wage scale. The operators may ask it, but the men will consent only on certain conditions, which are not likely to be accepted. The operators say they are not in need of coal at present, as the supply in storage is large enough to last until late in May at the present rate of consumption. Two years ago the men asked certain conditions, which were granted, and they worked for two months while a joint committee arranged the details of the final contract. At that time the Illinois miners were idle, and the operators had a large demand for coal from customers of the Illinois operators.

Chicago

Market conditions in Chicago have been exceedingly slow, buying being quite irregular. There was a slight increase in the demand for screenings, and indications are that all speculative coal has been disposed of.

It is expected that the buying of screenings will come first from the small users and a very fair demand is expected soon. Two of the largest concerns in the Pittsburg district have entered into competition in the Northwest with a cut price, and a sharp scramble for business is already under way. Whether the contract price on smokeless coal will hold throughout the year is a matter of speculation, and depends, dealers say, upon the turn of events in the anthracite field. No new shipments of anthracite are being received and business is dead. The market for coke is fairly steady.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.50@2.75
Steam lump	2.17
Screenings	1.67@1.82
Springfield:	
Domestic lump	$2.57@2.82
Steam lump	2.17
Mine-run	1.97@2.07
Screenings	1.67@1.82
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.17
Mine-run	1.97@2.07
Screenings	1.67@1.77
Pocahontas and New River:	
Mine-run	$3.15
Lump and egg	[illegible].05

Coke—Prices asked for coke are: Connellsville and Wise County, $4.85; byproduct, egg and stove, $4.95; byproduct, nut, $4.75; gas-house, $5.

Minneapolis—St. Paul

The unanimous opinion of coal men in the Twin Cities is that business in this market has never before been as quiet as at the present writing. Every branch of the coal trade seems to be in a state of hesitancy as wholesalers are still waiting for prices on which to place contracts and very little coal is coming this way for sale. Some steam users overstocked quite heavily in view of the strike and wholesalers report that a number of them are trying to back out of coal contracted for prior to Apr. 1. This has caused prices to drop considerably as some of these steam users resold coal at big losses and buyers looking for spot coal have had little trouble purchasing at low prices.

The rate case against the coal carriers in Pennsylvania before the Interstate Commerce Commission, having resulted in an order from the Commission reducing the rail rate on Youghiogheny coal from mines to Lake Erie points, 10c. per ton, has been announced in circulars issued by the Dock companies Apr. 15. Youghiogheny lump and nut sizes are quoted at $3.40 f.o.b. docks or $4.30 on track Twin Cities; dock run, $3.10 at docks or $4 at Twin Cities; Youghiogheny screenings, $2.40 dock or $3.30 track Twin Cities. Contracts are being let on Youghiogheny quite freely and wholesalers are anxiously waiting prices on which to base other coals.

The anthracite proposition is not causing very much excitement in this territory as it is generally well along in the summer before stocks arrive and by that time everything will most likely be adjusted. The retailers are the only ones who are uneasy as the consumer in the Northwestern territory has been educated to buy early during the summer and is now inquiring for prices from the retailer.

St. Louis, Mo.

The coal market in St. Louis is practically at a standstill. There are perhaps a dozen cars a week of Kentucky coal coming in, and the Illinois mines are loading the coal that was dumped on the ground previous to the shut down, whenever there is a demand for any. However, the demand is very small, and all grades of Standard coal have been practically a drug on the market.

There is still some Carterville coal being offered as low as $1.40 for lump and egg at the mines, and screenings at $1. Standard lump has been offered as low as $1.15 and screenings at 75c. At the present time there is no market in St. Louis for anything in the way of fuels.

Portland, Ore.

Coal dealers in Portland are having no trouble filling orders as it is the time of year when the demand is light. Cool weather is prevailing at this time, however, and the demand may be strengthened a little should it continue for a couple of weeks.

A topic of much interest here is the question of the policy to be followed in

regard to the coal lands of Alaska, the sentiment here being in favor of throwing them open for development. Cheaper coal here would have a tendency to stimulate many industries, and the establishment of large coal bunkers in Portland harbor is being given serious consideration by the Port of Portland Commission. The arrival of coal from foreign destinations has been very light here since the first of the year.

Production and Transportation Statistics

The Car Situation

The following table shows the surplus and shortages of cars on 169 roads on Apr. 11 last:

	Surplus	Short.	Net Surplus
Box	17,616	9,646	7,970
Flat	5,684	1,337	4,347
Coal, gond. and hopper	48,800	1,222	47,578
Other kinds	22,843	3,349	19,494
Total	94,943	15,554	79,389

Only section to report a decrease in idle cars was Montana, Wyoming and Nebraska, where a total of only 336 idle cars was reported, compared with 1551 two weeks before. Increased demand for box cars was the cause.

Some Government Contracts Pending

Washington, D. C.—Bids are asked by the Paymaster-General, U. S. N., Chief of the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., for furnishing bituminous and semi-bituminous coal, to be delivered in such quantities and at such times as may be required during the fiscal year ending June 30, 1913. The coal is to be 2240 lb. to the ton, and is to have an analysis indicating quality not lower than the following:

Moisture, "delivered coal," 3 per cent.; ash, 'dry coal," 10 per cent.; volatile matter, "dry coal," 22 per cent.; sulphur, "dry coal," 1¾ per cent.; "B. t.u.," "dry coal," not less than 14,200 per pound.

Schedule 4492, opening 10 a.m., May 14:

Class 1, 1300 tons bituminous coal, for delivery at the naval powder depot, Lake Denmark, Morris County, N. J.

Class 2, for delivery at Navy Yard, Philadelphia, Penn., 18,000 tons semi-bituminous coal.

Class 3, for delivery at the Naval Academy, Annapolis, Md., 12,000 tons bituminous coal for steaming purposes.

Class 4, for delivery at the Naval Engineering Experiment Station, near Annapolis, Md., 1500 tons bituminous coal.

Class 5, for delivery at the Naval Hospital, Washington, D. C., 2500 tons semi-bituminous coal, best quality.

Class 6, for delivery at the Navy Yard, Washington, D. C., 30,000 tons bituminous coal, to be standard grade New River, Pocahontas or Georges Creek coal, and to be crushed so that it will pass through a ring two inches in diameter.

Class 7, to be delivered at the Navy Yard, Norfolk, Va., 15,000 tons, semi-bituminous coal.

Class 8, to be delivered at the Naval Hospital, Norfolk, Va., 2500 tons semi-bituminous coal, best quality.

Class 9, to be delivered at the Naval Training Station, North Chicago, Ill., 13,500 tons bituminous coal.

Bidders are required to state: The commercial name of the coal, name of mine or mines, location of mine or mines, name or other designation of the coal bed or beds, British thermal units per pound, percentage of sulphur in "dry coal," percentage of ash in "dry coal," percentage of volatile matter in "dry coal," moisture in coal as received, and to furnish samples for test.

Ohio Coal Traffic Statement

Comparative statement of bituminous shipments over the principal Ohio railroads, for February, 1911-12, in short tons:

	1911	1912
Hocking Valley	238,060	417,176
Toledo & Ohio Central	85,282	165,118
Baltimore & Ohio	128,611	244,409
Wheeling & Lake Erie	231,328	409,966
Cleveland, Lorain & Wheeling	147,549	298,896
Zanesville & Western	94,309	121,410
Toledo Division, Pennsylvania Co.	153,504	561,675
Lake Erie, Alliance & Wheeling	99,425	141,643
Marietta, Columbus & Cleveland	1,403	13,942
Wabash Pittsburgh Terminal	7,160	4,432
Kanawha & Michigan	10,066	20,260
Total	1,196,697	2,398,927

Water Shipments to California

The following is a comparative statement of water shipments of coal and coke to California during the last three years in long tons:

Coal	1909	1910	1911
British Columbia	188,125	157,489	207,203
Australia	68,086	115,179	198,730
Great Britain	3,105	....	2,639
China	....	....	6,170
Japan	546	38,817	279
Oregon	24,125	25,293	7,439
Washington	16,940	50,342	57,298
Eastern	69,696	101,265	80,338
Total	370,623	486,385	**560,096**
Coke			
Great Britain	59,804	57,496	87,296
Australia	14,955	14,442	3,725
Washington	......	......	......
Japan	......	2,500	2,795
Total	74,759	74,438	93,816

Foreign Markets

The following is a comparative statement of the British fuel exports for the first three months of 1911-12, in tons:

	1911	1912
Anthracite	597,551	558,004
Steam	11,054,747	9,046,223
Gas	2,442,009	1,938,998
Household	368,444	299,234
Other sorts	738,601	630,613
Coke	251,671	277,123
Patented fuel	425,246	373,332
Bunker coal	4,701,509	4,051,302
Totals	20,579,778	17,174,829

British Columbia

In the East Kootenai district of British Columbia there was a falling off during the year of 1911 of 605,000 tons of coal and 40,000 tons of coke as compared with the production in 1910, and the total coal shortage for the whole province was 365,000 tons. Much loss was sustained by the various mineral smelters, due to the coal strike, and the shutting off of the coke supply.

Dutch Imports and Exports

The imports of coal into Dutch ports during 1911 showed an increase over the previous year's figures to the extent of nearly one million tons, the total being 11,344,981 tons, as against 10,347,138 tons. In 1910 a similar increase over 1909 was recorded. The exports last year amounted to 4,330,282 tons, showing an increase of 314,353 tons over the 4,015,929 tons exported in 1910.

Financial Notes

The New York Stock Exchange has listed $960,000 additional first and second, 40-year, 5% bonds of the Consolidation Coal Co., due 1950, making the total amount listed $13,960,000. New bonds are issued for additions and improvements.

The Delaware & Hudson Co.'s stock and bond holdings increased from $23,967,687 in 1910 to $27,014,189 at the close of 1911. The gain was almost wholly accounted for by the increase in Hudson Coal stock from $100,000 to $2,500,000. This served to settle the account owed by the coal company to the railroad company. The change in bonds held by the company's treasury was under $500,000.

Annual report of the International Coal and Coke Co. shows disbursements for last year as follows: Dividends, $56,073.38; maintenance, $77,554.28, and improvements, $47,029.61. The company is capitalized at $3,000,000 and owns mines in Alberta, British Columbia. Operations were suspended during eight months of last year because of strikes. It is believed the company will make a better showing during the current year.

United States District Court for northern district of Ohio, in the case of protective committee for Pittsburgh, Wheeling & Lake Erie Coal Co. 4% bondholders vs. Wheeling & Lake Erie Railroad Co. and others, held railroad company is obliged to pay off $200,000 prior lien obligations of coal company. Decision established that where corporation is organized and managed simply as adjunct to another corporation, principal corporation is liable for debts of subsidiary.

Chairman Taylor, of the Pittsburg Coal Co., gives the following details of the deals with the H. C. Frick Coke Co. and the stockholders of the Monongahela River C. C. & C. Co.: The company sold about 7000 acres of coking coal land, with improvements, at $1450 per acre to the Frick company. The final settlement will bring the proceeds up about $10,000,000. A payment of $9,561,000 has been made in H. C. Frick Coke bonds, which were sold at par, less 1 per cent. commission, and with the proceeds $8,600,000 Pittsburg Coal bonds were purchased at 110 and interest.

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CA

COAL AGE

Devoted to Coal Mining and Coke Manufacture

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CONVEYOR BOOM, LOADING LUMP COAL INTO CAR, ANNABELLE MINE, FOUR STATES COAL CO.

COAL AGE

Vol. 1 NEW YORK, MAY 4, 1912 No. 30

THE New Zealand Arbitration Court, created for the settlement of labor disputes, is the most successful body of this kind in the world. It is not bound by precedent, nor hampered by technicalities, and having legislative, as well as judicial powers, may do its best to attain fair and reasonable wages within the limits fixed by economic law.

The greatest danger connected with the just and equable distribution of wealth lies in our proneness to forget there is such a thing as market value, and, as a consequence, we often ignore the relation between what is desirable and what is possible.

As the system in New Zealand now stands, both strikes and lockouts are illegal; the piece-work system is forbidden, a minimum wage is defined for practically every trade, and the right of unionists to preference of employment is recognized. Conciliation has been declared a failure, the belief prevailing that mediation and compulsory arbitration cannot be combined. The Court reserves the right to make the contracts that exist between workmen and employers.

The aim of the Arbitration Board is intelligently set forth in the following words of one of its members: "The duty of the Court is to pronounce such an award as will enable the particular trade to be carried on, and not to impose such conditions as would make it better for the employer to close down his operations, or for the workmen to cease laboring, than to conform to them."

Compulsory arbitration has resulted in making wages more rigid, because of the difficulty met in changing the pay of one class of men without making many other changes, so as to uniformly adjust conditions in closely connected trades. There is also the inefficient or no-profit employer, who opposes the raising of wages on the ground that the slightest concession would plunge him into bankruptcy. His protests have their effect on the Arbitration Court.

Among the educated people in New Zealand, the belief prevails that any attempt to lay violent hands upon the profits of employers would put an end to all business enterprise, and thus destroy the very source from which the wealth is drawn. From such an idea, it is but a step to the position that wages are determined chiefly by economic laws, and the Court can cause only slight deviations from the valuations of the market.

The Arbitration Board has abolished "sweating," and strikes have been prevented. It is a question, however, whether the men would not have gained as much by dealing directly with their employers. It is admitted by all that wages have not increased more than the cost of living; the advance in the former over a period of 12 years has been in the ratio of 84.8 to 104.9; the cost of food increased in the ratio of 84.3 to 103.3.

Employers have been inclined to throw the blame for the high cost of production upon the Arbitration Court. Their idea is that the present method of settling disputes has added to their operation charges, not so much by fixing minimum wages as by granting limitation of apprentices, prohibition of piecework and other restrictions.

The "go easy" way of working has gained ground in New Zealand in recent years. As in other countries, the tendency of trade unionism seems to be toward a levelling down, which discourages capable men from doing their best work, and results in industrial inefficiency.

The actual results of government ownership of mines, federal competition in business, old-age pensions, and the effect of radical labor legislation in New Zealand will be discussed next week.

Fireproof Coal Washery, Panama, Ill.

By John A. Garcia *

This modern plant of 1200 tons daily capacity is of concrete and steel construction throughout. It washes all material passing through 3-in. screens at the tipple and makes five sizes of coal. Its greater efficiency, lower cost for operation and maintenance and longer life make this installation economical as compared with the more usual timber structure.

One of the main objections to coal washeries is the fact that they have a bad habit of burning down and leaving the coal company with a collection of contracts for washed coal and a lack of contracts for raw screenings, a combination sufficient in itself to reduce the revenue of the average mine below the cost of production; and this condition, although quite common in the coal business, is none the less undesirable.

The Shoal Creek Co. of Panama, Ill., was confronted last March with the problem of a burned down washery and a box full of washed coal contracts, and out of this distressing predicament it has developed a really fire-proof coal washery. This plant is simple, compact and efficient as well as fireproof and yet cost but a little more than an equivalent design of wood construction. The Allen & Garcia Co. of Chicago was given the commission for designing and superintending the construction of the washery about the middle of June. On October 3, practically 120 days later, the plant put out 400 tons of washed coal and from that day has continued to operate regularly without hitch or breakdown, a record seldom equaled in washery construction.

Completed Washery, Panama, Ill.

View Showing Steel Washed-coal Bins

The washery has an output capacity of 1200 tons per day and a storage capacity of 600 tons of raw coal and 550 tons of washed coal, a total of 1150 tons. The plant is rendered more or less independent of the continuous operation of the mine by the great capacity of its raw coal tank and the arrangement for unloading screenings which are shipped in from other mines—a part of the installation that is not yet in place.

Belt Conveyor to Washery

A 30-in. belt conveyor 174 ft. centers and built on an angle of 20½ deg. conveys the 3-in. screenings which pass through the tipple shaking screen to the top of the raw coal bin of the washery. This bin is 36 ft. in diameter and 32 ft. high, is built of steel, with a conical bottom and is equipped with a Humphrey ladder, designed to carry coal to the bottom of the bin with practically no breakage.

Coal is led from the storage bin to three Shannon jigs by a separate chute for each jig. Its flow in each chute is controlled by a lifting gate, which is operated from the revolving jig shaft and automatically feeds the proper amount of coal to each washer.

The Shannon jigs operate in a concrete tank which forms a part of one large concrete tank that is made up of several sections variously devoted to the refuse elevators, jigs and washed-coal dewatering arrangement. This tank, or series of tanks, is a massive body of concrete and although apparently expensive, is in reality the least expensive type of jig tank that can be built, because the bulk of the concrete construction greatly reduces its price per yard. Each jig has a normal capacity of 50 tons per hour so that the total jig capacity is in excess of the ordinary tonnage of the mine, which averages 2000 tons per day and makes about 50 per cent. of 3-in. screenings. The object of providing the excess jig capacity was to enable the washery to continue in operation up to the capacity of the mines should it be found necessary to shut down one jig. The refuse from the jigs, is released from the bottom of the tank by means of a gate and hand-controlled lever. It settles to the bottom of the refuse tank where it is caught by a bucket elevator, raised to a steel refuse bin and thence carried by a Koppel side-dump car to a spoil tank across the tracks.

Shaking Screens Size the Coal

Coal from the jigs flows over steel aprons to the washed-coal tank, whence it is taken up by a bucket elevator to a head chute which carries it to the sizing screens. The first operation in sizing is accomplished by means of a double-deck Parrish shaking screen, hung on 1x10-in. ash boards and run at 120 r.p.m. This shaker makes perfect separation of the following sizes:—3-in. to 2-in., or No. 1 nut; 2-in. to 1-in., or No. 2 nut; and 1-in. to ¾-in. or No. 3 nut. Everything under ¾-in. is carried by chutes to revolving screens where it is separated into No. 4 and No. 5, sizes, the No. 5 passing to the dewatering tank and thence by a perforated bucket elevator to the loading bin.

The amount of machinery employed is reduced to a minimum, the whole equipment practically resolving itself into 3 jigs, 3 elevators, a No. 6 centrifugal pump, a steam pump and the separating screens. This entire outfit is driven by one double engine, connected by rope drive to a line shaft and thence by belt and chain drives to the various units.

*Consulting engineer, McCormick Building, Chicago, Ill.

INTERIOR VIEW NEAR RAW-COAL BIN

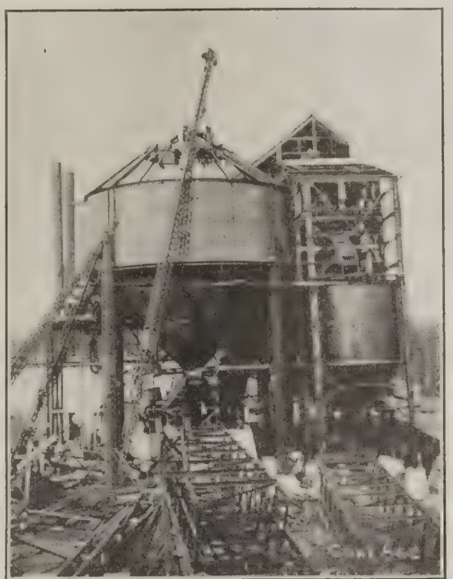
SHAKING SCREEN, SIZING NO. 3 WASHED COAL

The raw-coal conveyor is driven by rope drive from a single 40 h.p. engine in the yard near the tipple.

The five washed coal bins are each 18 ft. in diameter and 22 ft. deep, with conical bottoms. They are duplicates in design and construction and their shop and erection costs were quite low on this account. The bottoms of the bins are provided with heavy cast iron thimbles, having 15-in. openings and the flow of coal is controlled by slide gates which are moved back and forth in the direction of the loading track, by hand levers. The coal is allowed to flow into a car until it reaches the height of the bin gate and then the car is dropped slowly down the track, thereby giving each car load the neat and trim appearance that is so important to well prepared coal because the best screened coal, if loaded in a slovenly manner, at once creates a bad impression that its real merit can hardly overcome.

FIREPROOF CONSTRUCTION

The roof and upper section of the washery building and the conveyor runway are covered with No. 22 and No. 24 gage galvanized corrugated iron. The lower section of the main building is enclosed in Hy-Rib and cement. The engine room floor is of cement and the walkway of the conveyor structure is of Hy-Rib-cement construction. The hand rails are gas pipe and excepting for a few temporary walkways and hard maple stair treads there is nothing to burn in any part of the building.



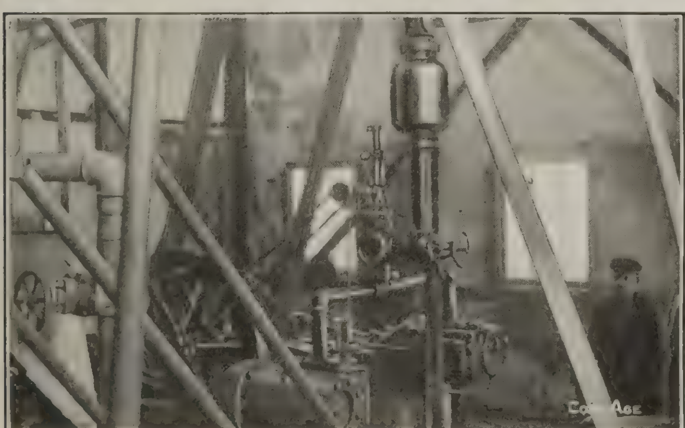
VIEW DURING CONSTRUCTION

The secret of the low first cost of the structure lies largely in the design of the structural steel, placing metal where it belongs and eliminating unnecessary members, and also in the compact arrangement of the mechanical units in order to economize space. The entire operation may be seen and controlled from either the jigs or the driving engine and it is the ambition of the coal company's management to operate the plant with two men—one at the jigs and one on the refuse car with, of course, the usual labor for spotting and loading cars.

Since the raw and washed coal tanks are protected by a rust proof paint—"Cunninghams Coal Tar"—no deterioration of steel due to sulphur in the coal is expected, although the interior of the bins will have to be repainted occasionally (a Sunday job).

The washery uses a very small quantity of water per ton of coal and after the first day's run there was practically no waste coal in the refuse. Because of the high efficiency of the machinery, the steam consumption of the driving engines is less than in the old washery which had only two-thirds the capacity of the new plant.

There are many desirable features and conveniences in the construction of this washery. A walk is built along the outside line of columns at the proper height to facilitate the loading of cars and the operation of the slide gates. There are Humphrey ladders in No. 1 and No. 2 bins which prevent the breakage of coal when flowing into the empty tank and the circular form of the bins together with their conical bottoms allows the coal to run uniformly from all sides



WASHERY ENGINE AND ROPE DRIVE

SHANNON JIGS, SHOWING MAIN SHAFTING

to the gates. Every bin will empty itself perfectly, and a car of coal can be loaded in 5 minutes.

A supply of circulating water is taken from the dewatering tank by a No. 6 centrifugal pump and, delivered to the head of all sizing screens, and also to a sluice way leading to the rotary screens. The fresh water supply is pumped directly from the reservoir, or may be taken by gravity from a storage tank placed on the hill at the proper elevation, and is delivered to the lower end of all screens, so that the various sizes of coal are clean and bright as they reach the bins.

While the machinery is arranged compactly and within an extremely small compass, every part of it is easily accessible. The conveyors are wholly within the building, and all shafting, gearing and belting are carried over platforms, easily reached by convenient stairways and walks. There is a walk entirely around the screens, and an outside stairway leading from the screening house to the top of the raw-coal bin. This latter can also be reached from the tipple by a walk alongside of the conveyor. The whole structure is notable for its extreme rigidity and strength.

An Economical Installation

Screenings in the Montgomery County, Illinois, field contain a large percentage of foreign substances, due to the sulphur streaks, blue band and bone coal found in the seam and to the methods of mining and loading, and it is expected that this type of washery will almost revolutionize coal mining practice in this field.

The greater average revenue which can be obtained from an installation of this kind, after deducting the cost of washing and the interest on the cost of construction, makes for an ideal investment. In addition, a wider range of sizes and an improved quality of product are secured, and therefore, a wider market and better running time, which, of course, also make for cheaper coal.

The structural steel for this installation was furnished and erected by the Wisconsin Bridge & Iron Co., Milwaukee, Wis.; the machinery was supplied by the Link-Belt Co., Chicago, and the entire plant designed and superintended by the Allen & Garcia Co., Engineers, Chicago.

A Mammoth Seam in Colorado

By Benedict Shubart*

A description of the preliminary development of an unusually large Western seam. The customary tipple has been replaced by a system in which the coal that is to be sized and loaded into railroad cars, is dumped at the railroad-track level, and then elevated to the top of the screens by means of an inclined conveyor.

*Boston Building, Denver, Colo.

Commencing Dec. 15, 1911, coal was shipped from one of the most remarkable mines in Colorado. The recently completed Laramie, Hahn's Peak & Pacific Railroad, starting at Laramie, Wyo., and running southwest to the North Park coal field in Jackson County, Colo., has opened up to market the immense seams of coal long known to exist in that field.

The Coal

During the last two years, E. R. Miller, Stewart Kennedy, and others, have been acquiring coal land and doing prospecting work in this section. For many years past the ranchers have driven from 75 miles around to this seam, digging the coal from an open pit, and hauling it to their ranches in wagons. But the full thickness of the seams was never developed until these men thoroughly prospected the field with a Loomis "Hollow-rod" drill, proving a top seam 65 ft. thick with 2 ft. of clay and 10 ft. of bottom coal, and three lower seams, 30 ft., 12 ft. and 18 ft. thick respectively.

The Northern Colorado Coal Co., incorporated under Wyoming laws, was organized and has acquired 4000 acres of coal land and a considerable amount of ranch land for the purpose of raising supplies and forage.

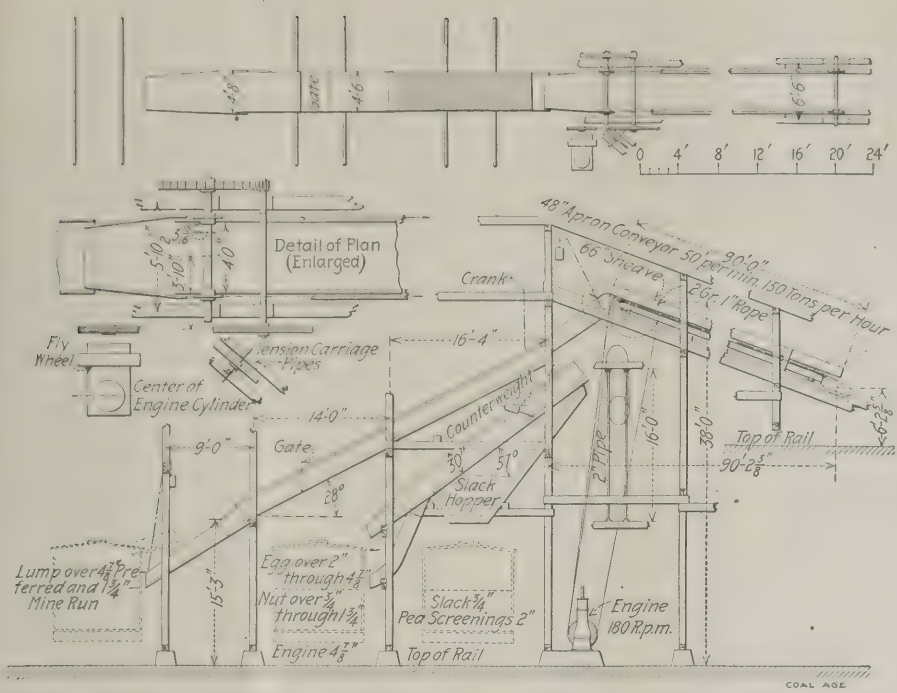
The immensity of the seam is shown in the accompanying halftones. At present coal is still being taken from the open cut, about two acres, 35 ft. deep being exposed, but a slope is now being driven down the 16° pitch of the seam, and a 12x24-ft., three-compartment shaft is also being sunk which will tap the seam at about 112 ft. The mine will be opened up on the room-and-pillar system, the 10-ft. bottom coal being taken out first, and the balance being mined when the room is brought back.

The coal is semibituminous, very similar in texture and appearance to the Rock Springs No. 1 coal. It is black, very blocky, and comparatively smokeless. The composition of the mammoth vein coal is as follows:

Analysis of the Coal

	Per Cent.
Moisture	8.5
Volatile matter	43.2
Fixed carbon	44.2
Ash	4.1
	100.0
Sulphur	0.50
B.t.u.	11,000

Stripping Operations of the Northern Colorado Coal Co., at Coalmont, Colo.



The Northern Colorado Coal Co.'s Tipple, Showing Apron Conveyor

The town of Coalmont, where the mine is situated, lies southwest of Laramie, 111 miles by rail. The very mountainous nature of the country made it impossible to construct a railroad from Denver or to branch off from the Moffat Road. The only practical outlet found was to the northeast and the rugged nature of the country made it necessary to select a very circuitous route for the railroad. However, by careful work, maximum grades of 1 per cent. out and 1.9 per cent. in have been obtained.

The Tipple

The tipple equipment was designed by Stewart Kennedy, general superintendent of the company, and follows the lines which he has successfully used in the Sheridan, Wyo., fields. The pit cars will not be taken up the usual high trestle but will be dumped into a hopper set on the ground, as shown in the accompanying drawing of the tipple. The usual crossover dump, with car haul for returning the empties, will be used and the mine-run coal will be automatically taken from the hopper and elevated to the screens by means of a Link-Belt corrugated apron conveyor, which acts both as a feeder and conveyor. This will distribute the coal evenly to a gravity screen which will make the following grades of coal: Lump, egg, nut, egg-run (for locomotive use), mine-run, and slack. This system of screens is very flexible and efficient. When the mine is developed to the full capacity of 1500 tons per day, an elevator and rotary screen will be installed for re-screening, provision having been made in the plans for this. The entire tipple equipment was furnished by the Link-Belt Co. of Chicago.

The power plant consists of two, 16-ft. by 66-in., Nagle, horizontal, tubular boilers, 110-lb. steam pressure, which furnish steam for the auxiliaries and for a 100-hp. Ottumwa Iron Works hoist. The present plant is being installed merely as the nucleus of a more complete plant. All machinery is being installed in a permanent manner so that the proper additions can be made later to take care of the increased capacity. Electrical equipment will not be installed for the present.

Another View of the Stripping Operations, at Coalmont, Colo.

President and general manager, E. R. Miller, with offices at Laramie will take care of the general Western sales. The Central Western trade will be cared for by the Havens, White Coal Co., of Omaha who will cover the territory of Nebraska, Iowa and Kansas. Complete traffic arrangements have been made between the Union Pacific Railroad and the Laramie, Hahn's Peak & Pacific Railroad, and the coal will be shipped out under the trade name of "Mammoth Vein Smokeless Coal."

Coal Loading Booms at Annabelle Mine

Special forms of coal-handling machinery, designed to avoid breakage, are coming more and more into prominence. Despite improvements in the various devices for burning fine coal, the demand of the consumer is imperatively for large sizes, and because of the difference in price between large and small sizes, nearly all breakage in handling the coal results in a direct loss to the producer. With these considerations in mind, the engineers of the Four States Coal & Coke Co. have introduced a number of improvements over usual practice in the design of the tipple at the Annabelle mine, near Worthington, W. Va.

Perhaps the most interesting of these is the device for loading lump coal into cars, which is illustrated on the front cover of this issue. At the Annabelle tipple, all the lump coal passes over two steel-band picking tables, 6 ft. wide and having about 40 ft. of clear picking space. The loading ends, or booms, of these picking tables are, for a length of 26 ft., free to move in a vertical plane. They are continuous with the picking tables proper, being connected thereto by a trunnion. At the free ends are the tail sprockets of the picking bands, carried in trussed steel frames, supported by ropes from an overhead electric hoist. Attached to each boom is a short chute, which tapers to 30 in. in width. This concentrates the stream of coal, so that the car is neatly topped out.

The device is controlled by the loader, who stands on the picking floor of the tipple, immediately above the cars that are being filled. He thus has a full view of the operation, through large railed-off openings in the floor, and has the controllers of both loading-boom hoists convenient to his hand. Levers, operating the clutches which drive the picking bands, and electric signals to the mine-car dumps are also within his reach. The loader controls the movement of the railroad cars by means of a car retarder. This device consists essentially of a band brake with its lever, and a drum, on which is wound a wire rope that passes

over pulleys uptrack from the tipple and is hooked to the car. The grade of the track under the tipple is 2 per cent., so that this rope is always taut and the moving car absolutely under control.

On beginning to load, the empty car is brought into position, and the boom lowered until the chute is practically on the bottom of the car. The picking band is then started and the coal is carried on this to the end of the boom. It will be seen that there is thus practically no drop at all in loading the coal into the bottom of the car. As the car fills up, the loader gradually raises the boom without stopping the flow of the coal until he has one end of the car filled to the top. He then slowly drops the car so that the coal is always delivered to the edge of the pile already formed. When the car is full, he stops the picking band, while a new car is being dropped down. If it is necessary to stop the band for a considerable time, the loader signals to the dumper to cease dumping, in order to prevent an accumulation of coal on any part of the tipple apparatus.

The tipple is equipped with two cross-over dumps, having steam pull-backs, two lump-coal shaking screens, two picking bands, two fine-coal elevators and conveyors, and two revolving fine-coal screens. It is thus seen that the entire tipple apparatus is in duplicate, and either half can be operated independently of the other.

Particular attention has been paid to bypass arrangements, and the duplication of parts. All bearings, gears, etc., are cast steel, so that the risk of breakdown has been reduced to a minimum. The capacity of the tipple is 3000 tons per day.

The Coal Fields of Western Canada

By E. Jacobs*

An interesting and comprehensive compilation of various data on the coal industry in Western Canada. The geology and relative commercial importance of the different fields are briefly sketched. The industry as a whole is likened to the Pittsburg field in the United States and an equally bright future is predicted for it.

In the course of the fourth of his series of lectures on coal to the fourth year class in geology at McGill University, Montreal, Quebec, in 1910, D. B. Dowling, of the Geological Survey of Canada, gave some interesting information relative to coal in Western Canada, as well as in other parts of the Dominion.

The preliminary statements attributed to Mr. Dowling in a report of the lecture published in a Montreal newspaper include the following:

Canada is destined to become one of the greatest coal-producing countries in the world. The deposits of coal now known to exist in Canada would supply the needs of the whole civilized world for the next 170 years. The coal deposits of Canada compare favorably with those of the greatest coal-mining countries in the world as to quality, quantity, and accessibility for mining purposes. The Welsh coal is supposed to be the best in the world, but in the Rocky Mountains of Western Canada there is coal which compares favorably with the best Welsh.

The production of coal in Canada has increased greatly during recent years. In 1902 it was only about 7 million tons, but during the three years 1907-1909, between 10 and 11 million tons a year were mined. There is as yet no reason to suppose that this production will seriously affect the future coal supply of the Dominion, when the extent of the coal fields and the available supply of coal are taken into consideration.

Workable Coal in Canada

New areas of coal-bearing formations are being found in the partly explored Canadian West. There are large areas that are fairly well known, in which it may be expected that coal will be mined. Parts of these are not yet within reach of transportation facilities, or require deep mining to recover the coal.

An estimate of the workable coal in Canada* gives a total of 173,736 millions of tons, as follows, in millions of tons:

Anthracite	470
Bituminous	71,391
Sub-bituminous	87,490
Lignite	12,385
	173,736

It is of interest to note in this connection that approximate estimates give Great Britain's supply of bituminous coal at 60,000 million tons and Germany's at 52,000 million tons.

Occurrence and Analyses

The following is an excerpt from a paper on "The Mineral Industries of Canada," contributed to the Internationaler Kongress, Dusseldorf, 1910, by H. Mortimer-Lamb, secretary of the Canadian Mining Institute:

The extensive coal areas of Canada are found in the Provinces of Nova Scotia and New Brunswick, in the East, and in the Saskatchewan, Alberta, British Columbia, and the Yukon Territory, in the West. The Eastern measures occur in the Carboniferous formation, while those of Central and Western Canada are found in the Cretaceous and Tertiary. The Eastern coal is entirely bituminous, the Central chiefly lignite, while in Western Alberta, British Columbia, and the Yukon the coal ranges in character from a high-grade lignite to anthracite. Lignites of still more recent age occur in Ontario.

Average analyses of Canadian coals from the respective areas are shown in the following table, compiled for the writer by Edgar Standfield, M. Sc., of McGill University, Montreal:

Coal Field	Moisture Left in Air Dried Sample	Fixed Carbon	Volatile Matter	Ash	Sulphur in Dry Coal
Nova Scotia					
Sydney	2.6	57	36	7	2.4
Pictou	1.7	57	30	13	1.2
Manitoba					
Souris	18.1	45	44	11	0.6
Alberta					
Edmonton	19.0	50	40	10	0.4
Cascade	0.7	72	15	13	0.7
Frank-Blairmore	0.8	57	26	17	0.6
British Columbia					
Crow's Nest	0.9	64	25	11	0.5
Nanaimo-Comox	1.5	51	36	11	0.9

Manitoba and Saskatchewan

In an official report,* published in 1909, D. B. Dowling gives "a concise statement of the area and probable contents of the various coal fields of the middle portion of Canada." Regarding the location and area of these fields, he says:

In Manitoba, the coal-bearing rocks occupy a small area in the southern part, underlying an elevated portion called Turtle Mountain. With our present knowledge we can define an area of about 48 square miles near the western end of this hill as being available for mining.

The Saskatchewan areas lie principally in the southern part, and are

*Secretary, Western Branch of the Canadian Mining Institute, P. O. Box 645, Victoria, British Columbia.

*See Quarterly Bulletin of the Canadian Mining Institute, No. 15, June, 1911, p. 107.

*"The Coal Fields of Manitoba, Saskatchewan, Alberta, and Eastern British Columbia," by D. B. Dowling, Canada Department of Mines, Geological Survey Branch, No. 1035.

being mined on the Souris River. The elevation known as the Coteau is also composed of coal-bearing rocks, which continue westward in the Wood Mountains and Cypress Hills. This area, though not well prospected, contains possibly 4000 square miles within which coal may be found.

The Province of Alberta is liberally supplied with coal areas. The elevation of the coal formations subjected them to greater denudation than the harder rocks beneath; consequently little of this material is left; but in the wider valleys remnants are still found. These, from the superior quality and the amount of coal, form very valuable coal fields. East of the foothill area lies a great extent of coal-bearing rocks which are comparatively undisturbed. The coal in this region is well suited for domestic use, and as it is within the settlement belt, where wood is scarce, a demand for it is assured.

Another coal formation occupies the southwestern border of the province, with an area of 5000 square miles; the seams in this are of more value in the southern portion than farther north, or east. The principal mines of this area are to be found near Lethbridge.

Coal in Alberta

The coal areas of this province occur in three divisions of the Cretaneous. The lowest is exposed in long narrow belts in the outer ranges of the Rocky Mountains and the foothills. These areas, besides providing the best coal, are important in that they contain many thick seams, thus ensuring a large supply of valuable coal. The middle division, found occasionally in the foothills, is better known as the Lethbridge formation and is exposed over a large area in eastern Alberta; it furnishes a coal that grades from bituminous to subbituminous and lignite. The higher coal-bearing beds are well exposed in central Alberta. Those on the western edge of the area contain seams approaching bituminous, but in the eastern part the coal is sub-bituminous.

Mr. Dowling's latest published estimate gives for the province of Alberta a total coal-bearing area of 29,608 square miles, with an aggregate coal content of: Anthracite, 400 million tons; bituminous, 30,250 million tons; and sub-bituminous, 79,000 million tons; in all, 109,650 million tons.

Coal in Western Canada

The following excerpt from "Geology and Economic Minerals of Canada,"* gives an idea of the extent and importance of the coal fields of western Canada.

The coal produced in the Cordilleran region of Canada is almost entirely bituminous, and by far the greater part is of Cretaceous age. Coals of Tertiary age are known at a number of localities, as in the Nicola Valley, and near Princeton, Similkameen. The Tertiary coals are lignites, and sometimes form thick seams, as in the case of the Princeton area, where an 18-ft. seam outcrops on the banks of the Similkameen River.

On Vancouver Island, the coal seams occur in the upper part of the Cretaceous. Coal mining is concentrated in two areas on the east coast of the island, known as the Comox, and the Nanaimo coal fields. The Comox has an estimated area of about 300 square miles. At one mine, within a vertical section of 122 ft., there are 10 seams, with an aggregate thickness of about 29 ft., the thickest seam measuring 10 ft. In the Nanaimo field, two seams, one varying in thickness from 5 to 20 ft., and the other from 3 to 5 ft., are being mined. The coals are all bituminous.

In the Rocky Mountains and the foothills, the Cretaceous coal measures occur as basins among the folded and faulted Palæozoic and Mesozoic strata. The basins, generally stretching northwestward and southeastward, and sometimes for very long distances, are known to occur at intervals from the International Boundary to the Athabaska River, a distance of more than 200 miles. The coals within the Rocky Mountains are bituminous varieties, in places passing to anthracite, as at Bankhead and the anthracite mines in the Bow Valley. Eastwards, in the foothills, as the plains are approached and the regions of disturbance left behind, the lignite coals of the higher members of the Cretaceous are gradually encountered.

Within the mountains and the adjacent foothills, there are three coal horizons. The lowest occurs within the Kootenai formation belonging to the base of the Cretaceous, possibly the summit of the Jurassic. The seams of the Elk River and Crow's Nest basins lie within this horizon. The next group of productive measures is the Belly River, situated near the top of the upper Cretaceous column. The highest group of the coal measures lies in the Edmonton of early Tertiary age.

In Conclusion

Nothing like a review or summary of the coal resources of Western Canada will be attempted, but as an example of the view taken of the prospective importance of these Northwestern coal fields, only an excerpt will be made from an official comment of William Fleet Robertson, Provincial Mineralogist for British Columbia, contained in his annual report for 1909.* Dealing only with the Rocky Mountain coal fields, he wrote in part:

The Rocky Mountain coal fields, lying on either flank of the main range of the Rocky Mountains, respectively in the provinces of British Columbia and Alberta, are undoubtedly the most extensive coal deposits in Canada, and, what is more important from a commercial point of view, are the only large coal fields of first-class coal at present known on the Pacific slope, between Alaska and Mexico.

While it has been a matter of common knowledge in British Columbia that these deposits were large, it is questioned if more than a few people recognized their wonderful extent, or the enormous influence they must have on the future of the country. What this influence must be can best be demonstrated by an illustration of what the coal deposits of Pennsylvania have done for that state. They have made it probably the greatest manufacturing state of the Union—and the condition of Western Canada today is that of the Eastern United States 50 years ago, except that we may look forward to a more rapid development, due to the more general development of the rest of the continent and the improved transportation and other facilities now available.

It seems, therefore, that eastern British Columbia is destined to be, from the possession of its coal fields alone, the Pennsylvania of the Pacific slope, and that at no distant date.

*"A Descriptive Sketch of the Geology and Economic Minerals of Canada," by G. A. Young, with Introduction by R. W. Brock. Canada Department of Mines, Geological Survey Branch, Ottawa, Ontario, 1909, No. 1085.

*"Report of the Minister of Mines, British Columbia, 1909," p. 163.

Kentucky Mining Institute

The next meeting of the Kentucky Mining Institute will be held at Lexington on Monday, June 10. At the December meeting, a committee on program and entertainment was appointed; the members of this committee are Messrs. Hywel Davies, P. V. Cole and H. D. Easton (chairman). The Executive Committee cast a vote by mail and selected Lexington as the place to hold the June meeting. The institute won much credit by the excellent papers presented at the December meeting although the attendance was not large. These papers have been published in various mining journals and they are to be included with the papers read at the June meeting, in the transactions of the Institute. It is probable that the June meeting will last two or three days and that a side-trip will be arranged.

While it has been thought that electricity has been a contributing cause to some mine explosions, not a single explosion in American mines has yet been traced directly to its use.

Shaft and Slope Construction, 201 Mine

By R. G. Johnson*

The construction of a concrete-lined shaft and slope in southwestern Virginia. The character of the surface was such as to make slope sinking extremely difficult. All concrete was placed by gravity chutes or by special chute cars. Details of designs and of contractor's plant.

In May of last year, the Clinchfield Coal Corporation started the construction of a large coal-mining plant on a comparatively new portion of its property, in Russell County, Virginia. The operation is located near Slemp, on the Carolina, Clinchfield & Ohio Ry., about five miles from, and in direct connection with, the Clinch Valley Branch of the Norfolk & Western Ry., at Keiser. A contract was awarded for the sinking of a large concrete-lined hoisting shaft, and a slope with an air-shaft connection, but the power plant, tipple and other surface equipment were constructed by the company itself, under the direction of consulting engineers.

Lower Banner Coal Seam

Since the opening up of the coal measures in this particular section of the state is of quite recent date, a brief description of the coal may be of interest. The seam to which the shafts were sunk is known as the Lower Banner, and called locally the No. 4 vein. Geologically, it is near the bottom of the Norton formation, which overlies the Lee conglomerate. This is a continuation of the Pottsville conglomerate, which, as is well known, extends from the Pennsylvania anthracite field through the Virginias, and thence south through Kentucky and Tennessee into Alabama.

The Clinchfield corporation has proved by extensive drilling the existence of a good many thousand acres of the Lower Banner seam. The coal, an analysis of which is given below, is high in heat units, and compares well in calorific power with the best New River and Pocahontas output.

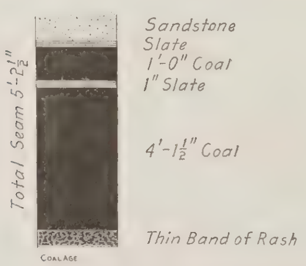


Fig. 1. Typical Section, Lower Banner Seam

ANALYSIS

	Per cent.
Moisture	0.70
Volatile matter	24.97
Fixed carbon	67.60
Ash	6.73
Sulphur	0.53

The columnar section, Fig. 1, taken in the heart of the Clinchfield company's field, shows what has proved to be an average thickness of the seam. Continuous low-vein mining machines are installed. These cut in a band of rash beneath the coal, the rash being loaded separately for consumption at the power plant, the high stack of which aids in the economical use of this fuel.

*Engineer with the Dravo Contracting Co., Pittsburg, Penn.

Modern Concrete-lined Shaft

In planning the shaft and slope, the most modern economical practice was followed. The shaft is concrete lined throughout and fitted with yellow-pine timber buntons and guides. Although reinforced-concrete and all-steel buntons have been placed in some of the latest concrete-lined shafts, the advisability of their adoption is a mooted question. Were it not for its excessively high cost, the reinforced-concrete bunton would be ideal. In using the all-steel bunton, a heavy section is required, because it is necessary not only to figure against a possible pressure of the ribs at the sides of the shaft, but also to provide against the corrosive action of the mine air and of water dripping from the cages, which is a far bigger factor than pressure, especially in sandstone country. A reinforced-

Water Gallons per min.	Material	Shaft	Shaft Sinking Progress Date El. 1744.0	Setting Forms	Concreting
0	Fill, Surface		May 6, 1911 1739.8	July 24, 11 a.m. 8 Hours; July 24, 3 a.m.	July 24, 8 p.m.; July 24, 11 a.m.
0			May 8, 1911 1734.8	July 22, 8 a.m. 4 Hours; July 22, 4 a.m.	July 22, 5 p.m.; July 22, 8 a.m.
0	Sandy Clay		May 9, 1911 1729.8	July 21, 8 a.m. 5 Hours; July 21, 3 a.m.	July 21, 5 p.m.; July 21, 8 a.m.
0		←13'6"→	May 10, 1911 1724.8	July 19, 12 p.m. 6 Hours; July 19, 6 p.m.	July 20, 5 p.m.; July 20, 8 a.m.
0			May 11, 1911 1719.8	July 18, 9 a.m. 3 Hours; July 18, 6 a.m.	July 18, 4 p.m.; July 18, 9 a.m.
35	Shale		May 12, 1911 1714.8	July 17, 9 a.m.	July 17, 7 p.m.
35			May 15, 1911 1709.8	7 Hours (2 Sets); July 17, 2 a.m.	10 Hours (2 Sets); July 17, 9 a.m.
40			May 16, 1911 1704.8	July 15, 10 a.m. 4 Hours; July 15, 6 a.m.	July 15, 4 p.m. 6 Hours; July 15, 10 a.m.
50			May 17, 1911 1699.8	July 14, 6 p.m. 3 Hours; July 14, 3 p.m.	July 14, 10 p.m. 3 Hours; July 14, 7 p.m.
130			May 19, 1911 1694.8	July 14, 8 a.m. 5 Hours; July 14, 3 a.m.	July 14, 1 p.m. 5 Hours; July 14, 8 a.m.
160	Sandstone		May 22, 1911 1689.8	July 13, 11 a.m. 4 Hours; July 13, 7 a.m.	July 13, 6 p.m. 7 Hours; July 13, 11 a.m.
180			May 23, 1911 1684.8	July 12, 9 p.m. 3 Hours; July 12, 6 p.m.	July 13, 5 a.m. 7 Hours; July 12, 10 p.m.
170	4" Tile Drain Pipe		May 25, 1911 1679.8	July 12, 9 a.m. 4 Hours; July 12, 5 a.m.	July 12, 2 p.m. 5 Hours; July 12, 9 a.m.
178			May 26, 1911 1674.8	July 11, 8 a.m. 6 Hours; July 11, 2 a.m.	July 11, 2 p.m. 6 Hours; July 11, 8 a.m.
170			May 31, 1911 1669.8	July 10, 10 a.m. 4 Hours; July 10, 6 a.m.	July 10, 5 p.m. 7 Hours; July 10, 10 a.m.
170			June 4, 1911 1664.8	July 9, 6 p.m. 5 Hours; July 9, 1 p.m.	July 10, 2 a.m. 8 Hours; July 9, 6 p.m.
150			June 7, 1911 1659.8	July 8, 6 p.m. 4 Hours; July 8, 2 p.m.	July 8, 11 p.m. 4 Hours; July 8, 7 p.m.
80		Water Rings	June 8, 1911 1654.8	July 7, 8 p.m. 7 Hours; July 7, 1 p.m.	July 7, 11 p.m. 3 Hours; July 7, 8 p.m.
50			June 9, 1911 1649.8	July 1, 3 a.m. 6 Hours; June 30, 9 p.m.	July 1, 8 a.m. 6 Hours; July 1, 2 a.m.
45	Slate		June 12, 1911 1644.8	June 30, 1 p.m. 14 Hours; June 29, 11 p.m.	June 30, 7 p.m. 5 Hours; June 30, 2 p.m.
40			June 13, 1911 1639.8	June 29, 5 p.m. 4 Hours; June 29, 1 p.m.	June 29, 8 p.m. 3 Hours; June 29, 5 p.m.
45	Sandshale		June 15, 1911 1634.8	June 29, 5 a.m. 6 Hours; June 28, 11 p.m.	June 29, 10 a.m. 5 Hours; June 29, 5 a.m.
38			June 17, 1911 1629.8	June 28, 6 p.m. 4 Hours; June 28, 2 p.m.	June 28, 10 p.m. 4 Hours; June 28, 6 p.m.
28			June 18, 1911 1624.8	June 27, 5 p.m. 7 Hours; June 27, 10 a.m.	June 28, 4 a.m. 7 Hours; June 27, 9 p.m.
				Average 5 hrs, 7 min.	Average 5 hrs, 20 min.

COAL AGE

Fig. 2. Construction Record, Progress of Sinking and Concreting

concrete bunton and a steel bunton of fairly heavy section each cost about three times as much as timber in place in the shaft.

The policy of a company largely determines the character of the construction adopted, and plans for a shaft that will serve the purpose can be made to fit any reasonable budget, the only question being the degree of efficiency and the length of time the figured efficiency will continue. If the company knows its coal seam, and believes there is economy in so called "model plants," shafts can be

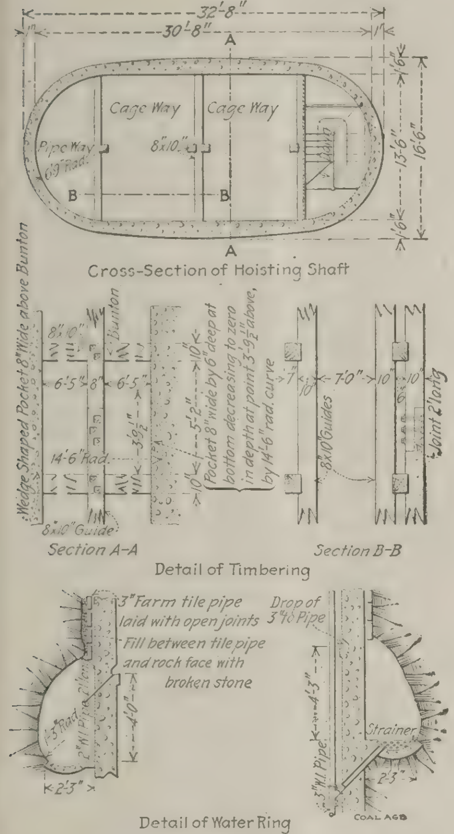


Fig. 3. Details of Shaft Construction

made of watertight and fireproof construction that will last forever. The Clinchfield Coal Corporation maintained, and wisely, too, that the vital parts of their plant should be of the best construction, while certain other elements, which could be replaced readily and economically, might be of a temporary and less costly nature.

In sinking the shaft, no unusual features were encountered, except possibly the badly broken-up rock structure. This condition, while uncommon in western Pennsylvania and upper West Virginia, is not unfamiliar, however, to rock men in southwestern Virginia and in the lower sections of West Virginia. Drilling in crevicy, hard rock is difficult, especially on inclined holes, as the points of the steel bound when striking the bottom of a crevice at an angle.

Sinking Progress

While little water was struck at the start of the rock sinking, the amount rapidly increased as work progressed, and at a depth of 60 ft. the shaft was making about 180 gal. per min. However, this was very cordially welcomed by the coal company as a source of supply for the power-plant condensers, and its later almost complete disappearance was as sadly mourned. The coal was reached in good time, as reference to the construction record, Fig. 2, will show, something more than 100 ft. having been sunk in a little over a month. As soon as the coal was taken out, excavations were made for arches on both sides of the hoistways.

On the floor of the sump, a layer of concrete 6 in. thick was placed on a thin bed of broken stone, to form a level foundation for starting the lining concrete. The recesses for the arches in the concrete lining were sunk 10 ft. below the bottom of the coal, to allow for lowering the shaft-bottom entries, if necessary, in order to provide for the proper grades to the cages. The arches were carried only 5 ft. back from the face of the lining, and here again was shown the wise application of the company's plan to build foundations at present for future additions, which may be made as time proves more clearly the character of the coal.

Water Ring and Drains

Just above the coal, a ring was formed back of the shaft lining, to catch the water from 3-in. tile drains placed vertically between the concrete and the rock rib. These lines of tile were laid with loose joints and completely surrounded by broken stone. The shaft was well drained; but with the knowledge gained from the recent successful applications of the pneumatic grouting process for sealing the water-bearing seams encountered in shaft sinking, different drainage methods would now be employed and the flow of water entirely shut off by cementing the crevices. This process, recently described in the Feb. 24 issue of Coal Age, has since been used repeatedly in connection with shafts sunk in New York City for the city tunnel of the Catskill Aqueduct, and its complete success has attracted widespread attention among engineers and mine operators.

The concrete in the lining of the shaft was mixed in the proportions of 1-2-4, and that in the coping of the shaft in the proportions of 1-2½-5. The lining was designed to be 12 in. in thickness at the ends and 18 in. at the sides. It is, of course, impossible to drill and shoot rock to accurate lines, so that a great deal more concrete was required to be placed than the drawings called for. Between the rock rib and the exterior of the lining, as determined by the 12- and 18-in. wall thicknesses, one-man stones were placed in the concrete. The bulk of the concrete was carried to its place in the forms by means of chutes hung in zigzag fashion down the shaft. This

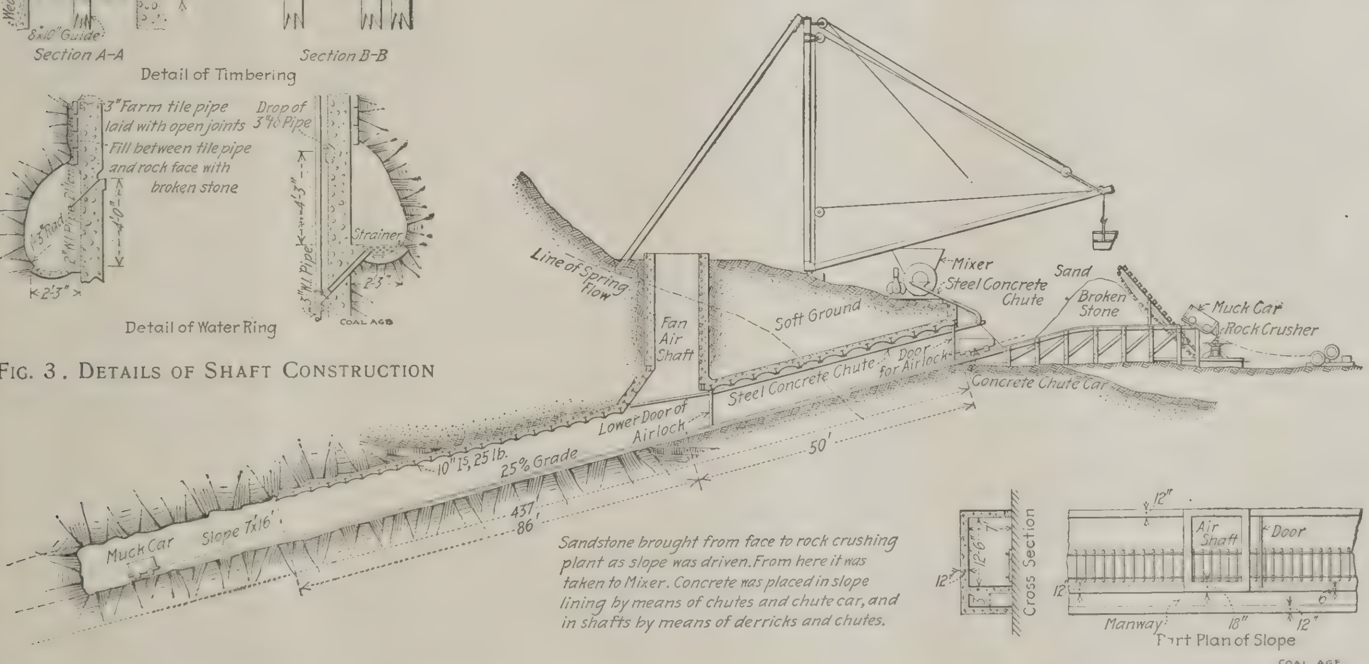


Fig. 4. Details of Slope Construction and Contractor's Plant

proved to be a decidedly quicker method than using buckets.

Slope Construction

The slope, put down in conjunction with this shaft, was located ideally, as far as outside track layout was concerned, but the excavation through the earth surface proved very difficult. The soil in this region is largely a yellow clay mixed with gravel and small boulders, and numerous springs, coupled with the rains, have caused the top soil to slide over the rock surface on many hillsides. Railroad cuts and roads in this section are often obstructed by such slides, and with little warning. It was evident after the slope had been started and was in only 20 ft., that a similar condition had here been encountered. The ground became heavy and difficult to tunnel and to timber by ordinary methods.

Timber centers were shortened and forepoling, such as is used in very soft ground, was found necessary. Although a possible 20 ft. of surface had been expected from the appearance of an outcrop of the rock strata not far above the slope mouth, actual working found the contractors tunneling for over 100 ft. before they reached a full rock section. The source of the trouble appeared when a particularly wet piece of ground was reached, and was followed by perfectly dry strata. A thick layer of sand, gravel and boulders had slid over a thicker stratum of clay, the spring water from the rocks above acting as a lubricant.

Timbering was required for a distance of 36 ft. beyond the earth section to prevent the caving of the thin rock overburden. Beyond this point, 136 ft. from the portal, to the bottom of the slope, the hard sandstone required no support of any kind over its entire 16 ft. of width, although the concrete partition wall put in later serves as such. The soft sliding nature of the earth section necessitated a change of plans for its permanent support, and a design, specifying 10-in. I-beams with concrete arches between them, was selected.

Concrete Placed by Gravity

The placing of concrete in the slope was done, for the most part, by means of long steel chutes. The lower sections of the 12-in. concrete partition wall and a portion of the roof arches were concreted by the use of a specially shaped car, having a chute attached. This method was entirely successful, the car being filled from the mixer at the slope portal and run down to a level just above the wall form, where a small portable chute was attached and the concrete run by gravity to place. The side-wall forms were filled with absolutely no handling of the concrete from the mixer, and the labor of tamping, and attaching the chutes to each carload, represented the only hand work done on any of the concrete at the slope bottom, 437 ft. from the portal and mixer. The only hand labor required in connection with transportating the concrete was that found necessary to insure a good job in placing the material in some of the roof arches, where the caps of the temporary timber bents were so close to the I-beams that there was not room for the chutes.

The original plans called for a Y-branch fanway, leaving the slope 70 ft. from the portal. The expense and hazard of tunneling and permanently supporting the soft ground for the main slope led the engineers to change their plans, omitting the Y-branch and constructing an air shaft over and into the slope about 50 ft. from the mouth. The concrete lining of this shaft was heavily reinforced with I-beams to resist the overturning moment of the hillside pressure, and by grading the surface at the shaft coping, an admirable fan site was prepared. An air lock was then placed in the slope, between the portal and the air shaft, for admitting supply cars to the mine, the whole making a unique and efficient arrangement.

Modern Power Plant

The central power plant for the mines, in the Dumps Creek division of the Clinchfield Corporation, is worthy of note, as it is without doubt one of the best in the bituminous coal fields. It is located near the shafts above described, on the Hurricane Fork of one of the main tributaries of the Clinch River. The present equipment comprises two 1000-kw., 6000-volt, 3-phase, 60-cycle Westinghouse generators, driven by Parsons turbines. An additional 2000-kw. machine has been purchased, and the building is so constructed that other units can be installed as needed.

The hot water from the Westinghouse surface condensers is pumped to cooling towers, situated over a reservoir, which has been formed by damming the stream about 200 ft. from the power house. Steam is supplied by three 400-hp. Wickes boilers with Cochrane feed-water heating system, all the boiler-room elements being placed with the future conditions in mind. Current for the haulage system of the No. 201 mine, of which the shafts are a part, is furnished by a 300-kw., 275-volt, direct-current generator, driven by a synchronous motor.

The shafts and slope were designed by D. R. Beeson, under the direction of H. M. Waite, then vice-president and chief engineer, and Carel Robinson, division superintendent. The construction work was done by the Dravo Contracting Co., of Pittsburg.

The United States imported 172,716 short tons of coke during the year 1910 and exported 984,562 tons during the same period.

Calcium Chloride

Among the methods for creating immunity from coal dust explosions is the use of calcium chloride. This chemical compound has the power of absorbing water, and under favorable circumstances such as are usually found in a mine, 100 lb. of the material will take up 115 lb. of water. Even in face of a strong sun, the salt will take up 50 to 60 lb. of moisture. It is easy to see, therefore, that in any ordinary mine, it will retain enough water to keep the places sprinkled with it in a perpetually damp and coherent condition. Dampness and coherency are the two requirements of a harmless coal dust.

A roadway well treated by the chloride should be as immune from an explosion as a dustless zone. But such a dustfree working is created at considerable expense and does not have the power of self-maintenance. The condition has to be continually renewed at the expenditure of no little labor. While on the other hand, the chloride moistens all the dust which falls and renders it innocuous, and does not need frequent attention.

Its principal sale today is as a road-binder. This use exhibits well its power of creating an agglomerate mass out of a collection of separate solids, and this would appear to be an argument for its use in mines where the roads are often in bad condition for traveling.

Pure calcium chloride is white and odorless. It is the presence of hypochlorite of lime which causes the pungent odor of the impure variety. The strong smell of the impure salt is due to the continuous liberation of chlorine from the decomposition of the hypochlorite.

Calcium chloride does not injure the hoofs of mules. It may be applied either in solution or as a solid. When used dry, it will soon obtain the necessary moisture from the air. It is reported that the Bureau of Mines is about to make an examination of the chloride to ascertain its desirability as a means of checking the extension of mine explosions.

Byproduct Coke Ovens

On p. 808 of Coal Age, No. 25 is given a list of byproduct coke ovens operating in the United States, as of Jan. 1, 1910. The following additions will bring it up to Jan. 1, 1911 (cf. *Journ. Ind. and Eng. Chem.*, March, 1912). *Koppers*: Woodward Iron Co., Woodward, Ala.; Tenn. C. I. & R.R. Co., Corey, Ala. *Rothberg*: Cleveland Furnace Co., Cleveland, Ohio; Lackawanna Iron & Steel Co., Lebanon, Penn. *Didier*: Lehigh Coke Co., South Bethlehem, Penn.

Without the dreamer industry would not exist, and without the worker it could not. Moral: Be both.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Fire Fighting in India

The following remarks on mine fires in India are taken from the *Transactions* of the Mining and Geological Institute of India. They are contained in an article written by W. H. Pickering and R. R. Simpson. They state that the Koithi and Sibpur beds in the Raniganj coal field measure 14 ft. and 18 ft. respectively. Owing to this great thickness, to the readiness with which the coal burns and to the great strength of the roof, the problems presented by mine fires are unusually difficult.

"In considering the inherent dangers of coal mining in India, it is necessary to clear our minds of any prejudices due to experience in other countries. The conditions are very different from those which obtain in other coal fields. To be specific, the fire dangers are markedly different. The extraordinarily strong roof over the coal allows wide galleries to be driven to the full height of the thick beds, and the practice has been to cut up large coal areas into pillars by such intersecting galleries.

Air Blasts

If the pillars crush or are burned out, the roof will not fall until a large area is left unsupported. Thus when the fall does take place, an air-blast is inevitable. Except in a few isolated mines, it has not been the practice to divide the workings into districts by leaving barrier pillars of coal. Under such conditions, the only places available for stoppings are in the galleries, which are perhaps 20 ft. high and 15 ft. wide. A dam of such an area, unless of enormous thickness, will burst under the sudden pressure of an air-blast. In any case it would be impracticable to make gas-tight dams in such large galleries in a short space of time.

Therefore, the only alternative in case of fire in many Indian collieries is to cover over the shafts or to fill them up. The conditions at the mouths of many shafts make the covering of them difficult, and filling them with earth is an extremely slow process where the approaching galleries are about 20 feet high. Shafts are numerous and interconnected over large areas and in many cases there are no boundary pillars between mines even when these are worked by different owners.

Importance of Creating Separate Districts

Thus, a fire may involve the closing of a group of collieries; and this closing may be permanent if falls extend to the surface. Fire will spread with marvelous rapidity in the coal mines of India because the local falls of roof, which do much to check the spread of fires in other countries, are absent. When falls occur in a fire area they produce air-blasts which drive burning gases in all directions, and extend the fire to distant workings. Fortunately provisions against these dangers can easily be made by dividing the working areas into districts and panels with barrier pillars between them. All the galleries cut through these large pillars should be small, not more than 8 ft. wide and 8 ft. high, and dams should be put in them as soon as coal working is finished in the district which they serve.

Gas Engines for Collieries

By E. L. Chorlton

In continuation of his discussion on the advantages of the use of gas engines in connection with by-product ovens and producers, Mr. Chorlton shows that fans, pumps and mining machines may be driven directly by gas engines, and that with air compression to aid in starting, hoists and haulage drums can be similarly actuated.

In the pneumatic system the power is converted into air-compression, and although the efficiency of this method may be less than either of those previously mentioned, it is more flexible than the hydraulic system, and as to safety is superior to a direct use of the generated power. Consequently it is still much used, and practically all collieries have such a compressed-air plant. Moreover, an increase in its use seems likely, if any further restriction is put upon the use of electricity underground. The efficiency seems to average only 30 per cent. This, however, is largely due to causes which might be obviated, as, for instance, by the use of more efficient air engines in the mines.

The direct driving of air compressors by gas engines with an automatic control, which varies the speed according to the demand, although an eminently practical proposition, has not, at any rate so far, been adopted to any extent at collieries.

This automatic control of gas engines is easily applied to the two-cycle type, and the following is a description of a plant which has been in use for two years. So successful is this type of plant that it is almost always more economical to install it than any other, even at existing collieries, where it may have to be worked from a separate producer. Figs. 1 and 2 show the general arrangement of the plant. A producer is used here because no coke-oven or other waste gas is available. It is in a separate room, and is walled off so as to keep the main engine room clean. Important points in the general scheme are the accessibility and the ease with which the whole installation is manipulated. It has been so arranged that one man can easily attend to the entire plant, thus not only is the fuel cost low, but the labor charges are small.

A Two-cycle Gas Engine for Colliery Use

The engine is of the two-cycle double-acting type, and embodies the latest improvements. Its suitability for the actuation of air compressors is largely due to its being the only gas engine with a single cylinder in which an impulse is given at every stroke. The maximum speed of the engine is 120 r.p.m., and can be slowed down automatically to as low a speed as 30 r.p.m., its action being similar to that of a steam-driven compressor. The piston rod is carried through a stuffing box fitted with metallic packing, and is connected to an external crosshead, as in ordinary steam-engine practice.

There are two inlet valves, one at either end of the cylinder, and the exhaust gas is blown through ports set midway between them. This exhaust is followed by an incoming charge of scavenging air, entering through one of the inlet valves. These valves are operated by an eccentric rod from the main shaft through a pair of rolling levers, from

which a simple motion also operates the trip gear to the magnetos. The flywheel is 14 ft. in diameter, and weighs 13 tons. It is cast in two halves, with a barring rack round the periphery.

Control by Speed and Air Pressure

There are two methods devised for governing the engine; one of them consists of a governor mounted directly over the crankshaft, and driven by spiral gearing. The governing is effected by a small butterfly valve, connected with the governing rod, which permits just enough gas to enter the power cylinder to meet the requirements of the load. This governor is simple, and is fitted with an attachment by which the maximum speed can be adjusted within certain limits while the engine is running. It only comes into action as full speed is approached.

The other method provides a special dashpot governor, which controls the engine when the pressure of air in the receiver exceeds the required maximum pressure. It reduces the speed automatically in direct proportion to the amount of air desired, thus economizing fuel.

In my experience of compressed-air installations for mines, I have observed that the air was nearly always economically compressed, the design of the plant being evidently the result of considerable thought. On going below ground, however, efficiency seemed to have been entirely overlooked, as engines and pumps of the most uneconomical description were employed. So common does this appear to be, that I am inclined to ask: Who, and where, are the makers of efficient air motors in this country? In America, and in some other countries, much better plants seem to be used, and many schemes are in vogue for increasing their efficiency, such as the closed-circuit system. As the air pressure required for coal cutting and similar work is so low, the air might first pass through other plants for pumping, etc., before going to the cutters.

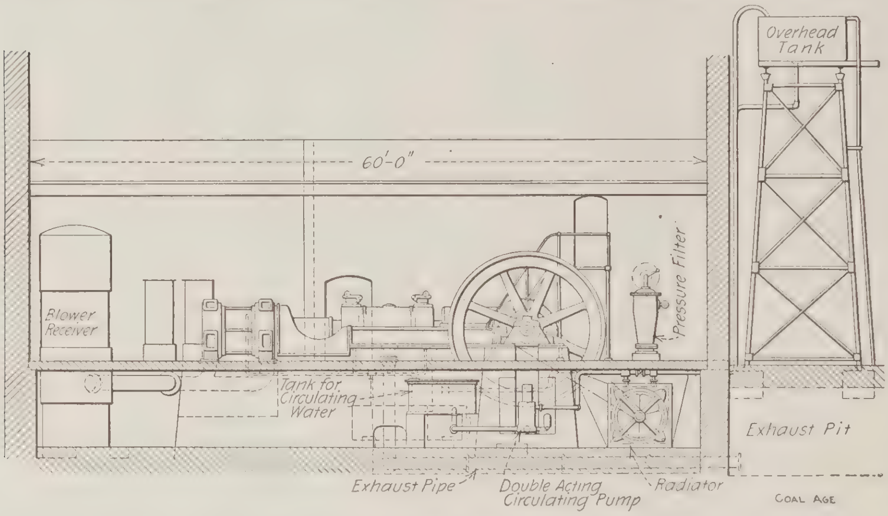


Fig. 1. Elevation of Gas-driven Air Compressor

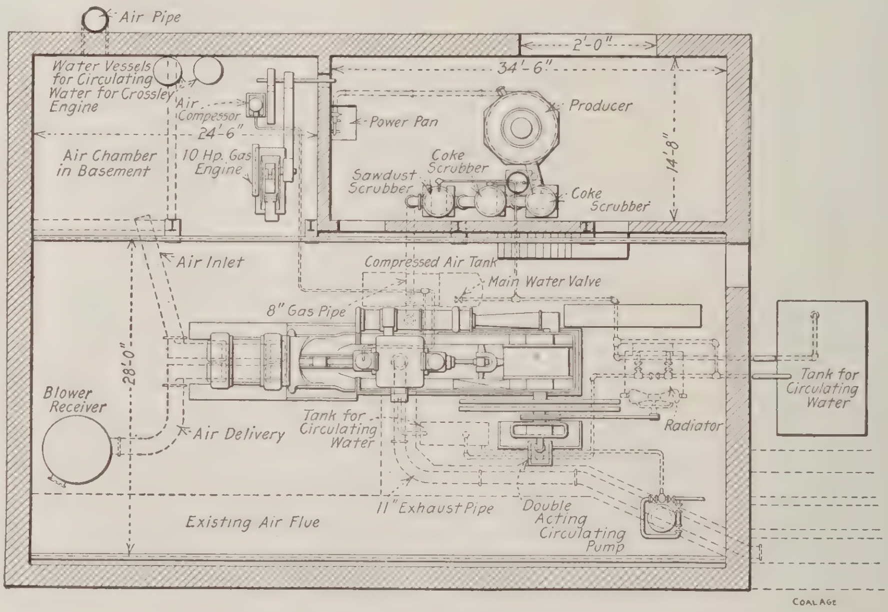


Fig. 2. Plan of the Above, Showing Gas Producer

The Mechanical or Direct Scheme

Hoisting with a direct gas-engine drive presents several difficult problems, and up to the present, I am unaware of the use of this method at any colliery. It seems hardly possible to operate the main hoisting drum of a shaft by the use of gas engines unaided by any other device. There are usually so many stops and starts for decking, so much reversal of the direction of hoisting, that we must look further, therefore, for some additions to the gas engine if it is to be made to meet the various requirements.

One method of circumventing these difficulties effectively would be to install a gas-driven hoisting engine, conforming in general layout to a standard twin-cylinder steam engine, the gas engine being of the two-cycle type, with its great advantage of quick starting. Behind each cylinder would be situated air cylinders, with the pistons coupled to and acting on tailrods from the gas cylinders in front. It will be seen, therefore, that with compressed-air auxiliaries the hoist can be run with an air engine being operated like a steam hoist when starting and decking, and making an inspection of the shaft, etc. To accomplish in an economical manner the general duties of hoisting by the addition of such air cylinders, I propose to connect them with a reservoir of relatively small dimensions, the capacity of which can be easily regulated by the addition or subtraction of water.

How Air Reservoirs Could Store Energy of Cage

Supposing now that the gas hoisting set is running at full speed in the middle of the hoist; the air cylinders, being put out of service, are ineffective; when the period of deceleration commences to bring the hoist to an end, they are thrown into circuit with the air receiver through the operation of a valve gear, and then, acting as compressors, they rapidly raise the pressure in the receiver on a curve corresponding to the deceleration curve of the moving cages. Thus the kinetic energy of hoisting is stored in the air receiver, and the cages are gradually slowed up, until finally they are brought to rest by a brake. The pressure thus stored is then available for restarting the engine on the next hoist, the gas-engine cylinders coming into play as soon as movement takes place. Thus these cylinders would act alternately as compressors and motors. It is obvious that by this means a considerable economy could be secured, positive starting and control effected through the air cylinders, and all this with a considerably smaller gas engine than would otherwise be required. Of course, there is some loss in the compression and re-use of the air, but this is largely corrected by reheating it before

it is used by means of the exhaust from the gas engine, and, when necessary, by storing the power given out by the engine when running at high speed. Thus, the period of starting up when the stored air acts as a motor will be shorter than that during which power is being accumulated at the end of the hoist. The figures regarding this scheme are unfortunately not yet worked out in such a way as to enable me to present them in satisfactory form.

As Efficient as Electric Hoisting

With reheating, the overall efficiency may be as high as or higher than that of the electric hoist. More important at the moment, however, is the fact that it seems to make gas hoisting a distinct possibility. It is well worthy, therefore, of consideration, with the hope that ultimately further practical demonstration and improvement will result.

There are other ways of regenerative working which secure the object desired, and of these, one is by a hydraulic engine to replace the air cylinders, water being substituted for air and used afterward as motive power.

A further variation, which, however, the writer has not yet developed, seems to suggest possibilities of increased simplicity. In this case a balance rope is employed, such as was used in certain shafts many years ago, and an example of which I have seen working at the Wharncliffe Silkstone Colliery before mentioned. In this system I propose to use a similar rope or chain to lap onto a conical drum for the slowing part of the hoist and to unlap for the accelerating part, and, instead of attaching to the end a balance weight, to employ a connection to the piston of a small capacity air-storage cylinder, such as is used in the previous plants.

Fans and Pumps

The direct driving of a ventilating fan by means of a gas engine is not a difficult problem. The method is already in use, and therefore it does not need further discussion.

Pumping presents a much easier problem than hoisting. Because, in mining work, the pumps will be necessarily below the surface while the engine is above, a design with pump-rods would have to be adopted. In the usual type of pumping reciprocators, flywheels are not used to regulate their action. This absence of a flywheel renders it much more difficult to apply gas as a driving agent. In this non-rotative type, steam cylinders would be replaced by gas cylinders, with the addition of suitable hydraulic compensating cylinders, such as have been employed on Worthington pumps to even out the irregular driving force exhibited so plainly in gas-engine indicator cards. The ignition is controlled from the differential gear in a suitable manner. It is essential that such gas cylinders should be of the two-cycle type, for by this means only can the excessively slow speed of this type of pump be obtained. The provision for a continuous and even absorption of power from a source which creates it, discontinuously and unequally, is so difficult that a rotational pump driven by gas must be considered a much cheaper and more satisfactory proposition in every respect. Fig. 3 shows a general layout with pump-rods actuated through bell cranks and passing down the shaft. Pumping can otherwise be performed by wire-rope driving in the dips and in the more remote parts of the mine.

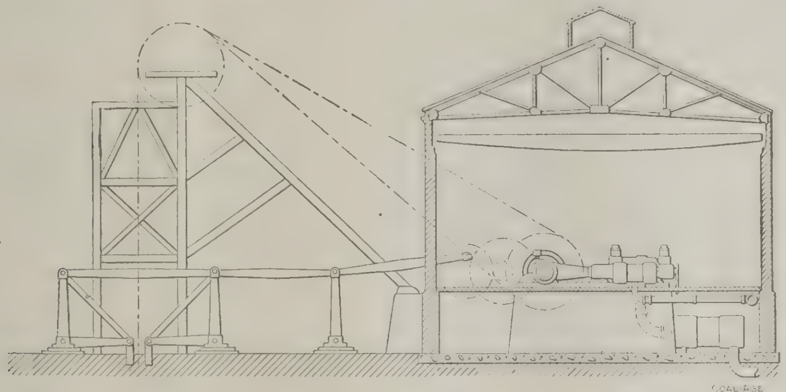


Fig. 3. Diagrammatic End Elevation of Colliery Plant Actuated by a Gas Engine and Mechanically Driven

Haulage and Coal Cutting

Many of the older collieries were equipped with direct mechanical drives, actuated by steam engines on the surface, and it does not seem that any insuperable difficulty should be found to result from the substitution of gas engines in place of the original prime movers.

Haulage is nearly always effected by wire ropes from haulage engines situated at the shaft top or bottom. In the direct mechanical system this drive is operated by means of a band rope actuated by a gas engine; and it is this rope, with its proneness to failure and its interference with hoisting, which is the undesirable feature of the mechanism. This objection, however, should not be insuperable, when the care and supervision necessary for all modern machinery are exercised. Such drives, worked by steam engines, are in common use, and seem to be both satisfactory and efficient. The writer has had the pleasure of seeing one or two modern installations of rope transmission, and he was impressed by the general simplicity and completeness with which these various requirements were fulfilled. The steam engine operating on the surface could easily have been replaced by a gas engine fitted, as an additional means of flexibility, with a reversing mechanism and the usual connections for starting by compressed air.

Coal-cutting machines, although often driven electrically, are more generally operated at the present time by compressed air. They can be operated effectively by wire ropes, as was done in the first mechanically operated machines. Efficiency could undoubtedly be increased if the various rope wheels were mounted on ball- or roller-bearings, the success of which for duties more onerous even than those in connection with mining has of late years been most marked.

The Chilean Coal Market

The demand for foreign coal continues good, notwithstanding the increased output of the Chilean mines, which amounted to more than 1,000,000 tons for 1911. The imports of coal for 1911 amounted to 1,274,118 tons, against 1,293,140 tons for 1910. Of this England furnished 705,762 tons, and Australia 526,643 tons, against 861,887 and 426,867, respectively, for 1910. No American coal was imported during 1911 and only 7260 tons during 1910. Only 51,861 tons of American coal have been sold in Chile during the past six years.

Briceville Explosion

E. N. Zern, assistant professor of mining, University of Pittsburgh, in an address to the Monongahela Y. M. C. A. Mining Institute, made the following reference to the Briceville explosion.

"Not long ago we read of a terrible mine disaster. These are the facts: The state mine inspector permitted a mine to be operated, the ventilation of which was provided by a fan installed within the mine. This mine was gaseous and dusty, and was neighbor to a mine where 10 years before 184 men lost their lives in an explosion. Open lights and electricity were permitted and their use can be classed in no wise as a precautionary measure wherever gas is generated, but the crowning fault lay in the use of that agency which, in the past ten years, has sent an army of men to the great beyond—black powder. In view of the dangers which were known to exist at this mine, I say that the loss of these 84 lives due to a blown-out shot is absolutely indefensible."

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

The fuel wealth of West Virginia has not been won by weaklings. In this little mountain state, Nature was lavish in storing her gifts, but all the good things were locked up in the fastnesses of her hills, and located far from the highways traveled by lovers of comfort and ease.

One of the pioneers in the development of West Virginia was Alexander Laing, father of John Laing, the present head of the State Department of Mines. The elder Laing emigrated from Falkirk, near Glasgow, Scotland, to America, in June, 1867. The family located at Hermitage, a small mining town, near Sharon, Mercer County, Penn.

John having been born in Falkirk, in August, 1865, was less than two years old when his father and grandfather came to this country. As soon as the family had located in Pennsylvania, the older men secured employment in the mines of Mercer County, continuing there for some years, but later changing their residence and devoting their time to mining in Mahoning County, Ohio.

John Laing entered the mines in what was known as the Spearman Shaft, Mercer County, Penn., at nine years of age, and his attention has been directed solely to the production of coal ever since. Mr. Laing accompanied his family to Ohio, and worked in the mines of that state until 1884, when they all moved to Fayette County, West Virginia.

John worked in the mines of the New River and Kanawha districts until 1891, when he gave up underground work and accepted a position as clerk in the store of the Rush Run Coal Co., in Fayette County. He was later advanced to bookkeeper, and as an additional duty, had charge of the company's payrolls. In January, 1892, when 26 years old, Mr. Laing gave up office work and took charge of the mine of the Red Ash Coal Co., as mine foreman. Five years later he was promoted to the position of mine superintendent of the Red Ash, Brooklyn and Cunard properties, three of the earlier operations located on New River.

In 1898, John was made superintendent of the mines of the Rush Run Coal Co., and in 1901, when a consolidation was effected, bringing together the Rush Run Coal Co., the Red Ash Coal Co., the Brooklyn Coal Co., the Cunard Coal Co., the Sun Coal Co., the Lanark Coal Co. and the Royal Coal & Coke Co., all located in the New River district, he was appointed superintendent of the combination. After this consolidation, the company was known as the New River Smokeless Coal Co., and was under the active management of Ferdinand Howald, one of the early settlers, who retired from mining in 1905, after having accumulated a considerable fortune. On the retirement of Mr. Howald, John Laing was appointed to succeed him as general manager of the consolidation.

John Laing

During the latter part of 1905, the New River Smokeless Coal Co. sold its entire holdings to the Guggenheim interests, of New York City. When this deal was put through, Mr. Laing resigned from the new organization, and with a part of the proceeds received from the sale of his interest in the original company, he organized the Wyatt Coal Co., in Kanawha County. He also purchased four mines on Cabin Creek from the Cardiff Coal Co., and these properties, known as Horton Nos. 1 and 2, Oakley and Berlin, are still being operated under his personal management.

In 1908, John Laing organized the MacAlpin Coal Co., which concern is operating on the Virginian and the Chesapeake & Ohio railways, in Raleigh County, West Virginia. He is president and general manager of this company. In 1911, John organized the McGregor Coal Co., which corporation has a lease of 3600 acres, located in Logan County, West Virginia. In 1912, he organized the McCaa Coal Co., which concern is working a lease of 1000 acres in Gilmer County, West Virginia, on the Coal & Coke Ry. John is likewise president and general manager of this latter corporation.

On December 22, 1908, Mr. Laing took oath of office as chief of the Department of Mines of West Virginia, which position he has filled creditably, and to the satisfaction of both operator and miner. His term of office expires July 1, 1913, and although he expects to serve until the end of his appointment, he will not accept the office for another four-year term.

In his own words, Mr. Laing says: "My work as chief mine inspector has been both congenial and pleasant. I have at all times had the coöperation and assistance of the Governor and administration of the state, and my relations with the operators and miners have been unusually harmonious. While at times we have had a slight diversity of opinion, and although a few accidents have occurred, we feel that our efforts have been successful."

Having been raised in the mines from early childhood, and having filled every position from trapper boy to president and owner, John Laing knows the practical side of his business from A to Z. He is a plain man and a strong one. Having mined coal himself, he knows his men, and it is not difficult for him to grasp their point of view. A natural story-teller, John would rather spend an idle moment telling a "new one" than to attend a reception at the Court of St. James.

His education was secured in the college of "hard knocks," but the schooling he received is the kind you can't forget, and the man who can start as a trapper at nine and swim to shore early in life, with several hundred thousand gold shekels on his back, has something thicker than water in his veins and stiffer than cord in his spine. Best of all, in his climbing, John hasn't walked on the hearts of his friends, and used the hopes of associates and acquaintances as stepping-stones to success.

Loyalty to friend and clan is not the least of his virtues, for what he hasn't done for "kith and kin" wouldn't fill a paragraph. Perhaps it's the Scotch in him, but I am inclined to believe its the size of his heart and not inherited instincts that is responsible for his desire to advance the "House of Laing" rather than the personal fortunes of John.

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Of this issue of Coal Age, we will print 7500 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

The Recompense of Labor

Were there but one individual in the world, it would be easy to determine the meet recompense of his labor. We could be assured that this solitary wight would receive, and could only receive, for his happiness and his sustenance what he gained by delving and spinning, less what was taken away from him by the rough hand of nature.

But, in the present, with a complex system of society, when some individuals take specialized parts of the corporate burden and others lightly shirk their responsibilities, we sometimes permit ourselves to believe that what is true of the unit man is untrue of the agglomerate unit, society. But it is certain, no matter how often we may overlook the fact, that society as a whole, cannot earn unless it works, and works efficiently, thereby creating wealth.

Wages are but tokens of the share awarded to the individual, representing his claim to a part of the universal wealth, and the attempt to issue these tokens without restriction will but cheapen them, because they do not call for segregated portions of the common store, but for such a part of the whole as the individual token bears to all tokens issued. Let us not fear, the wages of the world will buy the product of the world. No matter how liberally we recompense labor, the pay of the workmen cannot purchase more than what is for sale; nor can wages be so low that they can only purchase a part of all things salable. And this adjustment whereby the public's money and the public's property become equal automatically is provided in two ways—by changing the price or by controlling the product. The adjustment is foreordained, and for the sake of human betterment should be reached in times of depression by price reduction, and not by the idleness of the producer.

These are sayings so trite that we hesitate to make them. Unfortunately they are too often forgotten, and we hear it declared that class consciousness, liberal laws and the coming of labor into its own, express a sufficient reason why the workman is prosperous. But after all there can be no sufficing prosperity, unless the ground will produce and man will work intelligently at production.

The political intelligence of the American workman has not, in any way, been the cause of his personal well-being, and we fear his socio-political agitation will land him and the whole country further from his social ideals.

But it is with no feeling of satisfaction that we now proceed to condemn extensive rises in wages. It seems natural for every man to look forward to a time when his statement will run into three figures. When he has reached the highest point open to his intelligence, he naturally seeks to raise his class of fellow workers to higher levels of remuneration, in the expectation of personal advancement. He sometimes believes that this increase in wages will be taken from the profits of capital. But if he reflects, he must know it comes from his fellow workman, who must pay a larger price for the article he produces.

We cannot condemn him for shallowness of vision or for callousness toward his brother worker. The average capitalist sees no further than do his wage-earners and raises his prices regardless of the public weal or woe. So in this seeking of a larger wage, the worker commands everyone's sympathy. It is realized that no matter how inept, degenerate and feeble he may be, and few there are who can be thus described, his needs and those of his family are none the less urgent. He and they, as much as the intelligent, brilliant and strong, need sustenance and the luxuries of life.

But these can only come if there is a product of toil sufficient when divided to give an adequate share to each man. If the product sinks so low that there is not enough for all on the old standard of living, then "real wages" must fall, even if the "nominal wages" soar to suit the demands of agitators. The real wages, as Adam Smith has said, are the

materials desired by the workman, and exchangeable by him from the nominal wages given him by his employer.

The real wages of America have been high despite, and not because of, the deplorably high nominal wages. With virgin forests of excellent timber, with coal outcropping to the surface, with land unspoiled by endless tilling, with iron which can be mined by a steam shovel, with magnificent waterways, and above all with laboring men of a high degree of intelligence directed by enterprising industrial leaders and animated by the hopes which a large real wage inspires, there could not fail to accrue to workingmen an enviable opportunity. That this well-being was due to the men and to the land in which they lived, and not to any altered relation in the distribution of profits between capital and labor, is shown by the fact that both capitalist and artisan profited at least as largely as in any other country.

The only drawback to national supremacy has been and is now to be found in large nominal wages, and the accompanying high prices. But we are not the only people held back by such an encumbrance. New Zealand, Australia, and in a lower degree Canada are similarly hampered. All new communities, knowing how a large wage appeals to outsiders, offer it freely to encourage immigration of specially fitted foreign workmen. Able to pay such wages, even when elbowing their way into foreign markets by virtue of cheap raw materials and boundless vacant lands, capitalists do not hesitate to increase the rates of pay unduly.

Moreover, these larger wages have been paid usually to the invited guests of the nation; in early days, for example, the miner received more per ton of coal mined and loaded than the average day laborer got for a day's work. Today the glass workers, the tin-plate workers and the iron rollers, through their unions, have maintained, not the American wage, but the artificial wages offered to them before their entry on American soil, having held up the standard by selfish interferences with the laws of supply and demand.

High nominal wages shut or tend to shut the products of industry out of foreign markets. When nominal wages are equally raised in our country and in those competing, then there is no disturbance in business from such a rise, but when larger increases in wages are made here than abroad, the American product must find all its trade in the home market. Thus the work of consuls in building up a foreign trade is continually nullified by home conditions which are purely artificial and which aid no one.

The Bureau of Mines

Not a few organizations have been destroyed by the excess zeal of their friends, and such a result, the Federal Bureau of Mines has much reason to fear. The mining public is too well instructed to accept as official and authoritative all the statements that seem to emanate from Pittsburg and Washington. However, the average layman, unacquainted with the facts, is likely to be misled, and shaken confidence is sure to result when the public is at last correctly informed.

J. W. Paul has been credited with the statement that "at the explosion at McCurtain, Okla., 25 men were saved out of 100 in the mine." The alleged quotation does not declare that the men owed their lives to the Bureau, though the whole statement labors hard to create the impression that the Bureau is to be credited with the rescue of all the 25 men. Our readers will recall that eleven of the men escaped long before any member of the Bureau heard of the disaster. The others, possibly, may have been aided in their escape by the fact that the Bureau directed the recovery work and helped to reëstablish the air current in the mine.

Let the Bureau deny all attributions of bravery and judgment, which do not rightly belong to its rescue corps. Let it give due credit to the inspectors and the local rescuers who work so bravely to save their fellowmen. There is surely glory enough for all. The bravest are usually the most modest and the first to deny stories which overstate their achievements.

But there are other journalistic deliquencies besides those relating to mine-rescue work. A tendency of the advocates of the Bureau has been to lay claim to the origination of every mining improvement, forgetting that many of the developments have come from over sea. This does not show in the bulletins issued at public expense, but it does appear in reading notices scattered far and wide all over the country. These notices are the well springs of no little justifiable criticism and the Bureau must curb its friends or it will itself be curbed. From all sources comes the assertion that the nerve centers of the mining industry do not center in a common ganglion situate in the group of buildings at 40th St. and Butler, Pittsburg, Penn.

It should never be forgotten that the best friends of this organization are not the noisy press writers who know nothing of mining. Those who are working along the same lines as that body will recognize freely all its steady, honest and painstaking investigation. But gasconades and overstatements, whether made by the Bureau or by perfervid press journalists can only do harm. We would ourselves be the first to deplore the Bureau's besmirching and destruction, but these evils are likely to result if the present lack of conservatism continues to be evinced by those whose writings proclaim them accredited press agents.

Let it never be forgotten that we may wipe entirely off the slate all those foolish commendations to which the Bureau is not and never will be entitled, we can whittle away all the dross ornaments of editorial pens and there will nevertheless be much of which this governmental body and the people of these states may be justly proud, and we and they, are but at the threshold of their worthy attainments. Where so much is good, when false claims are unnecessary, there is no need to fear that the lopping of fallacious honors will leave Joseph A. Holmes and his associates despoiled of all honor. Let us hope that hereafter the Bureau will urge the press to regard and acclaim it with that measure of dignifying and honorable approval accorded the Bureaus of Standards and of Roads. Let it pride itself on the following aristocratic medieval motto, "Moveo et taceo,"—I move ever forward but I hold my peace.

Many annoying mine delays, caused by waiting for parts to be sent from the factory, can be avoided if only standardized, interchangeable equipment is used. The importance of this item in time saving cannot be overestimated.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Timbering a Mine Parting

Answering Noah Burton, Anglin, Ky., Coal Age, March 23, p. 786, who asks for the best method of timbering a mine parting under a tender roof, I submit a few sketches showing some of the methods I have adopted, in different mines. Each of these methods gave good satisfaction in the place where it was adopted. In timbering a mine parting, several conditions should be considered before adopting a method; as for example, length of service required of the timber; approximate weight it is expected to sustain; whether the siding will be temporary or permanent; whether the timbering will take up too much room and reduce the sectional area of the airway required for ventilation; whether or not the mine is in a good timber territory, or whether the timber will have to be bought and shipped in, and finally its cost as compared with steel I-beams, or T-rails.

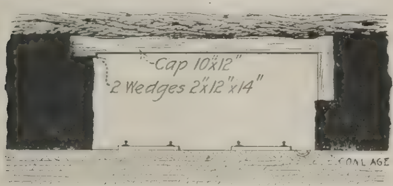


Fig. 1. Crossbar and Short Leg

Fig. 1 shows a method of timbering where the coal is reasonably hard and will sustain a good pressure. One end of the crossbar is notched into the coal, and rested on a plank to give it a better bearing surface. A wedge is then driven between this plank and the timber; or a pair of wedges can be used instead of a plank and wedge. This will reduce the liability of splitting off the edge of the coal supporting the timber. On the other side a short timber or leg is stood on the coal.

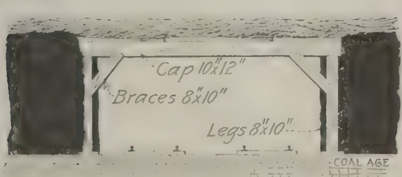


Fig. 2. Braced Timber Frame, Legs Set in Coal

Fig. 2 shows a method of using two legs and a cap or collar, and two braces of the same sized timber notched into the cap and legs as shown. This arrangement lessens the span and strengthens the collar. In both of these sketches the posts are cut into the coal on each side, and set back far enough so that a runaway car, or cars that become derailed will not knock the timbers out. The coal is cut just wide enough to admit the timber legs.

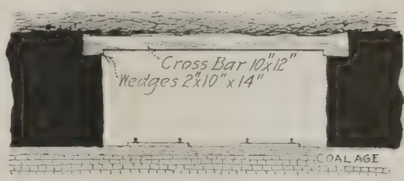


Fig. 3. Crossbar Supported by Hitches in Coal

Fig. 3 shows a method where the crossbar only is used. One end is slipped into a slot cut in the coal, the other end being swung in sideways, and the bar tightly wedged against the roof and the sides. Both ends of the bar rest on a short plank and wedges to give a good bearing on the coal. This is an economical and effective method where the coal is hard and will not split or crack off.

The timber frames can be set about 3 ft. apart, and lagged on top with 2-in. plank.

Fig. 4 shows a method of making a crossbar out of two steel rails, bolted together, with a wooden chock or filler between them. The ends of this bar are supported by two wooden legs. The sketch shows the general arrangement at one end. This bar is simple, easily constructed and will sustain an enormous weight and

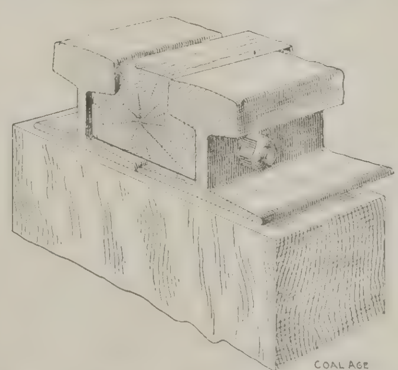


Fig. 4. Crossbar of Two Steel Rails

last a long time. The chocks do not reach the entire length of the rails; they are only about a foot long and placed where the bolts go through. Plank lagging can be used above the bars as with the other timber sets; or small iron rails, 16 lb. per yd., could be used, providing the roof was not too frail, requiring the lagging to be set skin to skin. This method is probably cheaper than the regular steel I-beams often used for mine timbering.

Fig. 5 shows a concrete arch with more than one radius. This is probably the most expensive first-cost method of supporting the roof over a sidetrack; but where the mine atmosphere has a corrosive effect on steel and rots wood, and where permanency and security are the chief factors to be considered, it is the best way to secure the siding or parting. This is especially true in shaft bottoms and landings. Where the weight to be sustained is great, and the excavation limited, the concrete can be reinforced with iron or steel to strengthen it.

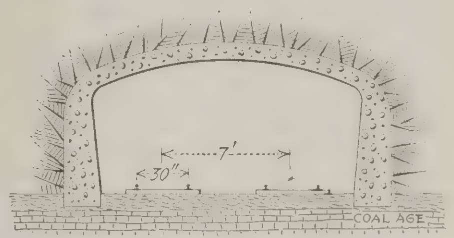


Fig. 5. Concrete Arch over Roadway

Not knowing the track gage, or the height of the seam, I have given no figures beyond stating the usual sizes of timbers used for mine partings in the bituminous regions of Pennsylvania. In estimating the cost of the job, it is necessary to consider the available supply of steel timbers, and of wooden timbers. The costs will probably be equal, in a territory where timber is scarce.

Johnstown, Penn. R. Z. Virgin.

The Utilization of Low-Grade Fuels

I was much interested in the Foreword, in Coal Age, April 6, which referred to the possibilities of the gas producer as an economizer of fuel for power purposes. The article draws attention, in a brief manner, to the fact that the gas producer has made it possible to use fuel that cannot be employed under a boiler because of its low calorific power, large ash content, or other cause that would make it an expensive fuel for this purpose. The statement is made that one ton of coal will turn more wheels operating through a producer and gas engine than two and one-half tons of the same coal burned under a boiler in the usual manner. This is an encouraging statement.

As master mechanic for the Cannel Coal Company of this city I have been studying the development of the gas producer, for some time. In preparing our

product for market we make one grade of coal (crushed-bone coal) for which there is little demand at the present time. There is a chance to sell electricity near here, for irrigation purposes; and we have thought, for some time, that this low-grade fuel, for which there is a limited market for power purposes, could be utilized through a gas producer and gas engine to furnish the power for an electric plant. I think such a gas producer and gas-engine-power station would be much better than a steam-power plant, in the economy of its operation. The article to which I have referred states that no coal is too poor for producer-gas purposes, and that coal containing even as high as 70 per cent. of ash has been used in this manner.

We have corresponded with a number of gas-producer manufacturers, but have found none who are willing to make any guarantee that this fuel could be used. If the statements to which we have referred are true, and we believe they are, we cannot understand why gas-producer companies should hesitate to assure us that their producer will work with this grade of coal.

The coal we mine is a semi-bituminous coal, called here "cannel coal." It gives on test about 15,000 B.T.U. The coal is very high in volatile matter, but has a large ash content. It is a long-flaming coal. The crushed-bone coal to which I have referred is what might be called a byproduct, in the preparation of our coal for market. I believe tests of this crushed-bone coal have shown about 8,000 B.T.U., with, of course, a somewhat larger percentage of ash than the regular coal.

I have suggested that our company should ship a car load of this crushed coal to some manufacturer of a good type of gas producer and have them try the same to ascertain the result. I would be glad to learn the name and address of such a manufacturer of gas producers, who would be willing to make such a test. I believe there is no fear but that the test would be successful.

W. F. Shutt,
Master Mechanic,
Cannel Coal Company.

Darwin, Webb County, Tex.

[It is possible there is a large amount of impurity in the crushed-bone coal to which our correspondent has referred. If this impurity is of a nature or in such quantity as to obstruct the grate and reduce to a large extent the temperature of the combustion in the gas producer it might be impossible to use this coal for the purpose mentioned. As cannel coal is one of the best gas producing coals, it is very possible that even this low-grade byproduct could be used in a gas producer; but it might require some previous treatment in order to separate a portion of the impurities. It might be necessary to wash the product before using the same in a gas producer. We would suggest that an analysis of the crushed-bone-coal product should be made, as this would greatly assist in solving the problem. It is a good proposition and should develop some valuable ideas in regard to the utilizing of low-grade fuels.

Coal Age will be glad to hear further from those who have had experience in this direction.—Editor.]

Treatment of Boiler Water

There is only one sure way of determining the proper treatment for boiler water, and that is to have it thoroughly and carefully analyzed. Then if there are properties in it which will cause either pitting, scales, or other boiler troubles, have chemists who make a study of this business prepare a compound or treatment specifically for this kind of water.

There are a great number of methods for treating boiler water, some of which are highly advertised. Many claims and counter claims are made, and experimenting indiscriminately with different methods is apt to discourage one from using any.

In time we will probably reach a stage of industrial development where practically all of the water used for steam will be analyzed and treated, if necessary, before it is used. Even the surface waters carry impurities that may produce scale or pitting, and it is so common among the miners to get water that is injurious that it is not safe to run a boiler any great length of time without carefully examining it. The better plan is to analyze the water and know before you start.

Injurious Impurities

Sometimes water strong in sulphuric acid derived from iron pyrites, or arsenical iron pyrites, will cause dangerous pitting of boiler tubes in only a few moments. This is a difficult water to treat.

The most common trouble with water that is seemingly practically pure is its leaving behind a sediment of lime or silicate, or a mixture of lime and clay that has been held in solution. This is quite common even in apparently pure surface water and it is this that forms what is termed scale in the boiler. Scale is not as bad as acids that will eat the metal of the shells and tubes. If neglected, of course, even scale proves dangerous in the end, but it is comparatively easy to clean out and remove.

The safe and sure plan is to send samples of the boiler water to chemists who make a specialty of boiler compounds; have it analyzed, and treatment prescribed according to its needs.

Engineer.

New York City.

The Fireboss Question

I have been much interested in the discussion that has been going on for some time, in Coal Age, regarding the fireboss question. I am, at the present time, employed as a fireboss in western Pennsylvania. From my own experience I can indorse much of what has been said in regard to the general treatment of the fireboss. Whenever there comes an idle day and the mine foreman is aware of it in time to stop the fireboss from making his rounds or morning inspection, he is there at the mine entrance to stop them from going in or sends word and they are sent home after having risen at 2 o'clock in the morning and prepared themselves for the work and traveled sometimes a long distance to reach the mine in time.

The mines here mostly ship by river. When the river was frozen over last winter and the mine was idle, the firebosses were laid off or allowed the choice of working every other day, at a wage of $2.75 per day, which was 52c. less than their regular wage.

To show the difference between the treatment received by the firebosses and that received by other men in the mine, I would say it was a usual thing for the mine foreman to allow all the roadmen and their helpers and the day laborers to work every idle day. During last winter, when the firebosses worked every other day, these men worked every day.

It has been truly stated that during a period of idleness the fireboss should be the last man laid off, but during the idle period last winter, in our mines, the boss-driver and motormen got steady work; and one of these motormen was a new man, only recently hired since the mine had closed down on account of the freezing over of the river. All of the firebosses had been in the employ of the company a longer time than this man.

Charter Member.

Western Pennsylvania.

A Flushing Problem in the West

When constructing the new Federal Building at Rock Springs, Wyo., the engineers were confronted with the problem of filling in the old workings of the Union Pacific No. 1 Mine which were directly below the site of the building.

To attempt to haul material for filling the workings through the old openings would have been a laborious and expensive proposition. In order to save time, the government engineers are drilling a series of churn-drill holes from the surface and the material for filling the old workings will be spouted down these drill holes, making a perfectly solid foundation for the building.

Benedict Shubart.

Denver, Colo.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Bituminous Mine Foremen's Examinations in Pennsylvania, April 9-11, 1912

Selected, Second-Grade Questions

Duties of Mine Foreman

Ques.—What are the duties of a mine foreman relative to his daily visit to each working place; what should he observe and what instructions give to the workmen?

Ans.—The mine foreman or one of his assistants must visit every working at least once each day while the men are at work. He must observe closely the condition of each place with respect to the health and safety of the men employed therein. He must see that the place is properly ventilated, drained and timbered; the coal properly mined and loaded, and proper breakthroughs made in the pillars. He must instruct each miner how to timber his place, mine his coal setting sprags not more than 7 ft. apart, and direct at what time blasting may be done. He must observe that sufficient timber and cap pieces are on hand, and that the fireboss has left his mark in the place, indicating that he has made his examination as required by law.

Ventilation, Water Gage in Two Airways

Ques.—If a water gage of 2 in. produces a velocity of 500 ft. per min. in an air course 4000 ft. long, what water gage will be required to produce a velocity of 800 ft. per min. in this air course, when its length has been extended to 8000 ft.?

Ans. — For the same cross-section (area and perimeter) of airway, the water gage varies as the length of the airway and the square of the velocity of the current. In other words, the water-gage ratio is then equal to the length ratio times the square of the velocity ratio. In this case, calling the required water gage x,

$$\frac{x}{2} = \frac{8000}{4000}\left(\frac{800}{500}\right)^2 = 2\left(\frac{8}{5}\right)^2$$

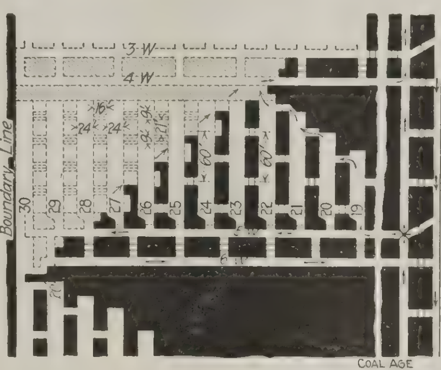
$$x = \frac{2 \times 2 \times 64}{25} = 10.24 \textit{ in.}$$

Drawing Pillars by Machines

Ques.—What method is best adapted to extracting pillars, in the mine, by mining machines, under ordinary conditions of roof and floor?

Ans.—The use of mining machines in drawing pillars requires experience and care. Few systems of mining will present conditions that will allow the machine to work with safety on the end of the pillar. With proper care, however, in the laying out and the prosecution of the work, the pillar coal will be sufficiently strong, under ordinary conditions of roof and floor, to enable the machine to undercut the rib of the pillar, back, say 3 yd. from the loose end.

A cut 7 yd. wide can generally be put in on the rib and the pillar cut through in this manner. The stub pillar 3 yd. thick is then mined out with the pick after setting the necessary timbers to protect the opening while the work is being done. The manner of crosscutting the pillars is shown in the accompanying figure, rib cuts being started in rooms



Showing Method of Drawing Pillars by Machines

24-27. Each 7-yd. rib cut is thus made with the machine, starting 3 yd. back from the loose end, and the pillar again cut through as before. Timbers are stood in this cut and the 3-yd. stub mined out by pick. This operation is continued till the entire pillar is taken out back to the entry stump

It is important, for success in drawing back pillars, especially when machines are to be used for that purpose, to lay out the work systematically and advance the rooms regularly with breakthroughs at a fixed distance apart. These breakthroughs should not be opposite to each other, but staggered, as shown in the figure. The line of pillar work must be kept, as nearly as possible, a uniformly straight line so that there will be a corresponding uniform line of fracture in the roof and none of the pillars will be unduly weighted, which would crush the coal.

In the accompanying figure the butt entries are driven to the boundary and the inside rooms turned first. The entire work is regulated so that the line of pillar work is continuous across the head of the butt entries. In the present case, the main-entry pillars are 10 yd. wide, the butt-entry pillars 8 yd. and room pillars 16 ft. All entries are driven 10 ft. wide; rooms are turned 8 ft. wide for 4 yd. and then widened out, on the inby side, at an angle of 45°, to a width of 8 yd. This makes the rooms 40-ft. centers; they are driven up 60 yd., leaving a chain pillar 20 ft. wide to protect the upper air course. The butt-entry pillars, in each case, are drawn with the chain pillar below them at the time of drawing the room pillars on the next lower butts.

Pressure on Mine Dam

Ques.—A dam in an entry supports a vertical head of water of 80 ft. The wetted area of the dam is 70 sq. ft.; find the total pressure, in short tons, on the dam.

Ans.—Assuming the wetted area is a rectangle 10 ft. wide and 7 ft. high, the center of pressure is one-half the height or 3.5 ft. above the floor. Then, if the water level is 80 ft. above the floor the effective head against the dam is 80 − 3.5 = 76.5 ft. and the pressure due to this head is

$$62.5 \times 76.5 = 4781.25 \text{ lb. per sq.ft.}$$

The total pressure on the dam is then

$$\frac{70 \times 4781.25}{2000} = 167.34 + \textit{short tons}$$

Ventilation, Height of Motive Column

Ques.—What would be the height of motive column, for upcast and for downcast air, respectively, where the depth of each shaft is 300 ft., and the temperature of the downcast shaft 32° F. and that of the upcast 48° F.?

Ans.—The heights of motive column, in terms of downcast and upcast air, are, respectively,

Downcast air,

$$M = 300 \times \frac{48 - 32}{460 + 48} = \frac{300 \times 16}{508} = 9.44 + ft$$

Upcast air,

$$M = 300 \times \frac{48 - 32}{460 + 32} = \frac{300 \times 16}{492} = 9.75 + ft.$$

The upcast air being the lighter gives a longer motive column for the same pressure.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Emergency Car of Colorado Fuel & Iron Co.

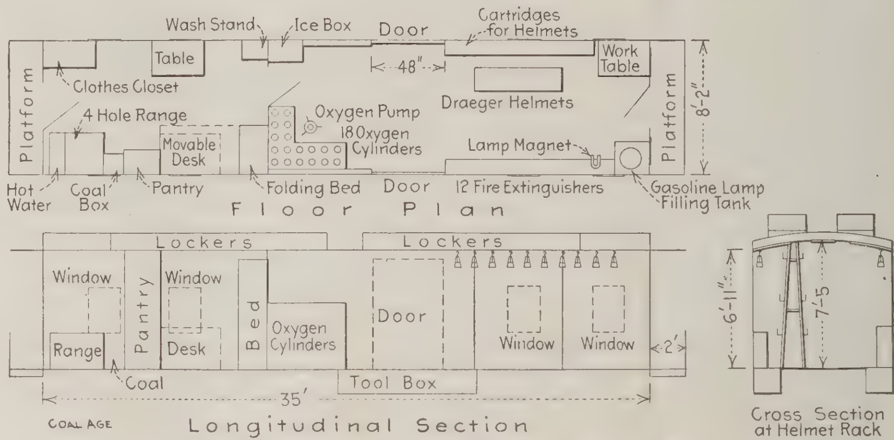
Special Correspondence

The emergency car of the Colorado Fuel & Iron Co. has equipment features of more than ordinary interest. It is intended to supplement the rescue car proper, which carries the regular rescue equipment.

It is a standard box car, fully equipped for train service. It carries a 5-ft. disk fan, manufactured by S. B. Stine, of Osceola Mills, Penn. This fan has a sectional base with two bearings bolted together, which support the fan independently. At one end of the fan is a flexible coupling for attachment to any one of three motors. A base is carried in the car to support any one of the motors when in use. It is designed and built of sufficient strength and size to accommodate the largest motor, and is provided with the necessary liners, which match the bolt holes in the bases and bring the motors up to the correct height for alignment with the fan. These two parts, the fan base and motor base, when bolted together, complete a direct-connected fan unit of substantial construction.

Motors for All Kinds of Current

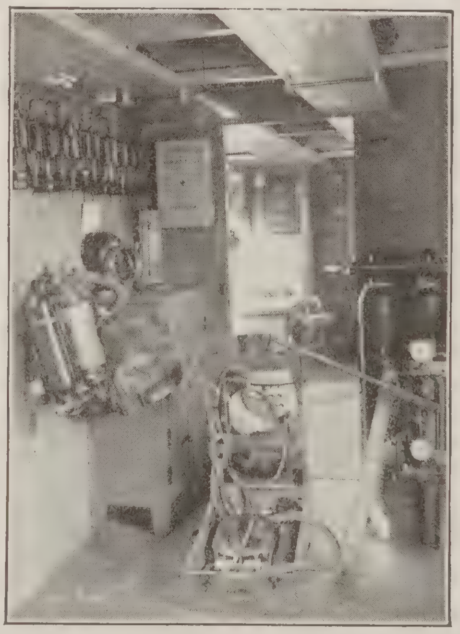
The different mines use current of different voltages. Moreover, at some direct current is used, and at others, alter-

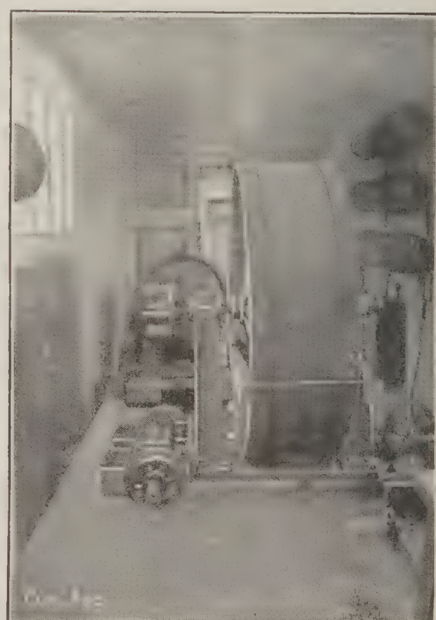


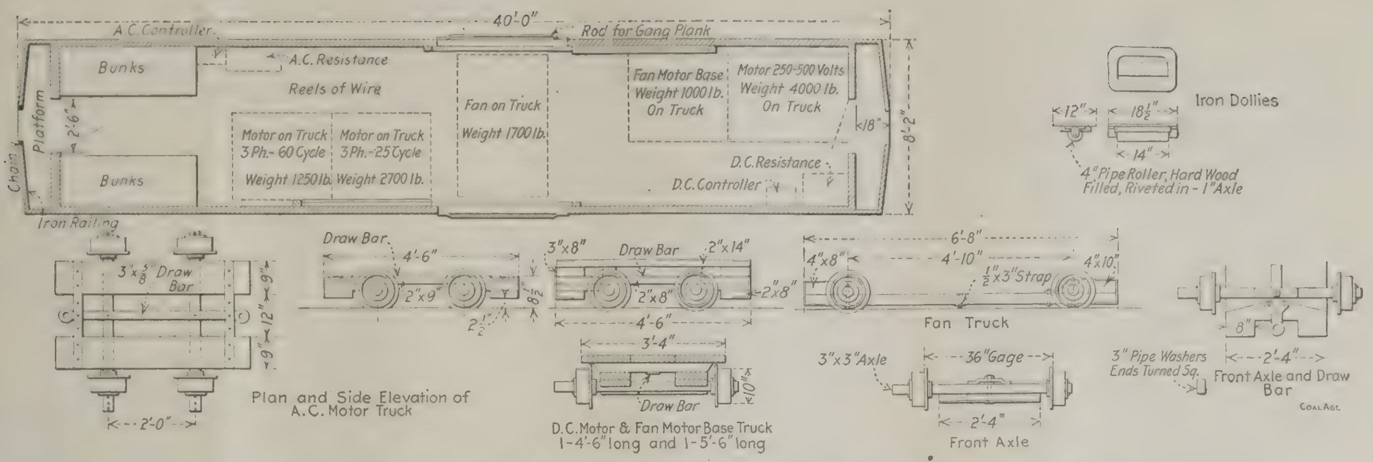
Plan, Elevation and End View of Rescue Car

Rescue Car of Colorado Fuel & Iron Co.


Kitchen and Dining Room in Rear of Rescue Car


Oxygen Pump and Cylinders, Pulmotors and Ice Chest


The 5-ft. Stine Fan with Flexible Coupling on Truck



Plan of Colorado Fuel & Iron Co. Emergency Car and Details of Trucks

End of Rescue Car, Showing Helmets, Oxygen Cartridges, Gasoline Tank and Lamps

nating. To fit the different conditions, the Fuel Co. has installed three motors, suitable for every type of current supplied. The motors will operate the fan at any required speed, from 150 r.p.m. to 600 r.p.m. They are equipped with the necessary controlling apparatus to provide for the above range of speed. Each motor is fitted with its own corresponding half of flexible coupling, so that it is not necessary to change couplings when motors are changed.

The following is a description of the three motors:

One 20-hp. direct-current motor of the semi-inclosed interpole type, using from 250 to 500 volts, and running at 550 revolutions per minute.

One 20-hp., 25 cycle, 3-phase alternating-current motor of the semi-inclosed, wound-rotor induction type, using 440 volts and running at 480 revolutions per minute.

One 20-hp., 60-cycle, 3-phase, alternating-current motor of the semi-inclosed, wound-rotor induction type, using 440 volts and running at 575 revolutions per minute.

These motors were furnished by the Allis-Chalmers Co. To facilitate transportation of the fan, the three motors and the adjustable motor base, each piece is equipped with specially designed trucks, or dollies. These are constructed to fit mine tracks, gaging 36, 38 and 40 in. On the car are also carried 2000 ft. of No. 4 wire, inclosed in a duplex rubber-covered cable, wound on a reel; also two 4-ton jacks and ropes, blocks, chains, and gangplanks. A supply of fireproof brattice cloth is set in racks on the sides of the car.

The Helmet Car

These supplies are supplemented by those carried on the helmet car, and it is the intention to move the cars together to the seat of any disaster. On the helmet or rescue car is carried a full supply of shovels, picks, axes, saws, hammers, bars, sledges, pipe wrenches, dies, pipe

Two Alternating-current Motors on Adjustable Trucks and Rheostat with Bunks in Rear

fittings, nails, rubber gloves, disinfectants, stretchers, fire extinguishers, 2000 ft. of 2-in. fire hose, cooking utensils and tents. Eight Draeger helmets, two pulmotors, a large supply of potash cartridges and oxygen, safety lamps, gasoline, complete first-aid equipment, flashlights and lanterns are also provided.

TELEPHONES FOR RESCUE WORK

Another part of the equipment consists of eight portable telephones, equipped with one mile of twin conductor cable, made in accordance with the general specifications No. 548, of the U. S. Army, as follows: Each conductor is made up of seven wires of diameter 0.010 in., the center wire being of copper and surrounded by six steel wires, each conductor being insulated with 1/64-in., 30 per cent. rubber-compound braided conductor, laid parallel and covered with waterproof braid. The telephones are for use in rescue work and will make it possible for the rescue party to be in communication with the outside. A full set of blueprints of all the mines is kept on file in the helmet car. It is also provided with the tin pocket splints invented by W. V. Gage and described in our issue of Mar. 30.

The emergency car is worthy of more general adoption. The Consolidation Coal Co., in the Fairmont district, has a fan placed in a car, ready for transportation when needed, but the Colorado Fuel & Iron Co.'s outfit is more elaborate and more flexible and should do good work, if the company should be unfortunate enough at any time to have to make use of it.

When Welfare Work Fails

By CHARLES L. FAY*

There is welfare work and welfare work. There is the sort which is the result of sudden impulse, often requiring large financial outlay, a "big" scheme which looks well in print and then, like the beautiful sky-rocket having blazed forth its glory for the moment falls somewhere in the outer darkness. It is all over, another failure and one more well meaning enthusiast, its promoter, is turned into a pessimist.

This man who once felt the great inner joy of an endeavoring to do something for others less fortunate than himself, his own employees perhaps, now considers the rank and file of men ungrateful, without desire for self-improvement and utterly unworthy of further serious thought. I have heard men with similar experiences to that mentioned, say, after failing to thrust a pet plan upon the masses: "The more you do for people the less they respect you. I thought differently, I find I was a fool. I was deluded by a fancy."

*Mining secretary, Pennsylvania State Y. M. C. A.

NO WORK SHOULD BE SPASMODIC

It never occurs to that man that *he* was at fault. He fails to recall that he was guided by a *sudden impulse* which had no basis other than the honest desire of a naturally generous and sympathetic nature. The man was all right and the sudden impulse was good but something was needed to control and guide it. That man should have remembered first of all that men and boys, whether laborers, mechanics, or what not, *think, and they think in the sphere in which they live.*

They respond with sincerity to a real and practical effort in their behalf, but they rebel and turn away from the superficial scheme. No man can lift and hold another man's life to a higher plane than he himself lives upon. For motive is the real power whether that motive be right or wrong.

THE BERTILLON MARK IN WELFARE WORK

There have been instances where a man with humane desires but still dominated by a selfish motive, has projected a beneficent enterprise in an endeavor to develop employees or others to an unselfish plane of living and of conduct. The plan, of itself good, has failed to gain response from those it was intended to help and another pessimist results.

This man hides from his own consciousness a knowledge of his ulterior motive, boasts of his former willingness and desire to help other men and heaps invective upon the ungrateful (?) masses. The man of the "rank and file" felt instinctively the selfish motive lying far back in the recesses of that life which laid a bogus claim to a desire to "uplift him," and his manhood, latent and corroded, perhaps, rose in an unexpressed agony and resented the proffered aid. Had purity of aim graced an honest motive, that workman's manhood would have gradually risen in its majesty to the higher plane to greet its helper.

Strong impulse to do good, honest desire to better the conditions of men, pure motives in the enterprise on hand will always be backed by a careful study of conditions surrounding those to be benefited, also with a delicacy of perception and treatment which recognizes men as men.

The plan of helpfulness, thus born, whatever it may be, playgrounds, reading clubs, societies of one sort and another, will be so arranged that the genius of those gaining the benefits will be required and have ample opportunity to operate in maintaining and developing whatever is undertaken. So that, out of their lives may come a fruitage from the growth developing within, started and nurtured by the kindly spirit and honest motive of the benefactor.

A life is an outward growth from within; it cannot be lined with a tee-square and developed in a blueprint room. Qualities cannot be tacked to the character as an "addition" or a "cupola" is added to a house. Like a leaf or a flower it may be checked or controlled but its growth must proceed from the vital processes within.

Mine Rescue and First Aid Contest, Colorado School of Mines

SPECIAL CORRESPONDENCE

On the last day of March, a most interesting demonstration of the Draeger Oxygen Helmet in mine-rescue work, and a first-aid-to-the-injured contest, was held by the students of the State School of Mines at Golden, Colo., under Prof. J. C. Roberts, of the U. S. Bureau of Mines, who had Rescue Car No. 2 there for ten days while he, with the crew of the car, were giving instructions in the above work to about 80 students from the senior and junior classes.

In the first-aid contest, ten teams, consisting of a captain, four assistants and a patient, competed for a silver loving cup presented by Dr. Victor Alderson, head of the school. The judges were Captain George C. Osburne and two other U. S. Army officers.

The demonstration of life saving in mine fires or explosions, was given at the School of Mines' tunnel. Dense fumes poured from the portal; students wearing the oxygen helmets went in and rescued the victims, and then gave them first-aid treatment outside the tunnel.

For saving the lives of the workers in coal and metal mines such tuition is invaluable, and this fact is now recognized by mine operators all over the country, who are giving their employees free instruction in this great work. Professor Roberts was assisted by Professors Schneider and Allen.

Tree Culture

Without doubt the public schools are destined eventually to promote the desire for beauty which will make mine hamlets places of scenic charm and order.

It will be objected that children must be reckoned with in any plan of beauty culture. Children are fond of destroying trees, solely because this destruction forms an occupation for their waste activities, but it will be observed that they take up fiercely a defense of anything those same activities have created or fostered. Consequently if children be induced to plant trees they will be devoted in their defense of the beauty they have labored to create and if their interest is enlisted children are natural conservationists, as active in protection as they are otherwise prolific in devastation.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

A body of several hundred delegates, representing commercial organizations, and among them men from various coal mining bodies, notably the National Federation of Coal operators, met in Washington, Apr. 22-23, upon the invitation of the Secretary of Commerce and Labor, for the purpose of discussing the advisability of forming a national chamber of commerce which would represent the commercial bodies of the country and would give expression to their views and wishes in regard to matters affecting federal policy.

It was decided to form an organization of the kind and to ask for a national charter, to be granted by Congress, with the idea of giving the organization a certain amount of governmental recognition and standing which, it was supposed, could not otherwise be had. Four plans for organization were more or less urgently placed before the convention and the scheme finally recommended was based as far as possible upon the ideas embodied in these plans.

Secretary Nagel in his opening address indicated the necessity for such a body as this for the purpose of concentrating public opinion upon national questions, and enumerated some of the principal issues now pending before Congress as being among those with which it should deal. Harry A. Wheeler, of Chicago, chairman of the convention, stated his opinion that an important function of the enterprise should be to ascertain facts by investigation, and then to attempt to secure national action based upon the conditions thereby revealed.

The new organization will be national in scope and based on existing trade organizations, chambers of commerce, etc., each being entitled to a delegate if its membership numbers 50, with one additional delegate for every additional 100 members, the total number of delegates from any one organization not to exceed ten.

Coal Car Discrimination Cases

The Interstate Commerce Commission has made a series of important awards in the actions brought by the Hillsdale Coke Co., Jacoby & Co., the Clarke Bros. Co., and the Bulah Coal Co. against the Pennsylvania R.R., all of which involve the question of reparation for losses due to discrimination in the distribution of railroad coal cars.

Damages were awarded to the several coal companies and in explanation of its assumption of authority in this matter, the Commission states that "there is a conflict of view as between the Commission and the very court to which these complainants, if refused any relief here, would doubtless have to resort to secure a judgment for the damages here claimed to have been sustained. In order, therefore, to prevent a failure of justice in these cases, as well as to create an opportunity to secure a final ruling by the courts as to what should be our course of action in the future in such cases, we concluded to proceed with these claims; and having found that undue discriminations had been practiced by the defendant against the complainants, we ordered a reargument on the question of the amount of damages respectively sustained by them by reason thereof."

In closing the discussion, the Commission says:

Many theories as to the elements that should be considered in estimating damages in a case of this kind were advanced by each side. It is said by the complainants that their damages should be estimated on the basis of a supply of coal cars according to the physical capacity of their mines, or at least on the basis of their rated capacity. We have dealt with the claims only on the basis of the fair proportion of the available equipment that each claimant was entitled to receive in view of what we here find would have been a proper rating for each operation. According to the argument and brief on behalf of the defendant there is no sound theory upon which the damages of the complainants may be calculated. The defendant contends in all these cases that the coal which the complainants were unable to mine because of their failure to obtain their fair share of cars still remained in the ground, and that the extent of the damage really suffered cannot, therefore, be ascertained without proof, showing that the coal when subsequently mined was sold at a less profit than might have been realized during the period of the action. We are not prepared to enter upon a discussion of that question. Such claims are clearly justifiable, and we know of no better guide or basis for our action than the rule followed by the courts in similar cases.

Alabama

Odenville—The miners employed by the Seaboard Coal & Coke Co. went out on strike, Apr. 15, as a result of a dispute in regard to the method of payment. The men wanted payment on a yardage basis and the company proposed to maintain the present system.

Birmingham—According to official figures recently received by Chief Mine Inspector Nesbitt, Alabama jumped, last year, from sixth place to fifth place among the coal-producing states, despite the fact that the output for 1911 showed a reduction of over a million tons compared with 1910.

Colorado

Florence—The Colorado Fuel & Iron Co. is preparing to sink a new shaft about 1½ miles south of Rockvale on the Radiant branch of the Santa Fé. This will tap the most extensive coal area in the Fremont County field. At present this territory is being worked by the Canfield company, at Coal Creek.

Charles Cowan, formerly one of the county's large coal operators, has filed articles incorporating the Farmers' Progressive Coal Co., with a capital stock of $50,000 to operate coal mines in Delta County. Several years ago Mr. Cowan purchased a large tract of coal land near Paonia, which has been found to contain six seams of domestic and steam coal. The mine is situated on the mountain side overlooking the town of Paonia and a tramway, which is now being constructed to convey the coal from the mine to the foot of the hill, will land the coal within a mile and a half of the town.

Denver—The government brought suit some time ago to recover 4000 acres of coal land in Routt County, which it alleged had been obtained by fraudulent means through dummy entrymen. At the conclusion of the hearing of this case recently, Federal Judge Trieber advised the defendants that he would sustain the government, at least in regard to its claim to 1640 acres of the land.

Illinois

Murphysboro—At Bush, a mining village of 600 inhabitants, in Williamson County, 18 persons were killed by the storm which swept this section, Apr. 20. The town was laid in ruins, the property of the Western Coal & Mining Co., the post office, a store, two hotels and 40 dwellings were demolished.

Belleville—A jury in the circuit court recently awarded the Mulberry Hill Coal

Co. a verdict for $10,000, against the Illinois Central R.R. Co. as damages for failure to furnish the plaintiffs with coal cars for the transportation of coal during a period of 99 days. This is the first case tried in Illinois under the new law, and this is the third time the case has been tried. The railroad company will appeal to the supreme court.

Springfield—The Sangamon Loan & Trust Co. has been appointed receiver for the Barclay mine and will probably arrange to lease or operate the property while acting in this capacity

Condemnation proceedings in connection with the right-of-way for the extension of the Chicago & Northwestern R.R. to the coal fields of central Illinois are rapidly being wound up in Tazewell and Sangamon Counties and it is expected to have deeds to all the property desired, by the first part of May. The road passes through the counties of Tazewell, Mason, Menard, Sangamon and Macoupin. The expenses of securing the right-of-way through Sangamon County will amount to $300,000, while the aggregate for the other counties will reach $500,000.

Troy—It is reported that the well known Bennett coal mine, located about two miles west of Lebanon, will be abandoned in the near future. Practically all the available coal has been taken out and the underground haul is now too long to operate the mine profitably. The Bennett mine is one of the oldest in this section, having been operated for the past 40 years.

Indiana

Indianapolis—With the formal signing of the Cleveland wage contract here Apr. 25, by representatives of the United Mine Workers and the bituminous coal-mine owners, peace was established in the central competitive field, so far as wages are concerned, for the next two years. The field comprises Indiana, Illinois, Ohio and western Pennsylvania, and the agreement probably will be the basis for contracts in the North and Southwestern coal fields.

Terre Haute—The convention of Indiana United Mine Workers adjourned Apr. 19 for 10 days, to allow time for the signing of the interstate agreement. Linton was chosen as the place for holding the next biennial convention. The convention voted down the plan for mutual accident insurance, with the operators paying nine-tenths of the assessment, which would raise $235,000 a year, because the delegates want a state law which will establish compulsory liability for the operator.

Kansas

Pittsburg—Grievances that have been in existence for the past two months at mine No. 17 of the Central Coal & Coke Co. were settled recently by Vice-President Variot and Assistant Commissioner George Richardson. It is said that the agreement is eminently satisfactory to both sides.

Kentucky

Madisonville—Six lives are believed to have been lost in the explosion, followed by a fire, in the Coil coal mine, near here, Sunday night, Apr. 21. The body of Joseph Hollowell, the mine foreman, was found Apr. 23, and also the bodies of three negro miners.

Hickman—Representatives of the owners of coal mines of western Kentucky and eastern Tennessee have been here the past week trying to get men who have been flooded out of their homes and work to go to the mines to work. They have met with no encouragement, however.

Pineville — The New Straight Creek Coal Co., a corporation composed of Winchester capitalists which was organized for the purpose of leasing and operating the mines of the Big Hill Coal Co., at Blanche, has surrendered its lease, after having operated the property for about nine months. The Big Hill Coal Co., the owners of the property, took charge the first of the month and are now operating.

Winchester—Work on the opening of a new $100,000 coal-mining plant in the northern edge of Perry County, on the new extension of the Lexington & Eastern R.R., will be begun at an early date, and the owners, who are Northern capitalists, are arranging for headquarters here.

Ashland—Owing to the increased coal tonnage over its lines, the Chesapeake & Ohio is reported to be considering double-tracking from Russell to Ashland, and improving its facilities at Russell.

Henderson—The engine and boiler room of the Keystone Mining & Manufacturing Co.. at Henderson, was damaged by fire recently. The tipple was threatened by the blaze, which was kept under control, however.

A Chicago syndicate is reported to have acquired a considerable amount of coal lands along the Kentucky River, in Letcher County. It is on the right-of-way of the extension of the Lexington & Eastern Railroad.

Michigan

Saginaw — West side capitalists are back of a new coöperative coal-mining company which it is expected will be organized and incorporated in the near future. Twenty-five practical miners are wanted as stockholders. It is proposed to use the unworked part of the old Caledonia tract and add to it a large acreage. A shaft 900 ft. deep will be sunk. A vein 3 ft. 8 in. thick is to be found under this locality.

It is expected that all the men will be back at work in Michigan coal mines by the first of the month.

Ohio

Columbus—During a two-days' session, which adjourned at Columbus, Apr. 4, the executive board of the Ohio district, United Mine Workers, named the dates for holding a number of conferences between miners and operators in several of the sub-districts as follows: Massillon, May 1; Hocking Valley, May 6; Guernsey, May 9; eastern Ohio, May 15; Jackson, May 27. These meetings are for the purpose of perfecting the details of the Cleveland agreement. President John Moore will attend each of them and as soon as those named above have been held dates will be selected for holding similar conferences in the six other sub-districts in Ohio.

Bridgeport—Ten thousand miners in eastern Ohio resumed work Apr. 23, after being idle since the last day of March. The men were expected to resume work on the twenty-first, but for some reason they failed to get an official circular sent out last week, and refused to report. Miners at Plum Run, Bradley and Piney Fork, where rules which permitted pumpers and repair men to work pending scale conferences, were violated, are to be disciplined and many of the ringleaders will be expelled from the United Mine Workers.

Zanesville—The citizens of Winterset are greatly interested in rumors of the building of a new railroad running east and west through Guernsey County. It is said the new road will leave the Pan Handle at Coshocton, running east via Plainfield to Birds Run and Tyner, then passing through the coal fields of Harrison County and terminating at Jewett or Cadiz Junction. It is claimed that the new road will shorten the distance from Columbus to Pittsburg several miles and pass through one of the richest coal districts in the state. If the new railroad is built it is also rumored that new coal mines will be opened up.

Pennsylvania

Bituminous

Pittsburg — An award of reparation against the Pennsylvania R.R. Co., aggregating in five cases, $129,722, was made, Apr. 24, by the Interstate Commerce Commission. The commission found that the railroad had been guilty of unlawful discrimination in the distribution of its coal-car equipment, by reason of which five complaining coal companies had been unable fairly to market their products. The commission established a new principle by awarding damages in these cases. Heretofore, such matters have been referred to the courts

The orders require the Pennsylvania to pay to the Hillsdale Coal & Coke Co., $27,193; to W. F. Jacoby & Co., $21,094; to Clark Brothers Coal Mining Co., $31,-128; to the Bulah Coal Co., $31,716, and to James H. Minds, $18,592.

Efforts of socialists and those in sympathy with the Industrial Workers of the World to inject politics into the affairs of Pittsburg District No. 5, United Mine Workers, are said to have caused the present rupture in the ranks of the local district. An appeal, said to have the support of Michael Halapy, of Indianapolis, formerly of this city, to the national board, for a reëlection of officers of this district has been made. There is thought to be little chance, however, that the national council will grant the petition. Halapy was defeated for the presidency of the local district by Francis Feehan, of Pittsburg.

Thirty-five new men were placed at work, Apr. 23, in the mines of the Hicks Coal Co., of Brackenridge, in place of the miners who went on strike two weeks ago. The striking men contented themselves awaiting an adjustment of their difficulties. No disorder is expected.

Huntingdon—On application of the Broad Top Coal & Mineral Co., an injunction was issued, Apr. 22, by the Huntingdon County Court, enjoining certain members of the miners' union from interfering with the operation of the company's mines and trespassing on the company's property. The Broad Top company's mines have always been nonunion, and as a result of the recent organization of the miners, they have been closed down since Apr. 1.

Anthracite

Scranton—The sub-committee of anthracite operators and miners in session at New York reached an agreement, Apr. 25, and the coal companies are preparing for a resumption of work by Monday, May 13. The agreement will undoubtedly be ratified by the general committee, which meets on May 2, and also by the miners convention, to be held later, although some little dissatisfaction is felt among the men in not having obtained a higher increase in wages. Briefly, the terms of the agreement reached by the subcommittee are as follows:

A 10 per cent. wage increase, with the abolition of the sliding scale. A four-year contract. The granting of colliery committees, working in conjunction with union officials to adjust grievances, with the conciliation board as a final arbiter. The signing of agreements by the union executive officers as representatives of the Anthracite Miners' organization. The maintaining of laborers' wages at rates fixed by the strike commission of 1902. The right to elect checkweighmen and docking bosses at the collieries. The maintenance of the strike commission clause to pay all miners uniform wages, according to the 1902 settlement. The determination, by committees of miners and officials at each colliery, of what wage rates prevailed at the collieries prior to the 1902 strike, which formed a basis of the settlement of that controversy. A standard wage rate for miners employed on "consideration work." This rate has not been announced, but it is supposed to be $3.50 a day.

Four men were buried recently under a fall of burning culm, at the bank of the Central colliery, of the Pennsylvania Coal Co., at Avoca. The material was being washed away and, becoming undermined at a point near where the men were working, a portion which was on fire gave way and slid down upon them. All were rescued alive, but three of the men died later from their burns. Five men were seriously burned in the same way at this place about a month ago.

Wilkes-Barre—The annual meeting of anthracite mine inspectors opened in Williamsport, Apr. 24. Twenty-one inspectors from all over the region were present. D. J. Roderick, of Hazleton, presided over the gathering, and Carbondale, Scranton, Old Forge, Pittston, Wilkes-Barre, Hazleton, Mahanoy City, Shenandoah, Centralia, Pottsville, Lansford, Mount Carmel, Shamokin, Lykens and Forest City were represented.

Hazleton—The Lehigh Valley Coal Co. is moving the offices of the Hazleton division to the tenth floor of the new Markle Building, and combining with them the offices formerly at Drifton. In this way Superintendent Davies will have all his forces under his immediate supervision.

Tennessee

Bristol—According to a rumor that is current in Bristol and Roanoke, the general offices of the Virginia Iron, Coal & Coke Co. are to be removed to Bristol. The report is unconfirmed, but it is believed to have good foundation.

Coal Creek—A strike has been called at the Cross Mountain coal mine, of the Knoxville Iron Co., at Briceville. Sixty to seventy-five miners are out, pending a settlement of the matter. The strikers demand a 10-per-cent. increase in the wage scale, a 9-hour day and a semimonthly pay day instead of being paid off once a month, as heretofore. Inauguration of the strike was attended by no violence or demonstration of any character. President T. I. Stephenson, of the company, went to Briceville and was notified of the miners' demands. The company has made no public statement here as to what action it will take.

Washington

Tacoma—One miner was killed and seven were painfully but not seriously burned, as the result of an explosion of firedamp, Apr. 15, in the mines of the Pacific Coast Coal Co., at Burnett, a small coal-mining town 25 miles southeast of Tacoma. According to the superintendent, the explosion was caused either by the breaking of a miner's safety lamp or by the careless usage of one of the lamps.

West Virginia

Wheeling—A call was issued, Apr. 26, for a joint conference of the miners and operators of the Fifth Ohio subdistrict, which includes four counties in this state, to be held in Wheeling, May 15, to arrange the working scale for 17,000 miners. The operators asked to have the place of the meeting changed to Cleveland, Ohio, but the miners will not consent unless the operators agree to pay the extra cost of caring for the miners' delegates. The miners' annual convention opens here May 13.

Morgantown—Within a few days a new coal company will apply for a charter for the purpose of developing coal lands in Mineral County. Enough stock has been taken to buy 20,000 acres; at the present time 300 acres are owned by one of the men forming the new company. The capitalists composing the company are from Morgantown, Uniontown, Penn., and Baltimore.

Numerous mass meetings are being held by the miners, on strike in the Kanawha district. One at Smithers was attended by about 2000 men from the mines at Boomer, Harewood, Longacre, Cannelton, Carbondale and National.

The Mound Coal Co.'s mine, recently the scene of much rioting, followed by the arrest of a dozen strikers, resumed operation, Apr. 22, after a two weeks' suspension, and has continued to run with a gradually increasing force.

Charleston—Employees of two additional mines joined the strikers in the Kanawha field, Apr. 23—those at Peytona and Racine, along Coal River. About 300 men are employed there. The mines are nonunion.

Canada

Toronto—The commission appointed by the provincial government of Alberta to prepare amendments to the Coal Mine Act began its sittings recently in Calgary. John Sterling, provincial inspector of mines, has been appointed chairman. The government of Alberta proposes to establish several mining rescue stations at various points in the coal-producing areas. The first of these has been installed at Blairmore, where five men are now under training.

Japan

Tokio—Following an explosion of firedamp in the coal mine of the Hokkaido Coal Co. at Yubari, on the island of Yezo, Apr. 30, 283 miners were reported to have been entombed.

Personals

A. H. Storrs has been elected president of the Jed Coal & Coke Co., as successor to the late W. A. Lathrop.

J. F. Russell, sales manager for A. Simons & Son of Columbus, is confined in the Grant Hospital as the result of an accident.

Frank L. McCarty, formerly superintendent of the Union Pacific mines at Reliance, has been appointed superintendent of the Superior mines.

Carl Scholz, of Chicago, Ill., president of the Rock Island Coal Mining Co. and of the Coal Valley Mining Co., recently spent some little time in Birmingham, Ala., on business.

C. G. Weitzel, president of the New Pittsburg Coal Co., of Columbus, returned recently from Cleveland, where he went to investigate the outlook for the coming lake trade.

Edward N. Peterson, of Peoria, has been elected president of the newly organized Mid-Valley Coal Co., and William Noonan, of Tremont, has been elected vice-president.

Baird Snyder, Jr., formerly general superintendent of the Lehigh Coal & Navigation Co., Lansford, Penn., has opened offices in Pottsville, where he is established as a consulting engineer.

D. G. Thomas has been appointed superintendent of the Union Pacific mines at Rock Springs and Reliance. Mr. Thomas has been special inspector of the Union Pacific coal properties for the past two months.

H. H. Heiner, president of the Maynard Coal Co., which operates properties in the Pomeroy Bend field, Ohio, returned recently from a trip to the Pocahontas field, where he is interested as receiver for the Big Vein Pocahontas Coal Co.

William Leckie has resigned as manager for the Jed Coal & Coke Co., Jed, W. Va., and C. M. Kornuff has been elected as his successor. Mr. Leckie's resignation was tendered so that he can devote more of his time to other plants in which he is interested.

Edward H. Coxe, general superintendent of the coal mining department, Tennessee Coal, Iron & R. R. Co., who has tendered his resignation to take effect June 1, was recently presented with a handsome gold watch and fob by a party of his friends and business associates.

Lewis A. Riley has been elected president, *pro tem*, of the Lehigh Coal & Navigation Co., to fill the vacancy caused by the death of W. A. Lathrop. Mr. Riley was president for a short time prior to the election of Mr. Lathrop and has since been chairman of the executive committee.

Obituary

Harry R. Beeson, secretary-treasurer and sales manager of the New Pittsburg Coal Co., and one of the best known coal men in Ohio and adjoining states, died, Apr. 15, at his home in Columbus, after a three weeks' illness.

Mr. Beeson was born and reared in Pennsylvania. He was 45 years of age at the time of his death. Starting in as a clerk in the offices of the Hocking Valley R.R. Co., he later went with the Pullman company and subsequently became traveling auditor for the Emerson McMillan properties, widely scattered throughout the west. About 10 years ago he entered the employ of the New Pittsburg Coal Co. and rapidly rose to the position he occupied at the time of his death.

Construction News

Viper, Ky.—It is reported that the Kelly Coal Co. will build a coke plant.

Bastrop, Tex.—The Bastrop Coal Co. is sinking shaft No. 2 and will install additional machinery.

Phelan, Tex.—The Independence Mining Co. is sinking its No. 3 shaft and will install additional machinery.

Helena, Ala.—The Wadsworth Red Ash Coal Co., of Birmingham, contemplates developing coal mines near here.

Birmingham, Ala.—The Crescent Coal Co., B. F. Roden, president, contemplates opening a new mine, at Kimberly, at a cost of $100,000.

Florence, Colo.—The Colorado Fuel & Iron Co. has asked for bids for sinking and timbering a 400-ft. shaft about 1½ miles south of Rockvale, Fremont County.

Johnstown, Penn.—Announcement has been made that another mine will be opened at Foustwell by the Somerset & Cambria Coal Co. and a contract for a number of new houses will be awarded in the near future.

Pittsburg, Penn.—The board of directors of the Four States Coal & Coke Co. has recommended an increase of capital stock from $1,500,000 to $2,500,000 to provide for completing the equipment of Annabelle No. 2 mine and the development of another mine.

Hazard, Ky.—The Perry County Coal Co., capitalized at $400,000, will open and develop its property near Viper, Ky., including the Richmond-McIntire tract and adjoining lands. E. L. and A. G. Speaks have organized the Speaks Coal Co., to develop a leased mining property.

Hazleton, Penn.—The Dodson Coal Co. contemplates improvements at the Morea colliery which will involve machinery for handling mine cars to and from a dump supplying a gunboat hoist in the mines. Address inquiries to T. M. Dodson, vice-president, Morea Colliery, Penn.

Birmingham, Ala.—The Sloss-Sheffield Steel & Iron Co. will expend $50,000 for mine improvements, to include 400 hp. increase of boiler capacity and two air compressors at the Bessie coal mines and a 300- to 400-hp. boiler increase at the Flat Top coal mines, costing $15,000, and improvements at Sloss iron-ore mines costing $35,000.

Publications Received

THE COAL MINER. A STUDY OF THE STRUGGLE TO SECURE REGULATED WAGES IN THE HOCKING VALLEY. By Earl A. Saliers, Ph. D., Instructor in Economics in Lehigh University, South Bethlehem, Penn. Bethlehem Printing Co., 1912. 1¼x 7¾ in. 65 pp., no illus. Cloth. $1.

In view of the sub-title of this book, it is not necessary to point out that the writer has taken almost without exception the standpoint of the miner. But we must concede he has shown a conservatism of statement and a dignity of language which will make the book acceptable reading to those who view the controversy from a different standpoint.

In the first chapter he discusses the "Pre-organization Period" when the Hocking Valley coal field was in its infancy. He details the disturbances which followed the unreadiness of the operator to recognize the inability of the Hocking Valley furnaces to cope with the competition of those in the Alabama fields. Realizing that the market was being destroyed by competition, they strove at first to lower wages but ultimately met the original wage by invading new markets. In the second chapter is discussed the "Period of Organization" and interesting but brief information is given of the earlier unions and of the formation of the United Mine Workers of America.

The third and last chapter discusses the evils of the "Truck System of Payment" and of delayed pay, and records the legislation, often ineffectual, by which it was sought to control and restrain these developments. The book can be read in one sitting and while unsensational, treats a mass of details in an interesting way. As the writer omits all statistics, one cannot form from the book itself an estimate of the truth of his conclusions. However, if the figures were obtained, it is probable that they would substantiate all that the author has stated.

Trade Catalogs

Helmick Foundry-Machine Co., Fairmont, W. Va. Booklet. Helmick Mine Cars. 15 pages, 3½x6 in., illustrated.

Ingersoll-Rand Co., 11 Broadway, New York. Bulletin. "Arc Valve" Tappet Rock Drills. 16 pages. 6x9 in., illustrated.

Chain Belt Co., Milwaukee, Wis. Monthly Bulletin. Concrete and Chain Belt Concrete Mixers. 8 pages, 6x9 in., illustrated.

Goulds Manufacturing Co., Seneca Falls, N. Y. Booklet. How and Where Pumping Costs Can be Reduced. 16 pages, 6¾x8¼ in., illustrated.

Industrial

The H. Koppers Co., of Chicago, announces that it has succeeded to the business of H. Koppers, of Joliet, Ill., and will soon establish general offices at No. 5 Wabash Ave., Chicago. Mr. Louis Wilputte, formerly connected with the business of H. Koppers, is not connected with the new company.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The stocks accumulated in anticipation of a prolonged suspension at the mines are having a decidedly depressing effect on the trade, with the result that the market is dull and heavy. Prices have been easing off slowly but steadily for several weeks, and buyers are hesitating to enter the market until satisfied that the bottom has been reached. Supplies are so plentiful that some consumers are offering to dispose of their surpluses.

In the Eastern markets no effort is being made to obtain anything more than a normal price; that is, last year's quotations with the new wage scale added. Some companies are still delivering on contracts made at the high level prevailing through March, but this business will soon close. It is rumored at some points that the selling scale fixed by the Pittsburg companies is being severely cut. Mines in that district are only working about 50 per cent. capacity, most of the operators refusing to open up full blast until there is some pressure for coal. Supplies of anthracite are down to a low point, and a continuation of the suspension at the mines will soon result in an acute shortage in this branch.

Prices in Ohio and West Virginia are soft, except in the small sizes, which are in good demand. Most of the Ohio mines are now in operation, and a heavy lake trade is anticipated during the coming season. It is expected the April shipments to the coast from West Virginia will break all previous records, and while the market generally is not so active, the demand is still fairly strong.

The trade in the Middle West is nearly demoralized. There is an almost total absence of any buying movement, large supplies are still in evidence, and the operators are seeking an increase in prices to compensate for the increase in the mining scale. A large number of mines are opening up, and should the output be heavy, prices will probably drop to about the cost of production.

Boston, Mass.

Some inquiry for contract has developed lately in bituminous, but there is little interest in coal for current needs. Stocks accumulated during the "flurry" are surprisingly large, and together with mill suspensions here and there and an unusually heavy run of water for power makes the outlook rather dull. There appears to be a disposition on the part of the Pocahontas and New River interests to net more remunerative prices than obtained last year and with conditions here as they are that would certainly point to a slow druggy market through the spring and early summer.

In Georges Creek and the Pennsylvanias there is no material change. There is no longer an effort to get any but normal prices, that is, last year's level with the increased mining cost added. At that the movement is light into New England.

Marine freights are down to 70c., Hampton Roads to Boston, and in most cases tonnage goes begging. The release of certain anthracite transportation for soft coal has reduced the rates that previously held from Philadelphia.

Bituminous in transit all-rail has been practically cleared up. The resumption in the union districts means that buyers' wants can now be easily and promptly supplied.

The news of the compromise in anthracite has allayed any fear of a prolonged tie-up. With retail prices still where they were put to stop undue buying early in March, there is little coal going out to the consumer. One large retailer speaks of his delivery yard being turned into a horse show.

Quotations are as follows:

Clearfields, f.o.b. mines	\$1.15@1.35
Clearfields, f.o.b. Philadelphia	2.40@2.60
Pocahontas, New River, f.o.b. Hampton Roads	2.75@2.80

New York

The New York market is dull and quiet. Prices have been steadily easing off for several weeks and are now at the lowest point reached since the panicky conditions in effect during the early part of the suspension. At no time has there been any acute shortage, although rumors to that effect resulted in a heavy buying movement on a number of occasions and caused prices to advance sharply. There are adequate supplies on hand now and the market is about normal.

The low-grade bituminous coals are being quoted down as low as \$2.50 or \$2.55 f.o.b., but there is not much offering at this price. The higher grades are nominally about \$3 f.o.b., although there are few transactions being made. The movement is confined principally to shipments on contract, and there is little demand for spot coal. Mines shipping this market are working up to a good capacity, and large tonnages are coming in.

In anthracite the situation is not so easy. The effects of the long shutdown at the mines are being felt, and while the prospects of a settlement are now in sight, it will be some time before any shipments can be expected, and there is a noticeable uneasiness among consumers. A joint meeting of the operators' and miners' full committees takes place here, May 2, to consider the results of the agreement reached by the subcommittees. It is generally believed that a resumption will not be effected before May 15, or possibly June 1.

The following are the prices nominally quoted, although any actual buying brings a premium on these:

Broken	\$4.50
Egg and stove	5.00
Chestnut	5.25
Pea	3.25
Buckwheat	2.75
Rice	2.25
Barley	1.75

Philadelphia, Penn.

It looks now as if peace between the miners and operators was about to be concluded. There is no doubt that some sort of arrangement has been made between the sub committees which will in due course be submitted to the committees of the whole, and it will be simply a matter of form to have favorable action passed on their findings by the several representatives of the operators and miners. Concessions on both sides have doubtless been made, and more than likely the middle of May will find the miners back to work under the new arrangements. This is further borne out by the fact that it is understood that the wholesale people are receiving numerous inquiries for prices, and while none are quoted, there seems to be a disposition to inform the dealers that the next week or ten days will see a basis of prices established for the coming season.

Of course, it is useless to speculate what the prices will be when announced. The chances are very much in favor of an advance over last year for some of the sizes, probably stove and pea. There may be a general advance all along the line in the domestic sizes, most if not all of the companies having practically all their output of the smaller sizes covered by contracts entered into the beginning of the year. These were \$1.75 for pea, \$1.25 for buckwheat and 85c. for rice. Car-

load lots may bring more than these prices, but the companies as a rule are almost covered up to their normal output of these small sizes and there is little to be had.

The retail trade in this vicinity is practically *nil*. Springlike weather has caused many fires to be drawn, and most householders are able, by sweeping up the corners, to accumulate sufficient to carry them over the few cool days which appear.

Pittsburg

Bituminous—The mines are opening rather slowly, demand being light. While the formal opening occurred the beginning of last week, in the early part of this week the mines in the Pittsburg district are probably not operating 50 per cent. of full capacity. Consumers are still using stocks and it is quite clear that one of two things was the case: Either consumers laid in too large stocks, or the operators reached a settlement with the miners too quickly. As the operators profited by the stock up, which advanced the market very materially and furnished an excellent tonnage, they are not disposed to complain of the stocking, and are endeavoring to avoid trouble from the scale being adjusted too quickly, by refraining from opening their mines until there is pressure for coal.

A definite effort will be made to hold the market on the basis announced in our report last week, \$1.22½, against \$1.15 a year ago, even though the \$1.15 price was not uniformly maintained and the 7½c. advance more than covers the advance in the wage scale. Thus far the market has not been seriously tested, demand being so light, but we do not hear of any cutting.

Shipments in the lake trade will start Wednesday, May 1, when the freight rate goes from 88 to 78c., but they will be light at the start, and entirely on old contracts. There is still negotiation on new contracts and the parties are not getting together very rapidly. We quote: Mine-run and nut, \$1.22½; ¾-in., \$1.32½; 1¼-in., \$1.47½; slack, 82½c. per ton at mine, Pittsburg district.

Connellsville Coke—Production and consumption are adjusted very closely, and the market is inactive. We note a sale of 10,000 tons of furnace for May delivery, at about \$2.50, ovens, which about represents the market. Furnaces are in a comfortable position at present, but many will need to contract for second half, having contracts at \$1.55, \$1.60 and \$1.65 which run out June 30. As a rule these furnaces cannot afford to pay \$2.50, considering the price of pig iron and the question is whether sufficient demand will develop to cause more furnaces to blow in. They would only come in at higher pig-iron prices, which would justify the higher price for coke. We quote: Prompt furnace, \$2.50; contract (nominal), \$2.25; prompt foundry, \$2.75; contract foundry, \$2.40@2.50, per ton at ovens.

The *Courier* reports production in the Connellsville and Lower Connellsville region in the week ending Apr. 20 at 396,320 tons, a gain of 33,000 tons, and shipments at 4129 cars to Pittsburg, 6403 cars to points West and 1122 cars to points East, a total of 11,654 cars, or an increase of 621.

Buffalo, N. Y.

There is still very little life in the coal trade. Anthracite will return to its own in a short time, with the trade in excellent shape, and with conditions the best for a profitable season, but there is very little that is hopeful in the bituminous outlook. The operators are eager to give to the consumers not only every advantage offered them, but even more. A scale of prices has been made by the leading Pittsburg companies, but it is already reported that it has been cut pretty badly, with the exception of slack, which appears to be strong everywhere. This is largely due to the fact that the lake trade is backward and not much slack has been made.

All the wage scales at mines tributary to this market have now been settled, and the miners are to get 3c. or more increase in pay, but it does not appear that the mine owners will profit much by the new scale, unless it may be in the case of the anthracite interests. At least there has been no selling of coal in April at the usual reduction and the rumor that the new scale will be advanced is still very persistent and will no doubt eventually materialize.

The Canadian coal situation was much affected by the congestion of rail traffic before the mines shut down. At that time there was coal, mostly bituminous, side-tracked everywhere, waiting for motive power to move it. This coal is now being delivered and it affects present sales seriously. When it is all in, some of the consumers will have a year's supply on hand. There are so many conditions favoring a slow bituminous market that not a few of the mine owners are holding off or starting only in part in order to meet some regular order or contract.

The lake trade is now on and there is soft coal loading at Erie and Ohio ports, but there is no anthracite for that trade anywhere. It was claimed that there was a large stock of anthracite held at various points, waiting release as soon as the mining scale should be fixed, but this is denied by shippers. They were just able to satisfy their regular trade when the suspension took place so that it is practically impossible that any important surpluses could have been accumulated at that time.

Bituminous prices for this market are nominally \$2.57½ for Pittsburg three-quarter, \$2.47 for mine-run and \$2.10 for slack, with coke hardly so strong as formerly at \$4.75 for best Connellsville foundry. Most prices are weak and the market is very unsteady generally for bituminous sizes. There is every prospect of the supply exceeding the demand considerably.

Baltimore, Md.

While there was a somewhat better demand for coal in the Baltimore market during the past week, it was not sufficient to affect prices in the least. Low-grade coal is now quoted around 80 and 90c., while the second best grade is bringing \$1.10, and the best big vein \$1.65 per ton.

There is no rush for the product, and consumers find not the slightest difficulty in getting all the fuel they want at greatly reduced prices. Many of the Baltimore operators are still delivering under contracts closed in March, but these deliveries will probably be completed by the end of next week. The trade is quick to admit that it will be some time before contracts are closed at any such figures as those given by consumers, who were willing to pay anything for their supply rather than be caught short in case of a prolonged strike. The sentiment in Baltimore is that there will not now be a serious strike in the United States for many years to come.

It was pointed out in the past week that before the time for the next wage-scale conferences arrives, the Erdman act will have been amended so as to include coal fields as well as the railroads. In the event that the act is so amended, meditation can be resorted to, should the miners and operators be unable to reach a satisfactory agreement between themselves.

Some indication of just how active the demand was during March, while the English strike was in progress and labor troubles threatening here, is given by the statement of coal tonnage handled by the Baltimore & Ohio R. R. for that month. The total tonnage was 3,173,168, as compared with 2,027,245 for the same month of 1911, making a gain of 1,145,-923 tons for March of this year. The coke tonnage for the month shows a decrease, the total for March being 384,094 tons, as against 371,219 tons for the corresponding period of the preceding year.

The Consolidation Coal Co. will, in all probability, begin the shipment of coal from its new mines in the Elkhorn Valley of Kentucky some time in June. The new railroad which this company is building is nearing completion, and will be operated by the Baltimore & Ohio R.R. Company.

Columbus, Ohio

The coal trade in Ohio is in a state of anticipation. Since the mining scale was formally signed by the operators and miners, everyone engaged in the trade is looking forward to considerable activity. While there is a pretty fair stock of coal in certain sections, everything indicates a rather active season and preparations are being made accordingly.

The majority of Ohio mines will resume operations May 1, although some have been in operation during the past week in eastern Ohio. In the Hocking Valley the New Pittsburg Coal Co. had several mines in operation by Apr. 22.

Quotations in Ohio are soft, excepting in the small sizes, which are the strongest feature in the trade. There is a good demand for both nut, pea and slack and coarse slack and this will probably continue until the lake trade becomes active. Jobbers having nonunion connections have been placing a small tonnage in central Ohio, although most of the railroads and many of the manufacturing establishments are stocked until the latter part of May.

Great results are expected from the lake trade this season. Preparations are being made to ship a large tonnage from Ohio mines to the Northwest, as there is practically no coal being carried over on the docks. The reduction by the Pittsburg Coal Co. of the dock price from \$3.50 to \$3.40 is expected to have a considerable effect on lake conditions. The jobbers in the Northwest are asking that the 10c. be taken off the price at the mines in order that they can compete with the Pittsburg Coal Co. There is still considerable ice in the upper passages and little coal will be moved in that direction until the middle of May. A number of lake boats will be loaded, however, previous to that time, to be moved as soon as insurance is obtainable on boats and cargoes.

Prices which prevail in the Ohio fields are:

Hocking Valley	
Domestic lump	\$1 50
¾-in	1 35
Nut	1 20
Mine-run	1.10
Nut, pea and slack	0 90
Coarse slack	0 80
Pittsburg No. 8	
¾-in	\$1 30
Mine-run	1 10
Coarse slack	0 80
Pomeroy Bend	
Domestic lump	\$1.60
¾-in	1 40
Nut	1 25
Mine-run	1 15
Nut, pea and slack	0 95
Coarse slack	0 85
Kanawha	
Domestic lump	\$1 50
¾-in	1 30
Mine-run	1 10
Slack	0 80

There is some stir in domestic circles, but little is expected in that direction until after June 1. Some inquiries are being received for the fancy grades, such as West Virginia splints and the rescreened grades. Dealers are carrying some stocks over.

Hampton Roads, Va.

While the market is not nearly as strong this week as it has been during the past six or eight weeks, there is, nevertheless, a heavy demand for Hampton Roads coal. In fact, up to the present time the month of April has broken all previous records in the way of shipments from the piers at Lamberts Point, Sewalls Point and Newport News, the Norfolk & Western piers at Lamberts Point leading the other two by a good margin. For the first 18 working days this month they dumped on an average of 21,666 tons a day.

Work has commenced on the new Norfolk & Western piers and with improved conditions both here and at Newport News, Hampton Roads gives promise of becoming the leading coal center in the world. The Chesapeake & Ohio Ry., in testing out one of their new Mikado engines, on Thursday, pulled 110 steel coal cars from Richmond to Newport News in approximately five hours. They are putting several more engines of this type into commission and while they will not be called upon to carry such a load upon every run, this class of equipment is a long step in the way of better movement on tidewater coal.

There are still a number of vessels, foreign and American steamers, schooners and barges anchored in the Roads awaiting berth to load cargoes of coal. Indications are now, however, that these hold-overs will be disposed of within the next week. The local coal market still continues steady with prices on spot coal ranging from \$2.75 to \$3.

Charleston, W. Va.

With two-thirds of the mines in the Kanawha district closed down on account of the strike and with both sides playing for position there has been no important change in conditions over those prevailing a week ago. Despite the fact that little coal is being shipped there has been no increase in the price.

Detectives have arrived to guard the property of the coal companies in the event of trouble, and also for the purpose of ejecting the miners if they refuse to return to work at the old terms and conditions. Up to the present time, however, the companies have not ordered the men from the houses, but this is one of the moves expected every day and when it is taken trouble will follow that will doubtless require the calling out of the militia.

The strike has had no effect in the New River and Pocahontas districts, nor are any mines reported closed in the Fairmont region. There are a few mines out, however, along the Ohio River section, in the northwestern portion of the state.

The car supply has been good and selling agencies have been busy trying to sell coal at prices that are considered fair, but not the figure that was believed would prevail with so many mines closed.

Louisville, Ky.

The warm weather and fine boating stages have had the effect of solving the strained situation which existed in connection with the local coal supply. The only inconvenience caused was in domestic. Now that the threatened coal-mining troubles have practically disappeared, those who were storing coal for emergency uses, especially the railroads, are letting it go. The heavy shipments by water from the Pittsburg district are also helping to establish normal retail prices for this time of the year. The local dealers are advertising reduced prices as an incentive for customers to lay in a supply for next winter.

Indianapolis

Only a few Indiana mines were reported to be in operation during the week. Mines operated in connection with manufacturing concerns were permitted to work, but those in southern Indiana, producing coal for railroads, were ordered to cease operations when it was found they were hauling coal to the general market.

The retailers are booking orders for immediate shipment to fill their summer storage orders when the mines resume operations. The mine operators say that improvements to their plants are about completed, and that the mines will be found in first-class condition when operations begin, which is expected in a few days.

Chicago

According to indications, the Chicago market will witness little buying for another month. A number of big consumers have cars of coal on their sidings which they are willing to sell to other consumers if the latter would offer a fair price.

Chicago dealers have been advised that the Ohio mines have arranged to add 5c. to last year's contract figures. The Indiana mines have added 7c. a ton to the old contract prices on mine-run and screenings and 10c. on lump coal. It is believed that this price will hold. The Illinois producers say that they will be obliged to add 12½c. a ton to last year's prices in order to come out even.

Prices of coke have been marked down. The furnace and foundry cokes have been

held at a rather stiff figure, in anticipation of a strike. These prices could not hold through the present period of dullness, and there has been a shading of values.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.50@2.75
Steam lump	2.17
Screenings	1.67@1.82
Springfield:	
Domestic lump	$2.57@2.82
Steam lump	2.17
Mine-run	1.97@2.07
Screenings	1.67@1.82
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.17
Mine-run	1.97@2.07
Screenings	1.67@1.77
Pocahontas and New River:	
Mine-run	$3.15
Lump and egg	4.05

Coke—Prices asked for coke are: Connellsville and Wise County, $4.75; byproduct, egg and stove, $4.55; byproduct, nut, $4.55; gas-house, $4.75.

St. Louis, Mo.

There is practically no change in the St. Louis coal market, as there has been little or no demand. The latter part of last week a few of the mines in the Standard field opened up, the first of these being the mine at Nashville, Ill., on the L. & N. R.R.

The Standard market opened up with 2-in. lump coal selling at from $1.15 to $1.25, and screenings from 90c. to $1. A few of the Carterville mines opened up, but there is very little demand for the coal, and it is being offered at from $1.25 to $1.40 for the lump, egg, and nut.

It is almost impossible to say what the developments will be before the present week is over, but indications are that prices will go down to about the cost of production, as there is no market, and the producers will try to operate their mines regardless of conditions.

Portland, Ore.

Nothing new or startling has developed in the coal trade in this district for some time and business is barely normal, owing to the fair condition of the weather. Receipts by rail have been ordinary in volume with very little coming in by water. No more Australian coal will arrive here until next fall and the stock on hand is quite sufficient to meet all demands. The demand for coal the past winter was lighter than usual on account of mild weather and keen competition from wood dealers. Prices remain unchanged.

Production and Transportation Statistics

Shipments to Our Non-contiguous Possessions

Alaska—Fuel shipments to Alaska for February of the present year amounted to 2244 tons as compared with 1341 tons during the same month last year.

Porto Rico—Total shipments of bituminous coal to Porto Rico during February of the current year amounted to 4555 tons as compared with 6165 tons during the same month last year. No anthracite was shipped to Porto Rico during February of last year, and only 101 tons this year.

Consolidation Coal Co.

During the year 1911, the Consolidation and its subsidiary companies mined 8,231,903 tons of coal, and made 43,740 tons of coke. The coal mined by lessees amounted to 473,008 tons.

Baltimore & Ohio Railroad

The total tonnage hauled over the lines of the Baltimore & Ohio for the month of February was 2,695,874 tons as compared with 1,701,846 tons for the corresponding month of 1911, making a gain for February of this year of 994,028 tons.

Atlantic Coastwise Movement

Comparative statement of fuel shipments, in long tons, from five principal Atlantic ports for February, 1911-12, including bunker coal placed on vessels in the domestic and foreign trade and comprising probably 90% of the total shipments from these points.

	1911	1912
New York	1,867,893	2,470,043
Philadelphia	526,422	412,011
Baltimore	356,601	286,085
Newport News	233,685	237,682
Norfolk	267,300	428,036
Total, 5 ports	3,251,901	3,833,857

Government Coal Contracts

Western Division — Sealed proposals will be received until 11 a.m., May 10, 1912, for furnishing fuel required at the posts of the Western division during fiscal year commencing July 1, 1912. Prospective bidders should address Post Quartermasters or Quartermasters at Seattle, Wash., and Portland, Oregon.

Eastern Division—Sealed proposals in triplicate for furnishing coal required in the Eastern division during year ending June 30, 1913, will be received until 10 a.m., May 15, 1912. Bidders should address Chief Quartermaster, Governors Island, New York Harbor.

Pacific Coast — Sealed proposals in duplicate will be received until 11 a.m., May 24, 1912, for furnishing fuel for the fiscal year beginning July 1, 1912, at Bear Island, Calif.; San Francisco, Calif., and Bremerton, Wash. The right is reserved to reject any or all bids or parts thereof and waive informality therein. Bids from regular dealers only will be considered. Prospective bidders should address the Depot Quartermaster, Marine Corps, 182 Second St., San Francisco, Calif., or the commanding officer or Post Quartermaster, Marine Barracks, at the station named.

Norfolk & Western Ry. Co.

Comparative statement of coal and coke shipments over the lines of the N. & W. Ry. Co. for March, 1911-12, was as follows, in short tons:

Destination	1912	1911
Coal		
Tidewater, foreign	146,089	90,488
Tidewater, coastwise	286,340	236,233
Domestic	1,353,330	980,033
Coke		
Tidewater, foreign	8,859	5,117
Domestic	140,298	163,141
TOTALS	1,934,916	1,475,012

Financial Notes

The O'Gara Coal Co. reports for the fiscal year ended Oct. 31, 1911: Gross earnings, $3,671,460; net profit, $335,171; surplus for year, $283,810; total surplus, $568,522. The company has $1,000,000 of 5% preferred stock, $5,000,000 of common and $3,000,000 of bonds. The company operates mines in Saline County, Ill.

Confirmation of the report now in circulation that the preferred dividend of the Pittsburgh Coal Co. will be increased from 5% to 7% annual basis cannot be confirmed in official quarters. It is stated that the matter has not been discussed by the board and that such increase is not contemplated at the present time.

General expenses and fixed charges of the Lehigh Coal & Navigation Co. for the year ended Dec. 31, 1911, were $432,610 for taxes; interest on funded debt was decreased $101,605, chiefly by retirement of the consolidated mortgage 7s. Against this latter was a full year's interest on the collateral trust 4½% loan issued Nov., 1910, making a net decrease in interest on funded debt of $35,980.

The coal-mining department of the Delaware & Hudson Co., which forms a considerable part of the company's business, brought in but a small amount of profit directly. On a gross business of $13,355,000 only $116,000 remained as net profits and, after paying taxes on the property, there remained a deficiency for the year of $24,000. Last year the mining profits were but $42,000 on $11,806,000 worth of coal sold.

The Pittsburgh Coal Co., after carrying to credit of undivided earnings account the net earnings for the year and charging the four dividends of 1¼% each or 5% on the preferred stock outstanding ($1,353,590), the amount to its credit Dec. 31, 1911, was $8,481,541 (an increase of $38,347 over 1910). There has been no readjustment in the values of any of the assets sustaining this credit, and they are believed to represent a greater worth than they are carcarried at, not including coal rights which are largely in excess of book value.

The directors of the Island Creek Coal Co. will probably place the 100,000 shares of common stock on a dividend basis of $3, beginning with the coming October. The current year is expected to show output of between 2,000,000 and 2,200,000 tons of coal as compared with 1,876,000 tons mined during the fiscal period of Dec. 31 last. At prices which the company is getting for its coal additional $250,000 more may be figured for the common stock above the $2.34 secured in last year. This means that the common stock will this year earn close to $500,000 against $233,357 in 1911.

Index of Coal Literature

Monthly list of the world's best articles on coal and coal mining

The following is a list of abbreviations used below:

A.E.G.-Ztg. = A.E.G.-Zeitung.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Berg-Hüttenmänn. Rdsch. = Berg- und Hüttenmännische Rundschau.
Bull. Am. Inst. Min. Eng. = Bulletin American Institute of Mining Engineers.
Bull. Assoc. Ing. Liège = Bulletin de l'Association des Ingenieurs sortis de l'Ecole de Liège.
Bull. Ass. Sucr. = Bulletin de l'Association des Chimistes de Sucrerie et de Distillerie de France et des Colonies.
Can. Eng. = Canadian Engineer.
Chem. Eng. = Chemical Engineer.
Coll. Guard. = Colliery Guardian.
Compt. Rendus Acad. Sc. = Comptes Rendus de l'Académie des Sciences.
El. Eng. = Electrical Engineering.
El. Jl. = Electrical Journal.
Eng. Contract. = Engineering Contractor.
Eng. Min. Jl. = Engineering and Mining Journal.
Eng. News = Engineering News.
Geol. Mag. = Geological Magazine.
Giess.-Ztg. = Giesserei-Zeitung.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
JB. Berg-Hüttenw. Sachsen — Jahrbuch für das Berg- und Hüttenwesen im Königreich Sachsen.
Jern. Kont. = Jern Kontorets Annaler.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Gasbeleuchtung = Schilling's Journal für Gasbeleuchtung und Wasserversorgung.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. S. Afr. Inst. Eng. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Mines Minerals = Mines and Minerals.
Min. Sc. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mitt. Ver. Moorkultur = Mitteilungen des Vereins zur Förderung der Moorkultur im Deutschen Reich.
Mon. Ind. Gaz = Moniteur de l'Industrie du Gazet de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Tonind.-Zeitung — Oesterreichische Tonindustrie-Zeitung.
Oesterr. Z. Berg- Huttenwes. — Oesterreichische Zeitschrift fur Berg. und Hüttenwesen.
Rev. Noire — Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Rock Prod. = Rock Products.
S. Afr. Min. Jl. = South African Mining Journal.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle — Stein und Braunkohle.
Tech. Rdsch. = Technische Rundschau.
Trans. Inst. Min. Eng. = Transactions of the Institution of Mining Engineers.
Trans. Manchester Geol. Min. Soc. — Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. El. Mach. = Zeitschrift für Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

I—GENERAL

Coal on Vancouver Island, B. C. E. Jacobs, Can. Min. Jl., Vol. 32, 1911, 24, pp. 807-8.

The World's Coal Production. Coal Age, Vol. 1, 13, pp. 398-400, 2 fig. (A synopsis of available statistics and notes on different fields.)

World's Coal Production and Consumption. Iron Coal Trades Rev., Vol. 83, 1911, 2287, pp. 1057-8, 8 tab.

The Mining Year Book 1912, 8vo. Financial Times, London, $3.75, net.

Coal and Coke Exports in 1911. Coal Age, Vol. 1, 13, p. 417. (American Export has trebled in 12 years, now amounts to 80 million dollars.)

The Colliery Guardian Review of the Coal Trade in 1911. Edit. by H. Greenwell, 8½x5½, 161 pp., 8vo. Colliery Guardian, London, 25c., net.

Scientific Coal-Mine Management. Sim and W. H. Reynolds, Mines Minerals, Vol. 32, pp. 459-60, 2 tab. (Three devices by which accurate knowledge of working conditions can be had daily.)

Notes on Mine Accounting. T. H. Sheldon, Eng. Min. Jl., Vol. 92, 1911, 26, pp. 1231-2.

Minimum Wage Boards. F. Kelley, Am. Jl. Sociology, Vol. 17, 3, pp. 303-14.

Treatise on the Law and Practice relating to Letters Patent for Inventions. R. Frost, 2 vols., 4th Edtn., Ryl., 8vo., Stevens & Hall, London, $9.50.

Western Coal Land Legislation. Mines Minerals, Vol. 32, 1911, 5, pp. 277-8. (System of leasing to avoid long time speculative investment. Present coal land laws.)

The Mining Law. H. V. Winchell, Min. Sci. Press, Vol. 104, 10, pp. 366-70. (The faults of Canadian and United States mining laws, and suggestions for changes. A comparison of English and American systems. The fundamental differences in the concession systems of South Africa and Australia. Claim systems, American regalian right.)

The Smokeless Coal Field of West Virginia. Edwin Ludlow, Mines Minerals, Vol. 32, pp. 467-8, 1 tab. (Legal and business conditions which operate to promote the wasteful exploitation of coal lands.)

American vs. English Mine Fatalities. J. T. Beard, Coal Age, Vol. 1, 13, pp. 403-5, 1 tab. (American output per man double that in England. Pennsylvania death rate lower than Great Britain's. Conditions in American mines.)

Fatal Accidents in Mines in 1911. Colliery Guard, Vol. 103, 2664, pp. 128-9.

Coal Supply and Coal Prices. (Kohlenversorgung und Kohlenpreise.) Konjunktur, 1911, Vol. 3, 11.

Price Policy of the Coal Syndicate. (Die Preispolitik des Kohlensyndikates.) Konjunktur, 1912, Vol. 3, 16.

The Technical Features of the Sale of German Coal in Germany. (Die Technik des Absatzes deutscher und englischer Steinkohlen in Deutschland.) Hans Jeschke, Z. Handelswiss, 1912, Jan., pp. 333-9.

The Prussian State and the Coal Syndicate. (Der Preussische Staat und das Kohlensyndikat.) L. Eschwege, Bodenref. 1912, 2, pp. 28-30.

II—GEOLOGY

Studies in Mine Surveying. (Studien zur Markscheidekunde.) E. Dolezal, Berg-Huettenmaen. JB., Vol. 59, 1911, 2, pp. 99-134, 2 fig. (Strict compensation of an open polygon.)

The Geology of Coal. J. Sim, Iron Coal Trades Rev., Vol. 84, 2297, pp. 365-6. (The term includes a large number of substances from peat to anthracite, the humic rather than the anthracite are, from the commercial point of view, the most perfect types of fuel. Paper read before the Scot. Fed. Inst. Min. Students, Glasgow.)

The Weathering of Coal Seams. T. Coventry, Mines Minerals, Vol. 32, 1911, 5, pp. 273-5, 2 fig., 3 tab., 1 map. (Peculiar geological conditions at the Charlie Coal Mines, Queensland.)

Metamorphism and Geological Structure in the Narragansett Basin, Rhode Island. F. H. Lahee, Am. Jl. Sci., Vol. 33, 195, pp. 249-62, 7 fig. (The basin is a body of carboniferous strata 50 miles long and from 14 to 25 miles wide, with a stratigraphic thickness of two miles.)

III—MINING TECHNOLOGY

Penn Mary Coal Mines, Heilwood, Penn. R. D. Hall, Coal Age, Vol. 1, 1911, 8, pp. 237-41, 5 fig., 1 map. (Some important and distinctive features of the plant described.)

Ore and Coal Mining Machinery. C. A. Tupper, Mines Minerals, Vol. 32, 8, pp. 454-5. (Their similarity and what each branch of the industry owes the other for its development.)

Buckner No. 2 Mine United Coal Co. Mines Minerals, Vol. 32, 1911, 5, p. 272, 1 fig. (The mechanical equipment of a thick coal bed mine in Illinois.)

An Outline of Mining. W. H. Coghill, Col. Sch. Min Mag., Vol. 2, 1911, 3, pp. 66-7. (An exhaustive outline of all appliances and methods used in every description of mining.)

Coal Cutting Machinery. W. B. Shaw, Colliery Guard., Vol. 103, 2672, pp. 527-9, 12 fig.; 2673, pp. 584-5. (A comparative review of the relative advantages of the various types of rotary machines.)

Crushing Coal for Boiler Use. Mines Minerals, Vol. 32, 1912, 6, p. 349, 2 fig. (The Jeffrey single-roll crusher employed at Pocahontas Consolidated Collieries, McDowell County, W. Va.; this machine has wooden pins on hub engaging holes in pulley; any undue strain shears the pins and stops machine.)

An Anthracite Plant at Hazleton, Penn. Coal Age, Vol. 1, 1911, 10, pp. 310-1, 1 diag. (The Andenried breaker of the Lehigh & Wilkes-Barre Coal Co., handling 1500 tons daily, layout of rolls, conveyors, screens, etc.)

A 150-ton Revolving Steam Shovel for Stripping Operations. Eng. Contract., Vol. 36, 1911, 25, pp. 650-1, 1 fig. (A new type designed for stripping overburden from the coal in Illinois coal fields.)

IV—WORKING OF MINERALS

Elementary Coal Mining. G. L. Kerr, 3rd Edtn., 8vo., 7½x4¾ in., 234 pp., C. Griffin, London, 90c.

A Modern Twin Coal Mining Plant. W. R. Roberts, Coal Age, Vol. 1, 1911, 8, pp. 324-7, 7 fig. (The Bunsen Coal Co., Danville, Ill. The plant runs the two mines in which only the shafts and tipples have individual service.)

Coal Mining Methods in Michigan. R. B. Hosken, Coal Age, Vol. 1, 1911, 8, pp. 242-8, 4 fig. (Interesting use of machines in low levels, in seams 26 to 42 in. thick.)

Methods of Mining in Southern West Virginia. L. J. Marshall, Coal Age, Vol. 1, 1911, 10, pp. 302-6, 5 fig., 1 tab. (The retreating system in gas seam No. 2 Page, Fayette County, W. Va.)

Anthracite and Bituminous Mining. E. T. Conner, Coal Age, Vol. 1, 1911, 9, pp. 277-80, 10 fig. (Methods of operating in New River field, W. Va.; several plants described.)

The Working of the Thick Coal Seams of Upper Silesia. B. C. Gullachsen, Trans. Inst. Min. Eng., Vol. 46, 1912, 2, pp. 209-18, 2 tab., 1 pl.

Maltby Main Colliery. Iron Coal Trades Rev., Vol. 84, 2298, pp. 403-4, 4 fig. (The mines near Doncaster comprise some 6000 acres. The article covers all the operations from sinking the shaft to the delivery of the coal and the mechanical equipment.)

V—BORING, SHAFT SINKING AND TUNNELING

Driving Stone Drifts through Water Bearing Strata. R. Watkin, Iron Coal Trades Rev., Vol. 84, 2294, pp. 248-9. (Some interesting difficulties met with are stated in the paper read before the Yorks. Nat. Assoc. Col. Mgrs.)

Shafts for American Coal Mines. R. G. Johnson, Mines Minerals, Vol. 32, 1912, 6, pp. 344-7, 8 fig. (Methods employed in sinking, their dimensions, timbering or lining with concrete, etc.)

Use of Grout in Shaft Sinking. R. G. Johnson, Coal Age, Vol. 1, 20, pp. 639-41, 5 fig. (One of the chief difficulties of shaft sinking lies in dealing with water encountered. Forcing cement grout into the fissures of water bearing strata by means of compressed air is a new and effectual solution of this problem.)

The Advantages of Freezing as a Method of Sinking Through Heavily Watered or Difficult Ground. W. B. Wilson, N. England Inst. Min. Mech. Eng., Vol. 62, 1911, 1, pp. 36-44. (Some fresh details given in the continued discussion.)

Rules of International Union of Deep Boring Engineers in Vienna. (Satuten des Internationalen Vereins der Bohringenieure und Bohrtechniker in Wien.) Z. Int. Ver. Bohringenieure, 1912, 1, pp. 1-3.

VI—BLASTING, EXPLOSIVES

A New Explosive "Stygia." (Explosivos Stygia.) Mem. Est. Major, Chile, 1912, Jan., pp. 19-20. (This new explosive, invented in Brazil, has all the advantages of dynamite without many of its disadvantages. Description and results of experiments.)

VII—TIMBERING, PACKING, ETC.

Mining without Timber. R. B. Brinsmade, 8vo., Ldn. Hill, 1911, $3.15.

Longwall Mining in Illinois. Mines Minerals, Vol. 32, 8, pp. 451-4, 1 fig., 6 ill., 1 tab. (Plan used in mines of Spring Valley Coal Co. Method of timbering. Building Cogs.)

Accidents in Mines Caused by Falls of Grounds. G. B. Harrison, Trans. Inst. Min. Eng., Vol. 46, 1912, 2, pp. 260-73, 3 tab. (The widespread occurrence of such accidents and the great total mortality from them. Presidential address and discussion.)

Hydraulic Packing in the North of France. Colliery Guard., Vol. 103, 2673, p. 595. (The material used in the Liévin coal mine is the earth removed from the shafts, graded into two grades from 0 to 40 mm. and 40 mm. to 120 mm. in size, and treated in breakers turning out 30 cu.m. per hr.; from the hopper the material is conveyed in pipes to the place of deposit.)

Shaft Raising in Hard Rock. Mines Minerals, Vol. 32, 8, pp. 495-6, 9 fig. (Methods of timbering, drilling, blasting, and handling the rock in shaft.)

The Action and Control of Differently Constituted Coal Roofs. H. Hepplewhite, Trans. Inst. Min. Eng., Vol. 46, 1912, 2, pp. 366-81, 23 fig., 1 pl. (Various methods of supporting roofs described and discussed.)

VIII—WINDING AND HAULAGE

Trials with Electric and Steam Winding Engines. Colliery Guard., Vol. 103, 2670, pp. 426-7, 4 tab. (Report of Committee to German Assoc., Dortmund Min. Assoc. and Boiler Insp. Assoc.)

Mine Headgears. G. Morris, Jl. S. Afr. Inst. Eng., Vol. 10, 1911, 4, pp. 83-5.

Gravity Planes with Monitors. Coal Age, Vol. 1, 1911, 10, pp. 312-13, 6 fig. (The economy in actual practice of gravity haulage, using monitors; available on all grades over 5 per cent.)

Track Arrangement for Shaft Bottoms. O. Cartlidge, Mines Minerals, Vol. 32, 1912, 6, pp. 336-7, 4 fig.

Model Steel Tipple at Annabelle Mines. W. A. Weldin, Mines Minerals, Vol. 32, 1912, 6, pp. 325-31, 12 fig. (Newest methods in building construction and coal handling in West Virginia.)

A Self Dumping Car Haul System. Coal Age, Vol. 1, 19, pp. 605-7, 5 fig. (A description of the Greene car-haul and automatic dumping system as installed at the Burnside Colliery, Penn. The apparatus includes a novel arrangement for recording the work of the tipple and is an important labor saver.)

Haulage System at Gray Creek Mine. F. W. Whiteside, Mines Minerals, Vol. 32, 1911, 5, pp. 264-5, 5 fig.

Wire Ropes as Applied to Mining. D. Baird, Trans. Inst. Min. Eng., Vol. 42, 1912, 1, pp. 129-41, 3 tab.; 2, pp. 288-300. (The increasing danger incurred in the increasing depth of shafts and heavier loads.)

The Shaw Hemsworth Overwinder. T. Beach, Trans. Inst. Min. Eng., Vol. 42, 1912, 1, pp. 92-8, 9 fig. (The effective automatic prevention of overwinding by this device described.)

A Comparison of Electric and Compressed Air Hoisting from Deep Mine Shafts. K. A. Pauly, Eng. Contract., pp. 7-11, 2 fig., 4 tab.

IX—SIGNALING

Relay Indicator Signaling in Mines. J. Charlton, Iron Coal Trades Rev., Vol. 84, 2295, pp. 300-1, 2 fig. (If traffic delays are to be avoided, the system of signaling must be reliable. The speed-

ing up of haulages and the highly organized system of working sets of tubs, increases the value of signaling.)

Luminous Electric Mine Shaft Signaling. J. C. Eadie, Trans. Inst. Min. Eng., Vol. 42, 1912, 1, pp. 37-46, 4 fig. (Paper read and illustrated with working models for both light and sound.)

X—LIGHTING

Ignition of Gas by Electric Lamps. Coal Age, Vol. 1, 15, pp. 478-80. (Belgian tests showing that under certain conditions all electric-lamp filaments ignite firedamp in coal mines.)

The Holmes-Ralph Gas-Detecting Portable Electric Lamp. G. J. Ralph, Trans. Inst. Min. Eng., Vol. 42, 1912, 1, pp. 201-8, 5 fig.; 2, pp. 435-40. (A small lamp described, using only about half a watt and operating detectively by the catalytic action of platinum. Paper and discussion.)

Acetylene in Underground Mining. J. Deszennyi, Acetylene, Vol. 9, 100, pp. 13-4. (Lamps free from soot give bright light on less consumption of oxygen than oil lamps.)

XI—VENTILATION

Effects of Reversing a Main Air Current. J. S. Haldane and J. Bain, Trans. Inst. Min. Eng., Vol. 42, 1912, 1, pp. 155-61. (Discussion with special reference to proposed legislation on mine ventilation.)

Coal Mine Ventilating Equipment. W. M. Weigel, Coal Age, Vol. 1, 14, pp. 441-2; 15, pp. 470-1, 4 fig. (Methods of ventilation by means of mechanical ventilators.) Vol. 1, 19, pp. 610-13, 6 fig.; 21, pp. 671-4, 5 fig.; 24, pp. 769-72, 4 fig. (Description and theory of centrifugal and disc fans.)

The Working of Mines. Lessons on Dynamic Ventilators (Cours d'exploitation des mines.) Leçons sur les ventilateurs dynamiques.) L. Denoël, 4to., 74 pp., ill., Liège, D. et E. Close, 1911.

XII—MINE GASES, TESTING

The Physical and Chemical Properties of Mine Gases. G. H. Winstanley, Min. Eng., Vol. 16, 213, pp. 8-9. (Some criticism of the conflicting standards for inflammable gases and the practical difficulties arising from several of them.)

Release of Gas Accumulations. W. H. Cunningham and C. R. Conner, Coal Age, Vol. 1, 1911, 12, pp. 370-1, 1 fig., 1 map. (Borings release gas from abandoned mines.)

Methods of Testing for Mine Gases. W. R. Crane, Coal Age, Vol. 1, 1911, 12, pp. 376-7. (Additional tests given in paper read before Coal Min. Inst. Am.)

The Composition of Some Mine Gases. G. A. Burrell, Chem. Eng., Vol. 15, 1, pp. 1-8, 8 tab. (Also gives a description of a Simple Methane Apparatus. Read before Coal Min. Inst. Am.)

Pathogenic Mine Atmospheres. E. W. Chance, Coal Age, Vol. 1, 14, pp. 448-50, 6 tab. (The cause and conditions governing flame extinction and death by smothering gases in mines.)

XIII—COAL DUST

Automatic Sprinkling Apparatus for the Prevention of Dust in Mines. T. C. Futers, Coll. Guard., Vol. 103, 2662, p. 24, 3 fig.

The Use of Stone Dust in Relation to Coal Dust Ignition. W. C. Blackett, Iron Coal Trades Rev., Vol. 84, 2297, pp. 368-9. (Some simple applications for the prevention of explosions of coal dust being carried along the pit roads, are given in a paper read before the N. Eng. Nat. Assoc. Coal Mgrs.)

The Influence of the Presence of Gas on the Ignition of Clouds of Coal Dust by Single Electric Flashes. W. M. Thornton, Iron Coal Trades Rev., Vol. 82, 2294, p. 253, 2 fig., 1 tab. (Some new experiments described, and the results compared with former experience. Read before N. Eng. Assoc. Min. Eng.)

British Coal-Dust Experiments. W. E. Garforth, Trans. Inst. Min. Eng., Vol. 46, 1912, 2, pp. 220-45. (A full report of Altofts experiments are presented and lessons deduced from the investigation.)

Experiments on Liquid Mixtures for Laying Coal Dust. W. M. Thornton, Trans. Inst. Min. Eng., Vol. 42, 1912, 1, pp. 66-86, 1 tab.; 2, pp. 417-24. (The use of liquid soaps, disinfectants, water glass, solvents, binders, cresol, caustic soda and other mixtures dealt with and discussed.)

XIV—EXPLOSIONS

The Prevention of Explosions. Dr. J. Harger, Coll. Guard., Vol. 103, pp. 2671-3. (Discussion of the author's views on the possibility of preventing coal-dust explosions as presented before the Man. Geo. Min. Soc.)

The Briceville Mine Explosion. R. D. Hall, Coal Age, Vol. 1, 1911, 11, pp. 343-7, 4 fig., 1 map. (Much dry coal dust present through spilt coal in haulage, fan at foot of shaft, the Cross Mountain Mine, Knoxville, Tenn.)

Botton Creek Mine Explosion. Mines Minerals, Vol. 32, 1912, 6, pp. 332-3, 2 fig. (Conditions in the mine at the time of the explosion, its effect minimized by the moisture, quantity and split up supply of air. The steam-jet system.)

XV—MINE FIRES

Notes on Underground Fires. J. Ashworth, Coal Age, Vol. 1, 21, pp. 668-70. (Instances of fires caused by criminal negligence, carelessness, and the disregard of rules and mine regulations. Lessons taught by mine disasters. Spontaneous combustion in mines. Effect of mine temperatures. Direction of air current from pyrites in coal. Manner of handling mine fires.)

Extinguishing the Majestic Mine Fire. R. Y. Williams. Mines Minerals, Vol. 32, 1912, 6, pp. 342-3, 1 map, 1 tab. (Investigation by men wearing oxygen helmets enabled effective action to be taken.)

Earthquakes and Mine Explosions. Coal Age, Vol. 1, 22, pp. 702-3. (Discussions at the Conference of the International Association of Seismology on Radio-Active Products as Source of the Earth's Heat. Formation of mountains and valleys. The earthquake and the pendulum. Correspondence of seismic unrest with mine explosions.)

XVI—RESCUE AND AMBULANCE

Mine Rescue Work in Illinois. H. H. Stoek, Coal Age, Vol. 1, 19, pp. 598-600, 6 fig. (The rescue stations and three rescue cars. Men from these cars attend all mine disasters and train mine-rescue men at the surrounding mines.)

Use of Oxygen Helmet in High Temperatures. H. H. Sanderson, Mines Minerals, Vol. 32, 1912, 6, p. 335. (Tests carried out at Virginia City, Nev., at the 2450-ft. level in 165 deg. of temperature give satisfactory results.)

XVII—DRAINAGE, PUMPING, ETC.

The Evolution and Present Development of the Turbine Pump. E. Hopkinson and E. L. Allan, Machinery, Vol. 18, 7, pp. 533-6, 9 fig. (The evolution of the Osborne-Reynolds pump is traced, as being typical of the turbine pump at large.)

XVIII—PREPARATION

Consolidated Coal Washery at Saginaw, Mich. Mines Minerals, Vol. 32, 8, pp. 468-9, 4 ill.

Standardization in Coal Washing. G. R. Delamater, Mines Minerals, Vol. 32, pp. 461-5, 2 tab. (A plea for uniformity in tests and reports. Formulas for accurate comparison of washery work.)

Washing and Sorting of Small Coal. N. T. Williams, Cassier's Mag., Vol. 40, 1911, 7, pp. 606-28, 13 fig. (The apparatus employed in cleansing coal.)

XIX—BRIQUETTES

Automatic Furnaces for Brown-Coal Briquettes. (Maschinelle Fuerungen fuer Braunkohlen briketts.) El. Anz., 1911, 98, pp. 1263-64; 101, pp. 1301-3, 12 fig., 3 ill. (Automatic feeding device.)

Briquetting Presses Driven by Three-Phase Commutator Motors. (Brikettpresses-Antrieb mit Drehstrom-Kollekttormotoren.) Druckschr. Siebens-Schuckertw. (Working results, description of plants.)

Electric Driving of Briquetting-Presses. (Der elektrische Antrieb von Braunkohlenbrikettpressen.) A. Strauss, Techn. Rdsch., 1912, 7, pp. 74-5, 2 fig., 2 ill. (Description of two plants built by the Siemens-Schuckert Works.)

XX—COKE OVENS

Treating Coal for Coke Making. Coal Merchant, Vol. 24, 589, pp. 11-12, 4 fig. (The great advantage of washing, mixing, and crushing before charging the ovens.)

Source of the Coking Property of Coals. H. W. Hempel and F. Lierg, Jl. Gas Light., Vol. 116, 1911, 2536, p. 822. (From Zeit. für angewandte Chemie.)

Continuous Coking in Vertical Retorts. Coal Age, Vol. 1, 1911, 10, pp. 314-6, 2 fig. (Description of retorts, their numerous advantages and maximum efficiency.)

Development of a Byproduct Coke Oven Gas Plant. W. S. Blauvelt, Am. Gas. Jl., Vol. 96, 11, pp. 169-71, 4 fig., 1 tab. (In thermal efficiency and in total yield of gas the byproduct oven compares favorably with the best gas benches. All difficulties in the operation of the byproduct oven gas plant have been overcome.)

A Horizontal Flued Coke Oven. J. R. Marsden, Iron Coal Trades Rev., Vol. 84, 2298, p. 405, 3 fig. (Deals with several points of comparison between the horizontal and vertical flued ovens; and states that for simplicity and comfort in working, cost of upkeep and repairs, the horizontal is distinctly the better.)

A Retort Coal Quencher and Loader. A. Goodall, Coal Age, Vol. 1, 21, pp. 678-9, 3 fig. (Describes an apparatus for quenching and loading coke from retort ovens in one operation. A number of plants are in successful operation in England, and it is claimed that the machine will effect a considerable economy of labor.)

Modern Coking Plants with Utilization of the Byproducts. (Moderne Kokereien mit Gewinnung der Nebenprodukte.) A. Wagner, Bergbau, 1912, 1, pp. 1-6; 2, pp. 13-8; 3, pp. 29-33; 4, pp. 45-9, 23 fig. (Preparation of the coal; coking ovens; utilization of the byproducts.)

XXI—FUEL TESTING

Gas and Fuel Analysis for Engineers. A compendium for those interested in the economical application of fuel; prepared especially for the use of students at the Massachusetts Institute of Technology. A. H. Gill, 6th Edtn., 12mo., 7+139 pp., ill. N. Y., Wiley, 1912, $1.25.

The Testing of Coal. C. Ostler, Jl. Gas. Light., Vol. 117, 2546, pp. 582-4. (The paper shows what testing can be done in a small test plant.)

Coal Dust as Fuel. H. V. Hart-Davis, Iron Coal Trades Rev., Vol. 84, 2295, pp. 298-9, 3 fig. (A coal-dust fuel boiler and its uses are described. Much dust is allowed to blow to waste at the pit mouth which is of high calorific value.)

Deterioration of Coal in Storage. H. C. Porter and F. K. Ovitz, Mines Minerals, Vol. 32, pp. 475-6. (Results of experiments showing effect of weather on various coals under different conditions.)

XXII—STEAM ENGINES AND BOILERS

Steam Regenerative Accumulators. D. B. Morison, Coll. Guard., Vol. 103, 2674, pp. 629-32, 10 fig. (The Fife Coal Co.'s collieries illustrate the amount of mechanical power required to operate the plant necessary for coal getting at a group of modern pits. Four stations are each equipped with mixed pressure turbo-generating units of 750 kw. capacity. Exhaust steam is utilized to an exceptional extent.)

Methods of Driving by Gas Engines for Collieries. A. E. L. Chorlton, Trans. Inst. Min. Eng., Vol. 46, 1912, 2, pp. 315-50, 25 fig., 3 pl., 2 tab. (Some methods of drive, possibly as economical, if not more so, than the customary electrical modes.)

Bettington Boilers for Pulverised Fuel. Ry. News, Vol. 96, 1911, 2503, pp. 1422-3, 3 fig. (Efficient combustion promoted by intimate mixture of air and fuel.)

Power Installations in Pits; Gas, Steam and Electricity. (Installations motrices des houillières; le gaz, la vapeur et l'électricité.) J. Burns, Lumière El., 33, 1911, Vol. 26, 46, pp. 208-11.

XXIII—ELECTRICITY

Colliery Cables. H. G. Fraser, Iron Coal Trades Rev., Vol. 84, 2294, pp. 254-6. (A discussion upon the installation and maintenance of high-tension vulcanized bitumen cables. If the current density is kept within the limits laid down by the Home Office it may be used up to, or even above, 6600 volts.)

Electrical Accidents in Mines. M. Pickering, El. Rev. (Ldn.), Vol. 69, 1769, pp. 678-80. (Wire armoring and wooden casing as preventive of trouble in cases of roof or side falls or iron girders or runaway tubs.)

Winding Plant with Electric Drive by Variable-Speed Three-Phase Motors. El. Eng., Vol. 8, 5, Supp., pp. 9-11, 4 fig. (Plant of the Deri Motor for shaft depth 690 ft., net load 1.6 tons, speed 20 ft. per sec.)

Electric Transmission in Coal Mines. H. D. Jackson, Coal Age, Vol. 1, 15, pp. 484-5. (The true cost of electric power, rail, bonding, calculation of copper required.)

Electrical Equipment of the D., L. & W. Mines, Penn. Coal Age, Vol. 1, 23, pp. 742-4, 4 fig. (An unusually complete and extensive electrification, motor capacity 27,618 hp. The central station and substation practice is outlined and the electric power in haulage, hoists, pumps and auxiliaries.)

Electric Winding Developments. F. Thursfield, Trans. Inst. Min. Eng., Vol. 42, 1912, 1, pp. 179-90, 1 fig. (Discusses the use of electric drive where waste gases or exhaust steam are available, but deprecates the substitution for live steam.)

Home Office Rules for the Installation and Use of Electricity in Mines. Iron Coal Trades Rev., Vol. 84, 2295, pp. 279-80. (Showing the alterations from the original draft which are of considerable importance.)

Motor Starters for Mining Work. A. P. Drake, Iron Coal Trades Rev., Vol. 84, 2295, pp. 287-8, 23 fig. (Resistance units, resistance starters, and alternating-current motor starters are all dealt with.)

XXIV—SURFACE TRANSPORTATION

Coal Developments at Stearns, Ky. J. E. Butler, Mines Minerals, Vol. 32, 8, pp. 481-2, 3 ill. (Use of an aërial tramway to transport coal across a river. Description of equipment and surface arrangements.)

Anti-breakage Coal Shipping Apparatus. Coal Merchant, Vol. 24, 591, pp. 55-6, 4 fig. (Particulars of the Handrock appliance with endless chains carrying steel plate trays, upon which the coal travels.)

The Largest Naval Collier in the World. K. G. Martin, Marine Engineering (N. Y.), Vol. 16, 12, pp. 495-8, 3 ill. (Characteristics of U. S. A. fleet collier "Cyclops." Description of deck arrangement and coal-handling machinery.)

XXV—SANITATION, DISEASES

Colliery Cottages and Surface Buildings. J. Perkin, Iron Coal Trades Rev., Vol. 83, 1911, 2286, pp. 1022-3, 9 fig.

Model Concrete Village for Coal Miners. Concrete, Vol. 12, 2, pp. 40 and 66-7, 13 fig. (A village of 20 double houses for 40 families, arranged around a park 300x600 ft. They are built so that the house cleaning can be mainly done with the garden hose. Many interesting devices are given.)

Coal Mine Mortality Statistics. F. L. Hoffman, Coal Age, Vol. 1, 13, pp. 400-3, 4 tab. (Tables showing the rapid increase in the death rate in North American mines.)

Miners' Baths. R. A. S. Redmayne. Coll. Guard., Vol. 103, 2663, pp. 77-8, 6 fig. (Bath installations described as at Dolwath, Cornwall, and in Belgium and France.)

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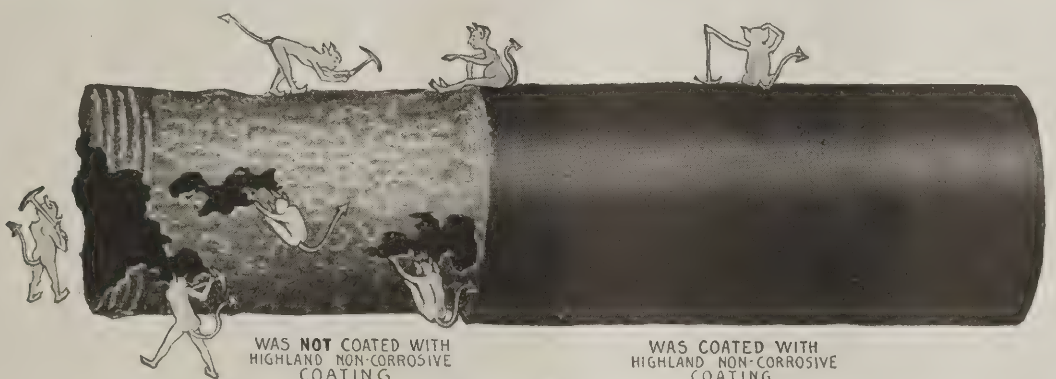

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Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 31.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, MAY 11, 1912

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COAL AGE

Vol. 1 NEW YORK, MAY 11, 1912 No. 31

THE eyes of the world have been watching the various phases of state activity in New Zealand, hoping to learn something that might be used in the social reform of other nations. Having become the sociological experiment station of the universe, she is rather expected to try out all radical ideas for the benefit of humanity. The country is remote, has a homogeneous population of intelligent, well educated people who have a high standard of public virtue; the climate is healthful and the soil fertile, so that important conditions are favorable to the work in hand.

If in any country, therefore, the ideals of Utopia could be realized, surely New Zealand affords the chance. But has the aim been accomplished? Let us briefly analyze the results the government has secured from having established Old Age Pensions, Parcels Post, Savings Bank, Fire Insurance, Life Insurance, a system of Telegraphs, Telephone Exchanges, and from operating Coal Mines.

To receive a state pension the citizen must be 65 years old, sober and reputable and 25 years a resident. His income must not exceed $300 annually, and his accumulated property must not amount to $1300 or over. The full pension of $130 a year is reducible by $5 for every $5 of income over $170. Thus when the applicant's yearly income reaches $300, the right to any pension is lost. Likewise, a reduction of $5 is made for every $50 of accumulated property.

As to state insurance, state ownership of mines, and government management of railways and other public enterprises, the plan of conducting all such activities on sound business principles has lately been adopted. This policy prevails not only where the state is competing with private effort, but in government monopolies, where lack of competition tends to cause expensive management, obsolete methods and unreasonable concessions to public clamor. The present aim is to make each business pay at least interest on the capital invested.

The most recent reports at hand show that the annual profits of the Post and Postal Telegraph Departments are approximately $500,000. The State Coal Mines netted the government another $100,000. The railways showed a deficit of $1,030,000, while the net profits to the state from 5 per cent. loans made to settlers was $325,000.

Telegrams and telephone service are cheaper than in the United States. Railway fares are practically the same (2c. per mile). The price of coal is higher than when the government first went into the business. Wages, as compared with the cost of living, are slightly lower than in this country, and the net public debt of New Zealand ($329,000,000) amounts to $340 per head, which forms a striking comparison with our net debt of $10 per head. The enormous net debt of New Zealand, however, does not seem so great when compared with the total private wealth of the country, which is $1628 per head, a greater per-capita wealth than that of any other nation.

It would be unfair to say that the mild form of socialism prevailing in New Zealand is a failure. But has it improved conditions? Of 1,000,000 inhabitants, 130,000 are directly dependent on the state. Poverty has not been abolished, for there are just as many paupers in the towns of New Zealand as in American cities. Also the distribution of wealth is not much more equal, since statistics show that 1 per cent of the families in that country own 35 per cent. of the wealth, a condition but little better than that which exists in the United States.

Strange to say, socialistic legislation has had an effect that certainly was not socialistic. Discontented and land-hungry laborers, through state aid, have been converted into prosperous citizens, strong supporters of the freehold and ardent advocates of the sanctity of private property.

There is still a discontented class, who, having little to tax and nothing to lose, desire to exploit the rich, regarding the capitalist as a goose to be kept for the sake of its golden eggs. We should study New Zealand's scheme of compulsory arbitration and her system of old-age pensions. Also, if it will make our coal industry more stable, we would like to see Uncle Sam operating a few mines of his own, but to believe that results so far attained in this far-off country point a way out of the tangled woods of social unrest is hardly justified by the facts that exist.

The Acme Co.'s Plant in Wyoming

By Jesse Simmons*

A detailed description of one of the largest and best equipped plants in the Sheridan, Wyo., field, a general description of which was recently published in COAL AGE. An unusual refinement in sizing the coal is attained by the use of a shaking screen with both a lateral and longitudinal motion; this is one of only four or five such screens in use in this country.

*Deadwood, S. D.

The mines of the Sheridan, Wyo. coal field are operating on seams that have been designated by the Geological Survey as sub-bituminous, but are more commonly known locally as lignite. Whether this coal is a true lignite, in the common acceptance of the term, is a question the Survey men evaded by giving the new name. The coal differs from the ordinary lignite in that it contains less moisture and far less ash. In color it is black instead of brown, and it has a high gloss, almost as bright as the best grades of anthracite. It burns freely to a clean, light ash, having a resemblance to wood ash.

Because of the fact that it is mined from large clean seams and nearly all of the mines leave a coal roof, the resulting product is exceptionally clean. It contains barely more than traces of sulphur. For steam purposes it is a good fuel, and is used in large quantities by the C. B. & Q. R.R. As a coal for domestic use it is in some ways superior to the ordinary bituminous, as in burning it leaves almost no soot, and for this reason, as well as its freedom from clinkers and sulphurous gas, it derives merited popularity.

Of the several mines in the Sheridan district the newest and one of the best equipped, as well as one of the largest, is the Acme Coal Co.'s property. This company is but two years old, and owns three mines. Mine No. 3 is operating in the top seam of the district, which is known locally as the Monarch. Mines 1 and 2 are working in the Carney, or second seam, the Monarch being eroded at this point. Mines 1 and 2 are on a property comprising about 300 acres, 3 miles west of the 1100-acre tract on which Mine No. 3 is located. The former property is operated under a short term lease, and the latter under a ninety-nine-year contract. All three openings are made in the bluffs of the Tongue River, by drifts having a slight inward dip.

The Acme No. 3 Mine

The main entry of the Acme No. 3 mine is in the bluffs of the Tongue River, on the northerly side of the stream. From the pit mouth the track, which has a 42-in. gage, and is laid with 45-lb. rails, both on the surface and in the main haulageway, follows the bluffs westerly, and crossing a steel bridge, enters the yards. At a point 250 ft. from the foot of the inclined approach to the tipple, the electric locomotives are uncoupled and the cars picked up, one at a time by a cable haul. The essential features of this haul are a 1¼-in. steel cable to which are attached 4-wheel trolleys, equipped with dogs which engage lugs on the car axles, the trolleys running on 16-lb. rails. The haulage is controlled by a friction clutch, making it possible to give the proper feed to the cars going up the incline.

Acme Co.'s Steel Tipple, Showing Re-screening Plant and Chutes

At the foot of the incline the cars are picked up by a cable haul similar in detail to the one described, which takes them to the top of the tipple. The top of the incline is 49 ft. above the yard tracks, and has a grade of 15 deg. The cars are dumped over a crossover dump, and automatically transferred by means of a double track system, down the approach, and made up into trains for return to the mine.

When the coal is dumped from the mine cars it enters a large bin provided with a movable bottom, or feeder plate, arranged to be operated at varying rates of speed. This delivers the coal to a shaker-screen of special design having a capacity of 3000 tons per day and openings 6 in. in diameter. Having both longitudinal and lateral motion, the makers of this screen claim it has an important advantage over other types. It is one of four or five in this country, but it has been extensively and successfully used in Germany.

From this screen coal may be diverted into either open or box-cars, a standard Ottumwa box-car loader being used to load the latter. By cutting out the screen, which is done by covering it with movable steel plates, mine-run may be loaded direct into the cars. As a further precaution in the preparation of lump, the coal before entering the railway cars passes over grizzlies, thus removing the last vestige of slack and dust which might have been carried to this point.

Re-Screening Plant

The coal passing through the shaker-screen may be either diverted to open cars on the slack track, or to an elevator boot from whence it is conveyed by a 30-in. rubber-belt conveyor, 265 ft. long, to a revolving screen 65 ft. above the ground, at the top of what is known as the re-screening plant. This screen is 24 ft. in length, and for one-half of the length an outer screen, 7 ft. in diameter surrounds the main screen, which is 6 ft. in diameter. Beginning at the upper end, the openings in the main, or 6-ft. screen, are as follows: 1-in., for the first 12 ft.; next a 6-ft. section with 2-in. openings, while the remaining 6 ft. has 3½-in. openings. The outer screen has ½-in. openings, and surrounds that portion of the inner screen having 1-in. openings.

The following grades of coal can be made at this plant: At the main tipple, lump, mine-run and slack; at the re-screening plant, slack, pea, nut and egg. The slack is that portion passing through the ½-in. opening; the pea size drops

through the 2-in. opening; the nut through the 3½-in. screen, and the egg is that product which has passed through the 6-in. screen in the tipple and over the 3½-in. The regular grades may be dumped into their respective bins at the re-screening plant, or the product may be mixed if desired, making not only the four sizes of coal as originally prepared, but a combination of these sizes to meet special market conditions.

The bins into which the coal is screened are made entirely of steel, and are of latest modern construction. In order to prevent any breakage of the coal after having been prepared in the revolving screen, it is conveyed to the bottom, or coal level, in the bin by means of special chutes, constructed as follows: The chute proper is a steel box, standing nearly vertical and provided with a series of sloping steel shelves. The coal in passing down the chute pursues a zig-zag course from shelf to shelf, and finally arrives at the coal level in the bin without having dropped at any time, a distance which would cause it to break. This scheme is largely followed in the anthracite territory, as being the best method of handling coal with minimum breakage.

Jeffrey Motor at the New Acme Mine

Beneath the storage bins, which have a capacity of 500 tons, are three railway tracks, where coal may be loaded from the bin. The mouths of the loading chutes are provided with grizzlies, similar to the equipment at the tipple, for removing slack. At both this point and the tipple, the slack is picked up by screw conveyors, 6 in. in diameter, and delivered to bucket elevators housed in steel, which returns the material to the screens. This eliminates considerable hand labor and keeps the loading tracks free from accumulations of coal.

At the re-screening plant the bins are provided with hoppered chutes over the center track, for loading open cars. The two tracks at the side are equipped with chutes for loading box-cars only. The hoppers over the center tracks are equipped with improved clam-shell delivery gates. The entire plant is operated by electricity, power being secured from the Sheridan Electric & Power Co., whose plant is close to the tipple, as shown in the illustration. Westinghouse, alternating current, 3-phase, 60-cycle motors, having a capacity of 2300 volts are used for driving the tipple and screening plant, one 60-hp. motor being used at each place. The electric locomotives and coal cutters are driven by 250-volt direct current.

Machine Shop

The machine and blacksmith shop is a reinforced concrete building, 40x60 ft., with a steel roof, and equipped with the machinery for making all necessary repairs to cars, mining machines, etc. A side track runs into the shop and over a pit, giving easy access for a man to work under the cars in making small repairs. A steel tank with a capacity of 75,000 gal. on a steel frame 75 ft. high, supplies the miners' cottages, etc.

Acme Co.'s Tipple and Sheridan Electric Light & Power Co.'s Plant

The tipple, re-screening plant and bridge across the Tongue River are all constructed of steel, resting on heavy concrete pillars. The work was done under contract, by the Ottumwa Box Car Loader Co., of Ottumwa, Iowa. The plant was designed by the manager of the Acme mines, A. K. Craig, of Sheridan, and machinery and equipment has been purchased from a number of manufacturers, it having been his endeavor to secure the best in each particular line.

The Acme No. 3 mine started producing mine-run coal, for railroad use, in February 1911, and during October the new tipple was put in operation. The re-screening plant will go in commission at an early date, and this mine will then be equipped to produce 3000 tons of coal per day—and a coal that will have as good a preparation as any produced in the field.

At this mine Jeffrey mining machines are used exclusively, both breast and longwall types; they are operated by a 250-volt direct current. A Sullivan high speed fan, motor-driven, furnishes the ventilation, the 30-hp. motor on this machine being driven by a 2300-volt, alternating current. Jeffrey electric locomotives are used for haulage. At the present time the camp includes a few temporary shacks, and 20 employes' cottages, completed or under construction; a large building, combining a boarding house, offices, etc., is also being built. As fast as necessary additional dwellings will be erected, and when a store, school, church, etc., are completed the camp will be quite an imposing one. The mine is about one-half mile from the main transcontinental line of the C. B. & Q. R.R., the grade being almost level for this distance.

Method of Mining

In a recent report made by Jno. K. Seifert, the workable coal in the 1100-acre tract of the No. 3 mine, is placed at a thickness of at least 35 ft. This is contained in two seams, the Monarch or upper seam, having 26 ft., 4 in. of workable coal, and the Carney or second seam, about 9 ft. of workable coal. The present openings on this property are made in the Monarch seam, the Carney, which is 42 ft. below, being held in reserve. The workable coal in this track is figured at 38,500,000 tons.

Owing to the thickness of the Monarch seam, the ordinary methods of mining cannot be followed to advantage. There is about 23 ft. of absolutely clean coal in this seam, which can be mined without touching any kind of rock, bone or inferior material. In general it has been found that the room-and-pillar method, driving the rooms 10 to 12 ft. high, and later drawing the pillars, bringing down the roof, gives a high percentage of recovery. The panel system is used, as it is found necessary to stop up abandoned workings, since the disintegrated and dirty coal has a tendency to ignite from spontaneous combustion if left too long exposed to the air.

Manager Craig, of the Acme mines, has devised a system of mining which is about to be patented. He claims for this system a higher recovery of the workable coal in these large seams than

is possible by any of the methods now in use at the various mines. As stated he is about to apply for a patent, having practically completed all of the preliminary work and experimentation.

Mining Conditions

The mines of this district are particularly fortunate in that they have absolute freedom from many of the disadvantages which mark coal operations in other districts. The mines are free from gas, probably due to the fact that the veins are found not far below the surface, while the superimposed strata is largely sandstone or other porous rocks. In mining with a coal roof very little, in fact almost no, trouble is experienced with caves or falls of rock which would injure workmen.

The Acme mine is typical of the district as regards freedom from accidents; during the two years that this mine has been open there has not been a single fatal accident, and no serious accidents of any kind. The freedom from gas makes ventilation a fairly simple problem, in fact the fan equipment at these mines would be totally inadequate were there any gas present. The fans are practically used only for the purpose of blowing out powder smoke.

The one drawback, which is not serious if anticipated and properly guarded against, is danger from fire. The slack coal, especially if mixed with dirt and rock where the roof has come in, in some abandoned room, is very likely to ignite from spontaneous combustion. Knowing this the operators use the panel system of mining, usually running about 30 rooms to a panel. Thus, when a 30-room panel has been worked out, it is only necessary to stop two openings in order to completely close up the section. These stoppings are ordinarily made with concrete.

Analysis of the Coal

The following analyses were made by the Commercial Testing & Engineering Co., Chicago:

Sample top to bottom of 8-ft. seam, Acme No. 1:

Moisture	17.83
Ash	4.11
Volatile matter	58.20
Fixed carbon	19.86
Total	100.00
B.t.u.	9950
Sulphur	0.24

Lower 12 ft. of Monarch seam Acme No. 3:

Moisture	17.92
Ash	3.58
Volatile matter	44.81
Fixed carbon	33.69
Total	100.00
B.t.u.	10,247
Sulphur	0.39

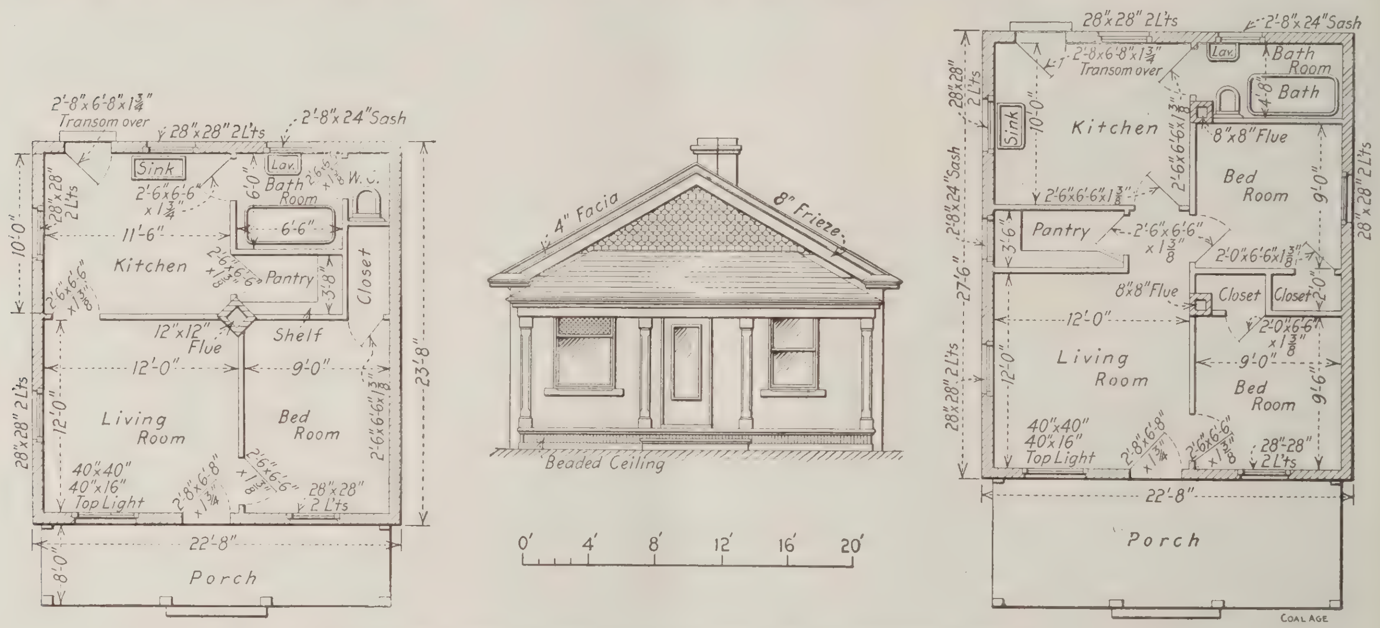
This quality of coal would make a splendid fuel for use in gas producers, probably as good, or better than the high class Virginia bituminous coal. These analyses are typical of this section, and when it is considered that this coal is mined absolutely free from foreign material (both the floor and roof being coal) it at once marks this district as unique in the coal industry.

Acme Nos. 1 and 2

The coal from the Acme Nos. 1 and 2 mines is dumped over a single frame tipple; both mines are drifts, with slight inward dips. The coal is mined from the Carney seam, the thickness varying from 9 to 12 ft. Like the Acme No. 3, the room-and-pillar method, combined with the panel system, is used. Rooms are 16 ft. wide and 200 ft. long, leaving 15-ft. pillars. Four Jeffffrey short-wall machines are used for undercutting. The miners drill and blast their own coal, which work, as well as undercutting and loading, is done on a schedule per ton made with the local Miners' Union. These Unions are affiliated with the United Mine Workers.

Two 5-ton Jeffrey electric locomotives are used in bringing the coal from the main partings to the tipple; horses are used in the rooms. The mines are electrically equipped, power at 22,000 volts, 3-phase, 60-cycle, alternating current being obtained from the Sheridan Electric Light & Power Co. This current is stepped down in three, 75-kv.-a., Westinghouse transformers to 2300 volts, and then drives a motor generator set, composed of a 220-hp., Allis-Chalmers motor, direct connected to an Allis-Chalmers, direct current generator, producing at 1130 r.p.m., a 250-volt, 545 ampere current; this current is used for the undercutting machines, locomotives and tipple. In addition to the above equipment, the transformer house contains a small transformer for stepping the current down to 110 volts for the lighting circuit, used both in the mine and town. As at present operated this plant is capable of producing 1000 tons of coal in 8 hours.

With the three mines mentioned the Acme Coal Co. is a strong competitor for the business of the Sheridan field, and the completion of the plant at No. 3 will place the company in splendid position. The Acme Coal Co. is owned by two men, A. K. Craig and Ora Darnell. The former is the practical miner and the latter the selling head. Both are well qualified for the work they have undertaken, having had long experience in the coal business. To both of them the writer desires to acknowledge the courtesies which have made it possible to secure the data for this article.

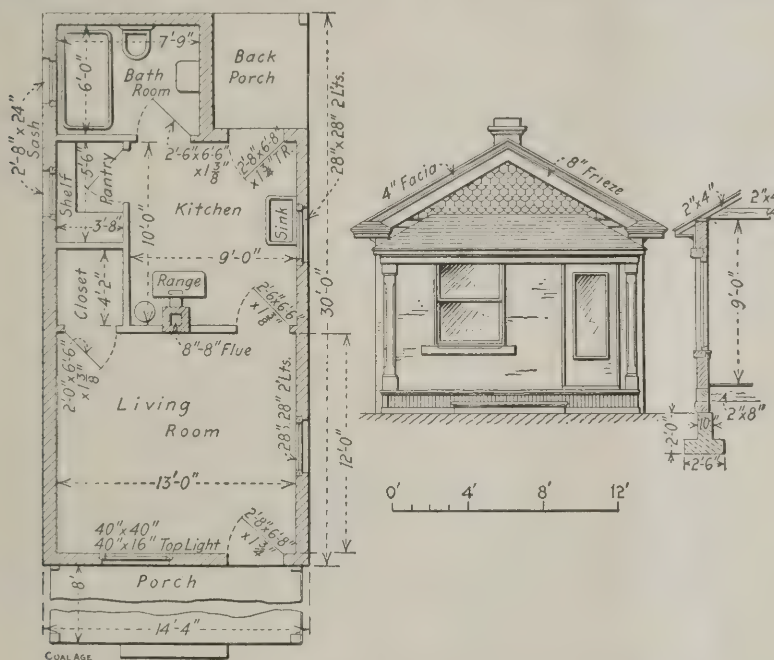


Plan and Front Elevation of Three-and Four-room Houses

Employees' Residences

In keeping with the equipment of the mine, the company is erecting a group of dwellings for the housing of employees which will bear comparison with those of any mining camp in the country. The plan of house No. 3, which is reproduced herewith, is typical of the village which is being buit. House No. 3, as it is designated in the specifications, has four rooms besides a bath room, pantry and two closets; the conveniences include a front porch extending the width of the building, electric lights, running water, sewer connections and hard pine floors. The extreme dimensions of the outside walls give the house a width of 22 ft., 8 in. and a length of 27 ft., 6 in.

The foundation is of concrete, with two courses of concrete blocks laid



Plan, Elevation and Partial Section of Two-room House

above the ground line; upon the foundation, and butting upon the blocks, are laid the floor joists, and upon these the rough floor is spiked and the studding raised. After the studding is raised and the outside weather boarding put on, the inside of the exterior walls is boarded up with rough lumber and into the space thus formed, between the ship lap and sheathing, concrete is poured and well tamped. After the wall thus constructed, and into which pipes carrying the electric wiring have been introduced as the work progresses, the interior rough boarding is removed and the wall pointed up with rich concrete. A coat of alabastine or whitewash completes the interior wall.

Aside from this innovation in construction, the house is completed in the usual workmanlike manner, good plumbing being used, and a heavy coating of paint protecting the woodwork. Partition walls are of the usual construction, 2x4 studding and lath, plastered with two coats and finished hard and smooth. Chimneys rest on concrete piers which extend from the solid ground up to the floor level, taking the weight off the floors. A house of this description rents to an employee for $20. per month, including water, light and coal.

House No. 1 contains two rooms, a living room, 12x13-ft., and a kitchen 9x10-ft., besides a bathroom, pantry and closet. House No. 2 contains three rooms, a living room 12x12-ft., bed room 9x12-ft. and a kitchen 11 ft., 6 in. x12 ft., also a bathroom, pantry and closet.

Power Plant

The Sheridan Electric Light & Power Co. has a most uptodate power plant on land belonging to the Acme Coal Co., having the surface right under a 50-year lease. The location is 9 miles from the city of Sheridan, a place of 10,000 inhabitants, which is served by its pole lines. The coal mines of the Sheridan district are close at hand, the most distant operating mine, the Kooi, being only a little over 3 miles away.

An interurban electric road is building from Sheridan to the coal mines, and has contracted for power generated at this plant. From these details it will be seen that the plant has a convenient location for the generation of power for the city of Sheridan, and is advantageously situated to give service to the mines and electric railway.

The plant is located about 200 ft. from the Acme No. 3 tipple, and it is the intention to install a conveyor for transferring the coal from the tipple to the boiler room of the plant. The boiler room contains three, Heine, water-tube boilers, one of which is being operated under a test with a Roney stoker; should this machine prove successful in the handling of lignite slack, a large field for its use will be opened up. There is demand for a stoker which will fire the slack coal from the Sheridan mines, as dozens of steam plants in Wyoming, South Dakota, Nebraska, etc., are using coal from this field, and a very large proportion of them are using hand firing.

The superheated steam from these boilers is fed to two, Westinghouse-Parsons turbines, direct connected to Westinghouse alternating current generators, which at 3600 r.p.m., produce 1250 kw. of 2300-volt current. Further equipment in the engine room includes transformers which take the 2300-volt current and step it up to 22,000 volts, which is the line pressure. Some of the 2300-volt current is used at the adjoining coal property, and a motor generator set, in the same room, is driven by this current. This set comprises an Allis-Chalmers, 220-hp. motor, actuated by 54 amperes of alternating current, 60-cycle, 3-phase, at 2300 volts, direct connected to an Allis-Chalmers, direct current generator, producing current at 250 volts no load, 275 volts full load, 545 amperes; the set operates at 1130 revolutions per minute.

Exhaust steam from the turbines is taken through a Leblanc condensing system. Water for this system is taken from the Tongue River, on the banks of which the plant is situated.

Annual Banquet of Mine Officials at Pittsburg

Superintendents, mine foremen, assistant foremen and fire bosses of the seventeenth bituminous inspection district of Pennsylvania held their first annual banquet at the Monongahela House, Pittsburg, on Saturday evening, April 13. One hundred and fifty-four mining men of the district were in attendance.

W. H. Pratt was elected toastmaster and with a few appropriate remarks called upon the following, to address the gathering: J. I. Pratt, mine inspector of the seventeenth bituminous district; David Young, mine inspector of the fourteenth bituminous district; J. B. Johnston, editor of the *Coal and Coke Operator;* R. H. Heath of Homestead, Penn.; Hugh Gibbs, inspector for the Pittsburg-Buffalo Co., Canonsburg, Penn.; H. D. Thompson, superintendent of the Pittsburg Coal Co., Willock, Penn.; and Dr. McKnight, of Willock, Penn. David Young, of Freeport and T. A. Jackson, of Curtisville, were invited guests.

It is intended to make these meetings an annual affair and much credit is due John I. Pratt for bringing the mine officials together to discuss various mine problems of the day.

Water Purification for Collieries

When water which is possessed of temporary hardness, is boiled or brought near the boiling point, carbonic acid gas is given off and carbonates are precipitated. This treatment suffices if there is no permanent hardness or other impurity to be dealt with but when permanent hardness is present, the water must be chemically treated. In the heater-softener, made by the Eriths' Engineering Co., of London, the use of lime is dispensed with and the arrangemen of the apparatus is as shown in Fig. 1. The supplies of cold water and soda solution are delivered together into a trough near the top of the upright portion of the apparatus, whence the water overflows onto removable trays, and finally falls into the settling chamber. At the same time, exhaust steam is delivered through the oil separator in the upper part of the shell surrounding the trays, and any excess of exhaust steam that there may be, escapes through a vent in the top of the shell.

Steam at atmospheric pressure is capable of heating the water up to about 210 deg. F., and the air and carbonic acid gas in the water are driven off through the vent pipe, a large proportion of the carbonates and precipitates being delivered at the bottom of the settling chamber. Moreover, the soda ash solution, which removes the sulphates, chlorides, and acids, has an accelerated action due to the heat. The water from the settling chamber passes upwards through a horizontal filter.

At the side of the settling tank will be seen a water space in which is located a float for controlling the admission of cold water and soda. The surface of the water in the settling chamber is occasionally flushed over in order to remove the scum due to oil from the oil separator. This is accomplished by admitting an excess of cold water and the portion thus flushed off passes into a trap or water seal. It will be seen that back pressure cannot occur with this arrangement and there is no danger of choking from deposits. The travel of the water after passing over the trays still gives plenty of opportunity for precipitation, and the low cost of soda ash, which is the only reagent used, makes the process inexpensive.

Combined Heater and Softener

The Paterson Engineering Co., Ltd., have a large number of water purification machines working in connection with coal mining plants and the majority of these are arranged for the utilization of exhaust steam from hoisting engines, haulage engines and other steam driven auxiliaries. Fig. 2 shows a type of apparatus in which the supply of hard water is controlled by a float in the feed-pump suction tank and is led through a chemical regulating apparatus, which measures it continuously by means of a narrow vertical discharge weir.

Special Correspondence

Water softeners which make use of waste heat, and combined preheaters and softeners are frequently installed. Iron salts require special apparatus for their removal. Aluminum possesses remarkable properties in connection with the softening of water, which are not, as yet, thoroughly understood. The third of a series of articles on water-purifying processes and apparatus.

A large float controls the position of two tapered valves discharging the softener reagents. The level of these valves is kept constant by ball cocks connected to the chemical storage tanks. The hard water and reagents are thoroughly mixed in a mixing tray before passing through a water seal into the heating chamber. The exhaust steam passes through a preliminary grease separator (where the oil from the engines is removed) to the heating chamber. Here it passes through the trays in a counter-flow direction, finally escaping to the atmosphere.

The heating trays are constructed of light sheet steel and are easily withdrawn for cleansing purposes. The water falls from the distributing box into the center of the top tray. Owing to the great length of the tray the water overflows the edges in exceedingly thin films, which cling to the underside and drop from the center into the middle of the tray immediately below. After working its way to the edges of the second tray it again overflows onto the underside and drops into the middle of the third tray and so on. By this method exhaust steam comes into contact with the films of water and the temporary hardness is removed without the aid of chemicals, by driving off the carbonic acid gas and precipitating the lime salts.

For the removal of the permanent hardness, sodium carbonate is necessary, and this is added through the Paterson measuring gear in accurate proportion to the amount of water passing. The heated and softened water passes into the precipitating chamber where the bulk of the impurities settle out, final purification being effected by double filtration through wood fiber. One objection to the open-type exhaust heater is the contamination of the feed water by oil. This is overcome in the Paterson apparatus by the addition of sulphate of alumina which coagulates the oil and fine suspended matter into tangible masses, readily arrested by the filtering medium.

Apparatus for Removing Iron Salts

Reference was made in a previous article to the removal of iron salts from mine water. The plant referred to, was an automatic self-cleansing filter erected by Messrs. Royles, Ltd., at the Tyldesley colliery for removing ochre colored impurities due to the presence of iron compounds in the water, a clear effluent resulting. Messrs. Royles have also developed a special type of eliminator for underground waters containing bicarbonate of iron which as soon as it is exposed to air is changed into iron oxide causing the water to assume a reddish brown color. Deposits of such sediments are apt to choke pipes and tubes and water thus affected is hardly suitable for either boiler-feed or for bathing and cleansing purposes. A brief note concerning this iron eliminator will therefore be of interest to colliery engineers who have to deal with this particular form of impurity.

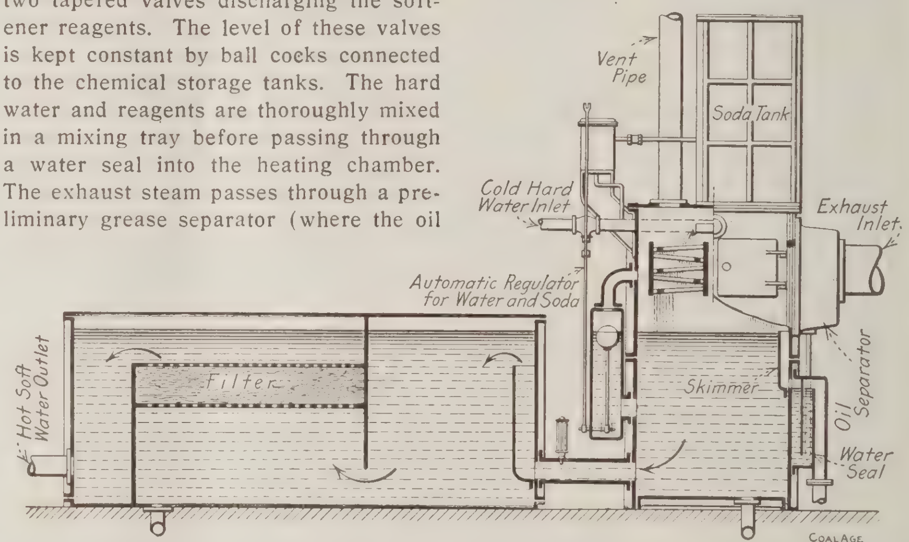


Fig. 1. Eriths "No Lime" Feed-water Purifier

The device is illustrated in Fig. 3 and consists of a spraying tank *A*, coke tower *B*, and a gravel filter which is periodically cleansed by means of air. The untreated water flows into the spraying tank, the bottom of which is perforated with small holes that allow the water to pass through onto the coke bed beneath, in the form of a fine shower. Water and air are thus thoroughly mixed and the absorption of oxygen causes the precipitation of iron oxide. This precipitation is continued throughout the passage of the water in fine streams over the coke, as the sides of the coke tower are perforated to admit more air. A coating of iron oxide speedily covers the coke, and this accelerates the separating action.

From the coke tower, the water passes in the form of a fine shower onto the gravel filter where the iron oxide remaining in suspension is arrested and finally the water is delivered at the point *D* in a purified condition. When the filter has to be cleaned, the mud valve *E* is opened to the drain, and the air blower *F* forces in a supply of air at the same time that water is admitted to the lower side of the filter. Energetic flushing of the filter is then maintained for a few minutes and the muddy water is drawn off through the mud valve.

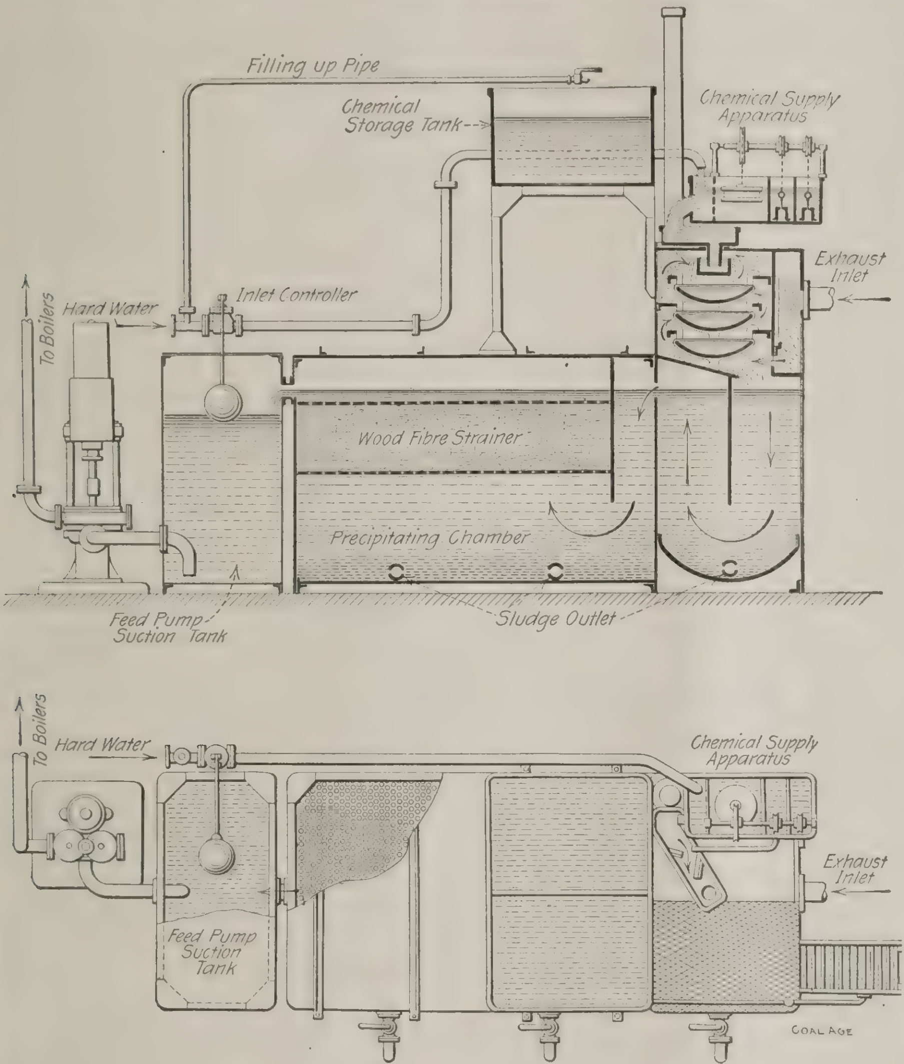


Fig. 2. Combined Purifier and Open-type Heater

Remarkable Property of Aluminum

Mention was made also of the remarkable action of aluminum on water, in connection with preventing hard scale in boilers, and some reference should be included to the Neff-Brandes apparatus which has been installed in Kainscht, near Meseritz, Germany. The boiler at this plant, used for driving air-pumping engines, was supplied with water from a ditch running over a neighboring mine. This water was of a particularly hard quality, the scale formed on the boilers being excessive. The Neff-Brandes apparatus, when installed, not only destroyed the adherent boiler scale, leaving in its place a scanty gray powder, the greater part of which was completely removed from the boiler by flushing out, but the pressure of steam was thereafter maintained with ease, and the boiler plates were kept in good condition. Dry steam of a bluish tint was obtained instead of steam having a gray appearance, indicating excessive moisture.

The Neff-Brandes apparatus has been brought to England under the name of the "Luminator" treatment. The operation consists solely in running the water down the channels of a steeply inclined corrugated aluminum plate, and the water after this treatment is passed directly into the boilers. No reagents of any sort are added. The action of the process, so far as at present can be determined, is as follows:

The surface of the aluminum plate, being kept clean and active by occasional scrubbing, slowly disintegrates and forms an extremely fine powder of aluminum in the colloidal state. This fine powder is washed off the surface of the plate by the water passing over it at a high velocity and is carried with the feed water into the boiler. In the boiler, these extremely minute metallic particles, which remain in suspension in the water, form nuclei for the evolution of carbonic acid gas and also for the crystalization of the carbonates in the water. This crystalization thus occurs on the aluminum particles instead of on the boiler surfaces and there is finally deposited a soft and non-adherent mud.

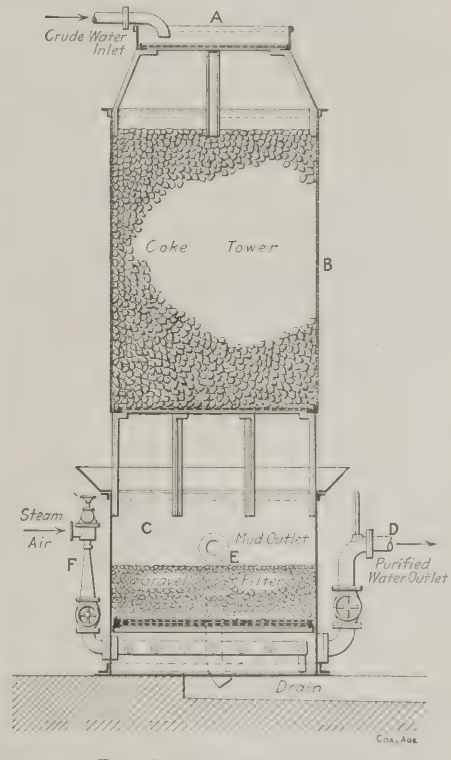


Fig. 3. Iron Eliminator

When the water contains permanent hardness the effect on the sulphates is not definite. The sulphate crystals form in the ordinary way but are separated from one another by the non-adherent carbonate mud, and are thus prevented from forming a close scale. This is briefly the theory of the operation of the process, although there are undoubtedly other actions occurring which have not yet been fully demonstrated by experiment.

Review of Iowa Mine Explosions

By R. T. Rhys*

Answers to numerous inquiries received in regard to the Iowa practice of slowing down or stopping the ventilating fan previous to firing shots in coal mines. Brief review of mine explosions in Iowa: First, in mines in which the ventilation was not reduced when firing; and second, in mines where the ventilation was so reduced. Comparative results and conclusions.

From the inquiries I have received of late it seems that the Iowa method of slowing down the fan at firing time is receiving considerable attention in other states. In the discussion relative to the advocacy of this method the following questions have been frequently asked:

(1) What is the practice, in Iowa mines, regarding the speed of the fan at firing time?

(2) Has the slowing down of the fan at firing time put a stop to explosions and windy shots in Iowa mines where this practice has been observed?

(3) Does experience in Iowa mines show that the slowing down of the fan at firing time reduces the danger, or the probability that an explosion will occur?

(4) Does experience in Iowa mines show that the slowing down of the fan at firing time lessens the force of an explosion and makes it less destructive should one occur?

My answers to the above questions are deduced from the official reports of Iowa explosions, and from my own personal observation and experience. They are as follows:

(1) The general practice in this state has been for the past several years and is today, in all new mines or mines not extensively developed, to stop or slow down the fan, a little before or at firing time. In practically all our more developed mines, however, the fan is allowed to run at its usual rate of speed; that is to say, there is no change made in the speed of the fan, at firing time.

After the Pekay and Cedar mines explosions the people of our state were in a receptive mood to adopt any practical measure that promised to diminish the danger of an explosion, or make it less destructive should one occur. Some of our leading mining men at the time strongly advocated the slowing down of the fan at firing time as a measure of protection; and, inasmuch as the remedy proposed was an easy one to carry out, entailing no expense to the operator or loss of wages to the miner, it was not long before some mines adopted the plan suggested. By the end of the year 1902 the practice of slowing down the fan at firing time had become quite general throughout the state, and has been adhered to ever since. Whether right or wrong the belief in its protective value is such that it would be almost impossible to secure shotfirers in new mines, especially during the cold season, unless the fan is stopped or slowed down at firing time.

(2) I can positively answer this question by saying that it has not. It is only fair, however, to say that no one, in this state, claims that it does.

(3) To this question I shall not reply either in the affirmative or the negative. I am seeking for and ready to receive proof either for or against the practice in this state. I think I am correct in saying that should I or some one else answer "yes" or "no" to this question it would only be a matter of opinion. No one yet, to my knowledge, has been able to show positive proof that the practice of slowing down the fan at firing time has prevented a single explosion, in this state, or that the practice has caused one.

(4) To compare explosions in Iowa with those in other states, even though there be a similarity of conditions, may often lead to wrong deductions. It seems to me that to arrive at right conclusions, Iowa explosions that have occurred in mines under one practice of ventilation at firing time, should be compared with those that took place in Iowa mines under a reversed practice of ventilation at firing time. In other words, to prove which of these two methods is the best and safest practice, comparisons should be confined to Iowa mines, under the two practices. When we do this the claim that explosions in mines where the fan was kept running at the usual speed and the usual quantity of air was circulating at firing time have exhibited greater force and were more terrific than those that occurred in mines where the fan was stopped or slowed down at firing time becomes a questionable one.

Iowa Mine Explosions, Ventilation Not Reduced When Firing

(a) The first explosion in Iowa, causing loss of life, was in Pekay mine, Nov. 8, 1892, when three men were killed. The official report of this explosion shows that there was evidence of great force. The fan was running to within a few revolutions of its usual speed; and practically the usual current of air was circulating at firing time.

(b) The explosion in the Cedar mine, Feb. 14, 1893, where eight men lost their lives, took place when the usual volume of air was circulating at firing time; and although the number of lives lost was greater than in the Pekay explosion, yet the extent of the explosion was limited and the damage done to the mine was small. All the men killed were on the entry, going home, and were caught by the blast not far from the seat of the explosion.

(c) The Jack-Oak mine explosion took place Nov. 27, 1894, at a time when the usual volume of air was circulating. One person was killed. The area traversed by the explosion was small and practically no damage was done to the mine.

(d) The explosion at Buxton, mine No. 13, took place March 5, 1907. One shotfirer was killed. This mine was an extensive one, and the fan was not slowed down at firing time. The explosion traveled only a short distance and did but small damage.

(e) The explosion at Lockman, mine No. 3, took place Jan. 4, 1910. One shotfirer was badly burnt. The usual current of air was passing at firing time. The extent of the explosion was small and no damage was done to the mine.

I have thus named every explosion of importance recorded in the biennial reports of the state mine inspectors that have occurred in mines where the usual current of air was passing at firing time. From these reports it is plain to the impartial reader that the Pekay explosion was the only one that exhibited evidence of great force. Also, in comparing these explosions it should be remembered that in the Pekay explosion five and one-half kegs of powder were exploded, which added greatly to the force of the explosion. This, everyone must admit, was a great factor in extending the area and augmenting the force of the explosion.

Iowa Mine Explosions, Ventilation Reduced When Firing

I shall now give a list of all the important explosions that have taken place, in the mines of this state, where the fan was stopped or slowed down before firing time.

(f) The explosion at Cleveland, mine No. 4, Jan. 5, 1901, when two shotfirers were killed, was marked by evidence of intense heat at the point of origin, and the initial force was great. Large rocks weighing several hundred pounds were picked up and carried quite a distance. The force of this explosion extended out along the main entry to the hoisting shaft through which it ejected dense volumes of smoke and dust to the surface. The fan in this case was running at a slow rate of speed at firing time.

(g) A second explosion occurred at Cleveland, mine No. 4, Feb. 5, 1901. The

*State Mine Inspector, District No. 2, Ottumwa, Iowa.

two shotfirers were found in an unconscious state by the rescuing party but recovered after being removed to pure air. This explosion originated at a point less than 50 yd. distant from the explosion of Jan. 5. The explosion left scarcely any sign of great heat, and created no unusual disturbance in the vicinity of its origin. Its initial force apparently was less than the first explosion named; but it gathered strength and became more destructive on its way out. Doors and stoppings that the former explosion failed to damage were destroyed by this explosion. A larger volume of smoke and dust was ejected from the hoisting shaft; and, while no life was lost, it was an explosion that exhibited tremendous force. much greater than the first one named. The fan in this instance also, had been slowed down at firing time.

(h) The most disastrous mine explosion in the history of Iowa took place at Lost Creek, Jan. 24, 1902. Twenty lives were lost. No explosion in this state has ever exhibited as great a flame as this one. It was a terrific explosion, and yet the fan in this case also was running at a slow rate of speed at firing time.

(i) Two shotfirers lost their lives in the Hocking-mine explosion, Feb. 18, 1902. I am not able to state the extent and the force of this explosion; but am informed that it was the practice, in this mine also, to slow down the fan at firing time.

(j) The explosion at Foster, Jan. 25, 1904, when two shotfirers lost their lives, was a light one, and the force of the explosion was comparatively small. The two shotfirers had undoubtedly erred in the manner of lighting the shots and also in the selection of a proper place of safety. The fan was stopped at firing time.

(k) The fan was stopped at the Dempster mine, when, on Nov. 1, 1906, the force of the blast of an explosion blew both cages up the shaft and against the sheave wheels, killing two men.

(l) The fan was stopped at Buxton, mine No. 15, when one shotfirer was killed by the force of an explosion, Feb. 25, 1910.

(m) At the explosion at the Regal mine, Jan. 15, 1912, when two shotfirers lost their lives, the fan was running at a very slow rate of speed at firing time. While no great damage was done to the mine, yet I doubt if any explosion in this state has showed evidence of a greater force.

This completes the list of all the principal explosions that have taken place, under both practices, in the Iowa mines, from the first serious explosion in 1892, up to the present time. In comparing these explosions I have named, first, those that occurred under one practice, and then those that took place under the opposite practice. I think every unprejudiced reader will agree with me that so far as the records of mine explosions, in Iowa, are concerned, the claim that slowing down the fan at firing time lessens the force of the explosion and makes it less destructive is not sustained, but is decidedly against this theory.

Explosion at Merritt, B. C.

By Chas. Graham*

Mixed lights and a single-entry system sufficiently explain the Merritt explosion. The flame, checked by a lack of fuel in the intake airways, was unable to travel more than a few feet along the right-hand split, with the result that eleven men were saved.

*Superintendent, Nicola Valley Coal & Coke Co., Middlesboro, B. C.

No. 3 Mine, operated by the Diamond Vale Collieries, Ltd., is located about one mile east of the town of Merritt, on the Nicola Valley branch of the Canadian Pacific Ry. The coal seam is about 4 ft. 6 in. thick and contains two bands of rock. The first band, about 12 in. from the floor, is 6 in. thick. The second, about 33 in. above the floor, also measures about 6 inches.

Two slopes have been driven from the outcrop directly to the dip, and at a point 300 ft. down, a left level has been turned off. The bed at this point is dipping at an angle of about 40 deg. About 50 ft. further down, another level has been driven to the right, and still further down a second level to the left has just been started.

The number of men working in the mine was normally only 20 at the time of the explosion, for the mine was not fully developed. Of this number, 18 miners were actually at work on the date of the disaster—six in the first left level, one in the second and the remainder in the right level. The six miners in the left level and the fireboss, who was traveling along the same heading, were killed; all the others escaped.

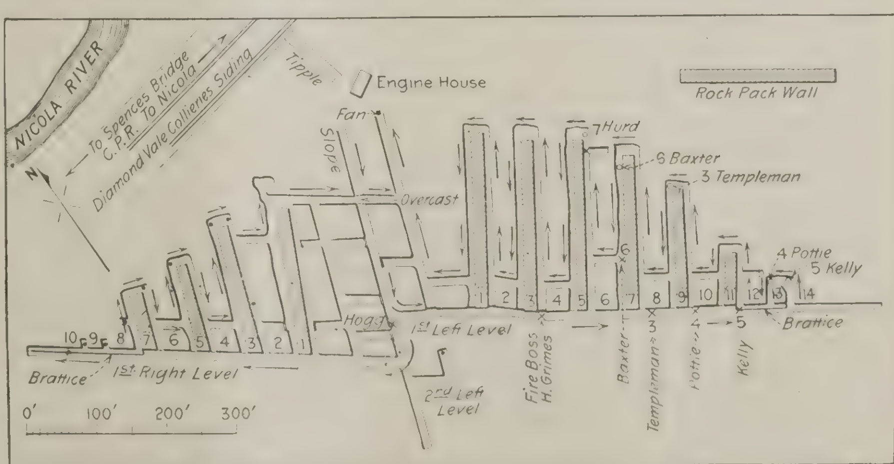
The mine was worked on the room-and-pillar system, with rooms 40 ft. and pillars 36 ft. wide. The room necks were double and about 20 ft. long. The rock from the coal was packed in the center of the room and just filled the space between the chutes, which were built along each rib. The roof is of a hard sandstone, and usually stands without timber.

The Explosion

The explosion occurred at about 9:45 a.m. on the morning of Mar. 7, 1912. A dense cloud of black smoke issued from the mouth of both slopes, and the tipple man, working at the mouth of the haulage slope was blown a short distance by the force of the explosion, but escaped injury. The fan, which was situated in the mouth of the drift, was blown about 25 ft., and the driving belt about 200 ft. The smoke-stack on the boiler was also blown down.

The explosion originated in chutes 13 and 14 of the left level, which were the last openings in this heading. These chutes were connected, but no connection had been made with chute 12. The air was carried by brattice cloth along the level to the mouth of No. 14.

The explosive force generated was not great, and there was little damage done to the mine, the greatest evidence of force being afforded by the action of the



Plan of Diamond Vale Colliery No. 3, Showing Where Men Were Working

fan, which was blown out of the mouth of the return airway. The tops had also been blown off the packs in the rooms.

Cause of the Explosion

Gas had evidently been found in chutes 13 and 14. for the two miners in this room had been provided with safety lamps. These lamps were found hanging on props in their respective chutes. The miners had apparently been using their naked lights on the heading, and one of them had evidently gone up along the chute and taken his naked light with him.

Fan Dislodged by Explosion

Main Slope Diamond Vale No. 3

The explosion confined itself to the first left level and the main slope. The flame turned down the main slope toward the right level, for the rope rider and a pusher who were on the siding were severely burned. There is much water on the floor at this point, and the flame did not travel any further. All the men who were working in this level escaped uninjured, with the exception of the two men mentioned. These men recovered from their burns.

The cause of the explosion was undoubtedly an ignition of the gas in chutes 13 and 14 of the left level by a naked light. The explosion was extended in some degree, however, by coal dust. No powder is used in the mine, but much dust is found, especially in the chutes, due to the breakage of coal as it descends the steep pitch.

Rescue Work

Notice of the explosion was telephoned to the office of the Nicola Valley Coal & Coke Co., at Middlesboro, about two miles distant. I immediately got together a crew of men and loaded the Draeger apparatus on a switch engine. My party was taken over to the Diamond Vale mine. In the meantime, Supt. Browitt, of the Diamond Vale Collieries, Ltd., had gone into the mine and was endeavoring to reach the men. Upon my arrival, Mine Foreman D. Brown, Thomas Archibald, of the Nicola Valley Coal & Coke Co.'s staff, and I went into the mine with the apparatus on. We proceeded along the level and located three of the bodies, the first one being that of H. Grimes, the fireboss.

There was a certain amount of natural ventilation and the level seemed clear. We returned to the slope, took off the apparatus and got together a number of men and went along the left level and brought out four bodies. A fifth was found on the slope below that level. An attempt was made to recover the two remaining bodies up the chutes, but the party was driven back by the afterdamp. Stoppings were repaired temporarily, and it was not until the following afternoon that the remaining bodies were found and brought out. All of the men who escaped, came out of the mine unaided.

In the mine plan, the double lines show where dirt stoppings were erected; single lines, which cross openings, denote curtains. Crosses show where the bodies were found, and the open circles show where the men worked. It is clear that several of them tried to escape after the explosion and fell dead on their way out. The black dots show where those men, who were not killed, were working when the explosion occurred.

Operation of Diamond Vale Collieries, Ltd.

A cheerful disposition may brighten the day underground even though it cannot bring real sunshine.

Safeguarding the Use of Electricity in Mines

By Hartley M. Phelps*

Investigations of great moment to mine workers and operators, looking to the elimination of explosions, and consequently the saving of human life, are being conducted by the Electrical Section of the Bureau of Mines at its experimental station in Pittsburg. It is known that the results attained so far have been important, although the details have not been made public, as it is the policy of the government not to divulge such information prior to its appearance in the regular bulletins and monographs of the Bureau.

Investigations are being made along the lines of determining the danger of igniting gas by the indicators of inclosed fuses and by incandescent lamps when broken in gaseous atmospheres. Tests are also being made of explosion-proof apparatus and of the insulation of electrical conductors. Furthermore, preparations are being made to investigate the action of electric sparks and arcs in the presence of coal dust; the danger of using electricity in the vicinity of explosives; and to make examination of electrical shot-firing devices, and devices for the protection of trolley wires.

According to H. H. Clark, who is in charge of the Electrical Section at Pittsburg, a great many explosions in coal mines are due to electricity, and many more explosions originate from this source in the United States than in England, for instance, where strict legal regulations hedge in the use of electricity in coal mines. Mr. Clark points out that the equipment of mines involves a distinct branch of electrical engineering. The conditions underground are quite different from those on the surface. Not

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only is it here more difficult to install and properly maintain electrical apparatus, but, unless suitable precautions are observed, the presence of such equipment in mines adds danger to a calling already hazardous. In addition, danger to electrical installations comes from falls of roof, coal and rock, and from the fact that acid waters and dampness make insulation difficult. The need of only temporary installations, thus limiting the investment, further adds to the risks to life. Moreover, many mine workers are prone to ignore the rules made for their benefit.

The three principal dangers arising from the use of electricity in mines are: shock, explosions and fires. The chief sources of shock are trolley wires and other bare conductors. Many explosions result from sparks and arcs occurring in an atmosphere of inflammable gas or dust. Sparks big enough to ignite gas are produced when a motor is started rapidly or operated under a heavy load; or when a circuit, carrying current, is opened, or becomes grounded. It requires a much larger spark to ignite bituminous coal dust, but such flashes might be caused by short circuits on conductors carrying a large current, as in the event of a trolley wire failing.

Tests are being made by the bureau to determine how small a flash will ignite gas or coal dust, the temperature of the spark being the crucial factor.

Two Testing Galleries

There are at Pittsburg two galleries for testing electrical equipment in the presence of gas. The smaller is in the laboratory and consists of a boiler-iron box, with connections for admitting gas and air, and having heavy plate-glass observation windows, and openings for relieving the pressure of an explosion. A small motor-driven centrifugal fan mixes the gas and air and causes the mixture to circulate. Devices are installed for determining percentage of gas. In this gallery small sparks and lamps are tested.

The larger testing gallery is a tube designed to simulate a section of mine entry. It is of boiler iron, 30 ft. long and 10 ft. in diameter, and is horizontal, being set in a concrete bed and partly filled with concrete to form a floor upon which apparatus can be set up for tests. Seven and one-half feet from either end, a diaphragm of heavy paper may be inserted to relieve the pressure from an explosion before it becomes dangerously heavy. Entrance to the shell is made through a manhole between the heads. Heavy plate-glass windows are set in the sides of the gallery. A fan mixes the gas and air and an indicator is provided to show the amount of gas present. In this gallery explosion-proof motors and switches and other large apparatus are tested. A special tube is being built for investigating the ignition of coal dust by electricity.

In testing lamps, these are placed in a gas-tight receptacle, filled with a mixture of gas and air combined in proportions most sensitive to ignition. The lamps are lighted and the filaments brought into contact with the gaseous mixture in three ways. First, by smashing the bulbs, thus bringing the mixture in contact with the broken filaments. Second, by snipping off the tips of the bulbs, which usually does not break the filaments, as the velocity of the entering gas is less than in the first method. Third, by puncturing a small hole in the neck of the bulb, which prevents the entering gas from impinging directly upon the filaments, and therefore rarely breaks them.

Explosion-proof motors and switches are tested in much the same way, as it is the flame-proof quality of the casing that is in each instance the point at issue. The atmosphere provided outside the casing is a combination of methane and air most sensitive to ignition.

The experiments relating to the action of acid mine waters upon the insulation of electrical conductors have for their purpose the standardization of methods for future tests. The action of such water is determined by means of insulation-resistance measurements, and by high potential tests.

In making tests of inclosed cartridge fuses in explosive gas, a representative of the manufacturer of the fuse may be present. Those fuses passing the tests are listed for the benefit of the state mine inspectors.

Suggestions and Recommendations

Among the various recommendations made by the Bureau as to installation of electrical equipment may be mentioned the following: All high- and medium-pressure lines and apparatus should be marked at frequent intervals "Danger," and the voltage given. Low-pressure or lighting wires should be marked "Caution," and the voltage stated. Machine terminals should be protected. Lightning arresters should be placed on transmission lines from the generator stations to the mine entrance. High-pressure lines in underground roadways should be lead-covered cables, armored or unarmored. Insulation should be non-hygroscopic and as acid-proof as possible. Trailing cables for portable motors should be especially flexible and well protected. Automatic trolley switches and danger signals should be used.

One important recommendation is: Before any coal-cutter motor is in operation more than a half hour, the mine roof should be examined unless otherwise specified by the mine foreman.

Current and power circuits should not be used for shot-firing. Gaseous mines should be examined daily by firebosses before work is started, the gas to be detected by safety lamps under normal ventilation. If gas is found in dangerous quantities no current should be turned on any circuit for at least 24 hours.

All main cables should be kept away from explosive gases. The switches and fuses should be inclosed in explosion-proof boxes and break under oil. The current-carrying parts of direct-current motors should be surrounded by explosion-proof casings unless the motors are in rooms separately ventilated by intake air. The carrying of tools near wires and the placing of powder near conductors should be prohibited, or guarded against.

The Bureau deplores the absence of uniformity in the installation of electrical equipment in mines, but affirms that the various states are taking a lively interest in an effort to secure suitable regulations, although an admirable set of rules was rejected by the Pennsylvania legislature two years ago.

Coal of Southern Nigeria

In regard to the deposits of coal in Southern Nigeria, West Africa, Consul William J. Yerby reports that the governor, in his recent annual address said that the work of the mineral survey during the year has been concentrated on the further examination of the extensive deposits of coal at Udi, which are found to stretch more than 50 miles to the north of that place. The tests and analyses carried out by the government have proved that the surface samples give results equal to two-thirds that of the best Welsh coal. It is reasonable to expect that if the seams are worked the coal that has not been exposed to the weather will be of still better quality.

The question of the construction of a railway to connect this coal field with the river port of Onitsha is under consideration. It is hoped that sanction for the construction of this line may be given, as the importance of cheap fuel to the two Nigerias is great, their combined railway system being already over 800 miles in length. Besides the railway requirements, there is urgent necessity for coal to supply river and ocean shipping.

The lignite deposits to the west of the Niger are also valuable and in at least one locality vary from 10 to 15 ft. in thickness. The total trade of Southern Nigeria in 1910 exceeded $55,000,000, whereas it was scarcely over $20,000,000 in 1900.

The possibilities of profitable mining and export of coal from the Federated Malay States is referred to favorably by the chief secretary of the government in his annual report, just submitted. The deposits of coal are extensive and convenient, the serious question about the matter being with respect to quality. A satisfactory coal supply in those States would be welcomed by shipping in that portion of the world.

Colliery Mine Car Construction

By A. T. Shurick

This is the first of a series of articles which will appear on this much neglected subject. The present paper discusses the general conditions for determining the proper shapes and sizes, and includes a few preliminary remarks on car wheels. The second installment will follow at an early date.

With the advent of large corporate interests into the coal industry, involving extensive investments and heavy tonnages, the mine-car expense item is being more carefully studied. The attention of trained and capable engineers has been concentrated on this feature, and important strides in the design and construction of cars have been made in the last decade.

As a result of the keen competition existing in the coal industry today, it is not unusual for a difference of one cent per ton in the cost of mining, to determine whether a mine may work, and in reducing operating expenses to a minimum the mine manager will doubtless put his finger on the mine-car expense account first. Not only must this be considered from the standpoint of first cost, but in upkeep as well. The expense, incident to continued oiling, and the wear and tear (an item of particular importance in mine cars) are the first points to consider in the well designed car.

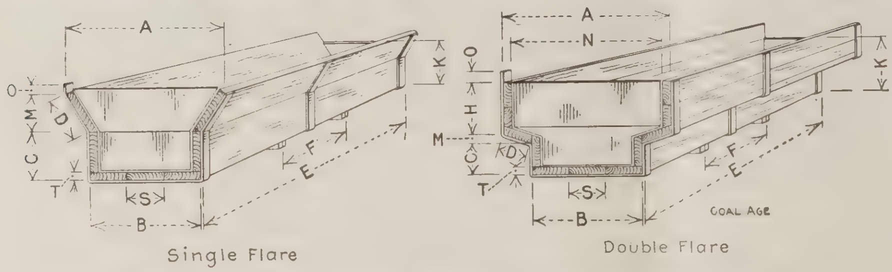


Fig. 1. The Two General Shapes of Cars in Common Use

Preliminary Considerations

It is the purpose of this paper to discuss only the composite, frame cars, and to confine the discussion more particularly to the features of interest to the active colliery engineer.

The steel car is coming rapidly to the front and may even in time entirely supersede the wooden car, but that cars of this type have serious disadvantages for work of this character is generally conceded. Thus, for example, the results of a runaway on a heavily pitching slope may be considered with both types of cars. An accident of this kind, on a slope laid with good track, will probably result in the more or less complete destruction of the entire trip, especially if the cars are loaded.

With the wooden car a certain amount of salvage will be possible, as the individual pieces of the iron framework are comparatively easy to recover and reshape. In the case of the steel car the problem will not be so simple, since the average mining plant is not equipped with proper facilities for handling work of this character*.

*For further discussion of this point the reader is referred to Coal Age, p. 379.

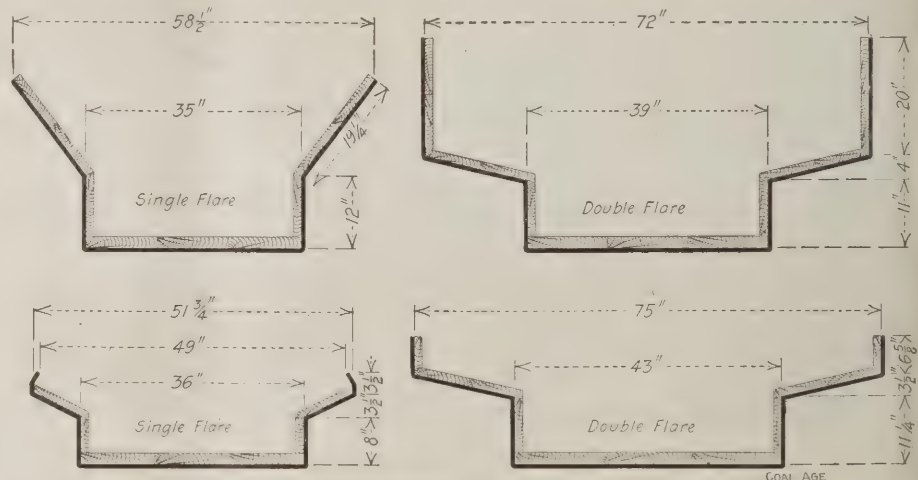


Fig. 2. Typical Sections of Small and Medium Capacity Cars

Rules, formulas, etc., for the proportioning of material, as in machinery design, appear to be entirely unknown here. Many companies design and assemble their own cars, ordering the different irons as required. The ultimate and finally accepted design in such instances is often only arrived at after years of experimenting on the "cut and try" method, but that this eventually gives a thoroughly practical car is hardly to be questioned. A superintendent working along these lines finds for example, only after a number of years, that a certain iron is too light and revises his design accordingly.

That a method such as this would be productive of apparent inconsistencies and freak designs was inevitable. Thus for example may be noted the open derision expressed by a well known mechanical engineer, because of the excessive material (according to his views) used in a coupling at a certain colliery. This coupling had been evolved from 12 years' experience, and had he known the number of wrecks, due to runaway trips, costing from $500 to $1000 each, not to mention the delay to the mine, which had been required to bring about its adoption he would have been less abrupt in his criticism.

Shapes

The first problem confronting the mine car designer is fixing the general overall dimensions and shape. The shapes may be roughly classified as belonging to one of two types, the single or double-flare, as shown in Fig. 1 herewith. In addition to these there is the square, box type, now confined almost entirely to the anthracite field.

Referring to Fig. 1 the overall width *A* will of course be determined by the minimum widths of the haulageways. The overall length *E* is limited by the track curves and to a certain extent by the wheel-base *F*. The bottom width *B* is dependent entirely on the track gauge and the overall height will be determined by the thickness of the seam.

The choice of the single or double-flare type is mostly a matter of taste and is a subject still open for discussion. There are, however, certain features which should be considered in this connection.

When the seam is high, providing ample head room with no additional cost, the square box type anthracite car may be used to an advantage because of the simplicity of construction. The double-flare type is adapted more practically to a soft, friable coal having few lumps, while with a coal making numerous lumps, these can be used to build up around the sides and ends, thus eliminating the necessity of the extra vertical board.

To one who has ever helped lift a single-

flare car on the track by the usual method of placing the back and shoulders under the flare-board and later tried the same with the double-flare type there will remain no question in his mind as to the superiority of the single-flare car. In addition to this the extra space on the outside of the single-flare car greatly facilitates spragging, particularly in a narrow entry.

Some Typical Cross-sections

The variety of cross-sections for cars is unlimited and selection of the proper shape is governed entirely by the physical conditions of the seam to be worked. Eliminating all designs of a "freak" nature the principle and typical cross-sections of mine cars are given herewith. The examples selected show the maximum and minimum dimensions as to height and width of accepted designs of cars; the designs are in every case of cars which have demonstrated their practicability by a number of years of service.

Two types of low vein cars are shown in the lower part of Fig. 2. On the left is a single-flare car only a little over 4 ft. wide, and with a maximum height of body of but 15 in. This is an extreme exaggeration of this type and may be likened much to the sled used in some parts of Europe for conveying coal along the face to be dumped into the mine car. The flare board comes out nearly flat, completely covering the wheel, which would make spragging difficult, although in a car having such an obviously small capacity as this, the necessity of spragging would not be so urgent.

On the lower right hand side of Fig. 2 is shown a type of low vein car over 6 ft. wide and less than 2 ft. high. This car has an enormous capacity, comparatively speaking as regards low vein cars generally, but would be adaptable only where the best roof conditions prevail. It is of the double-flare type, having a short 6-in. vertical board around the top, which of course adds materially to its carrying capacity. The broad, flat flare of 16 in. on each side would, in this case, prove a very serious hindrance to spragging. The difficulty of providing adequate support for this flare, to insure its retaining its proper shape under the everyday conditions of hard usage around mines, would be another objection. An illustration of a typical low vein car is shown in the accompanying halftone, Fig. 4.

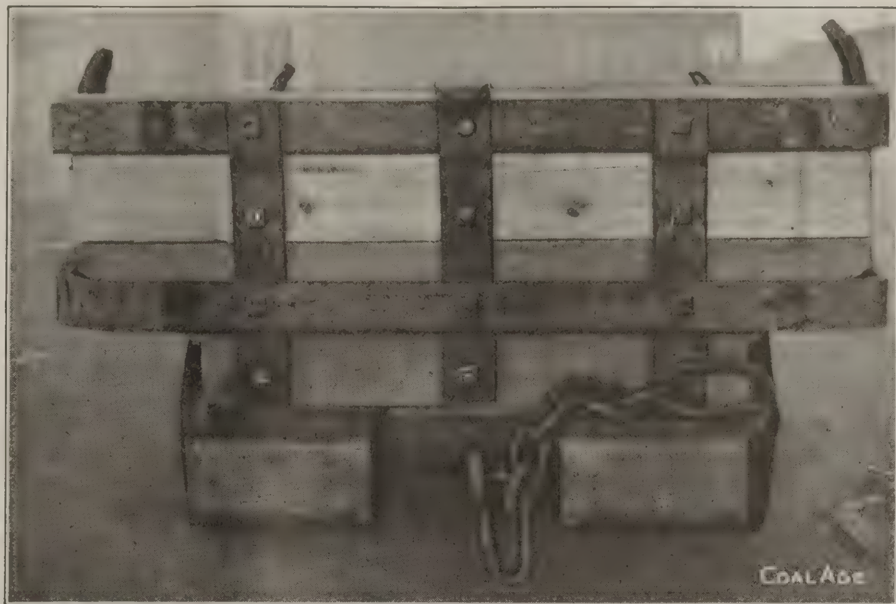


Fig. 4. End View of Low-vein Car, Showing Door

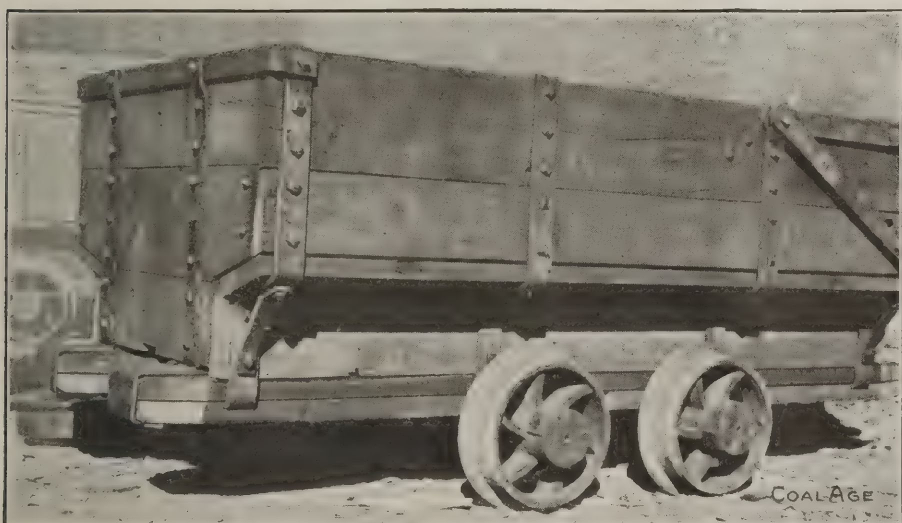


Fig. 3. A Double-flare, Medium Capacity Car

The two upper sections in Fig. 2 are examples of the typical medium sized cars, and an illustration of the same type is shown in the halftone, Fig. 3. On the left of Fig. 2 is shown the single-flare type having a width of nearly 5 ft. and an overall height of body of about 2 ft. 4 in. This section is one of the most popular in use on the medium, or medium-small cars in the bituminous fields. The single flare with its rather acute angle, makes the car easy to sprag and handle under all working conditions, and at the same time adds appreciably to its capacity. On the upper right-hand side is shown a rather large, double-flare car of good capacity. This car has an overall width of 6 ft., and a body height of nearly 3 ft. While the broad, flat flare adds appreciably to the capacity of this car, as already stated, it is much more difficult to handle, for which reason it does not commend itself so readily to the practical man.

Large Capacity Cars

The larger size bituminous and one of the smaller anthracite cars are shown in Fig. 5. The bituminous types here shown are probably more extensively used than any other class of car, since they are readily adaptable to a 6-ft. or thicker seam, which is probably the average for this country. An illustration of the typical single-flare car of this class is shown in the halftone, Fig. 6. The anthracite operators claim conditions in their mines cannot be compared with the bituminous, and they continue to adhere to the straight box form as shown.

The single-flare bituminous car, shown in Fig. 5, has a maximum width of a trifle less than 4 ft., and a body height of a little over 3 ft. This car has a capacity of 2¼ or more tons of coal, depending on the height to which it is "built up." Larger cars than these are found at times, in fact some districts using them to the exclusion of all others. The opponents to the larger capacity car claim that the difficulty experienced in handling them under the adverse conditions in the mine more than offsets the advantage gained

by the increased tonnage, so this still remains an open question.

The beginning of the flare in these cars may be at any point, providing it is sufficiently high to clear the flange of the wheels, which commonly fit fairly snug against the side of the car. The height should be made such that some commercial size of board will fit, without further trimming, as for instance, 6, 8 or 10 in.; this rule should be followed in the layout

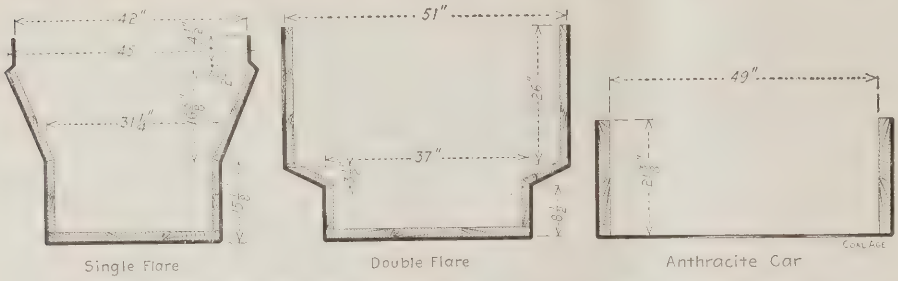


Fig. 5. Large Capacity Bituminous and a Typical Anthracite Section

of all the straight lines of the bands when it can consistently be done within reason.

Car Wheels

The heavy tonnages handled at the modern plants of today necessitate large trips and a comparatively high-speed haulage. In addition to this most of the power required at the mines is usually consumed by the haulage appliances in one form or another. The importance of this subject is, therefore, at once evident, and in no single detail of haulage is it possible to effect greater economies than by the provision of a suitable wheel. This fact has long been appreciated by both the engineer and the manufacturer, and has resulted in a keen competition among the latter until an unusual refinement in design has been attained.

Were it possible to use straight tracks, the mine-car wheel would no doubt be fitted tight to an axle revolving in boxes attached to the car. The sharp curves, essential in all mines, obviously make this impossible since the travel on the outer rail of a curve is so much longer than on the inner that the wheel on the former would have to slide in order to keep up. The advantages of the tight wheel were too great, however, to be completely ignored, and some manufacturers finally evolved the combination tight and loose wheel, thereby overcoming the difficulty due to curves, and making the use of one tight wheel practicable.

But even under these conditions it is still evident that one loose wheel must be used, and since the other presents no difficulties in construction, the discussion of wheels here will be confined entirely to the loose-wheel type.

Car-wheel Material

The first requisite of a good car wheel is the selection of the proper material, and the manufacturers have attained a high degree of refinement in this respect. To insure the best results the chemical analysis of the iron must be exact. Variations of one-tenth of 1 per cent. in the content of some of the ingredients may entirely ruin the wheel, and since no two carloads of pig iron analyze the same, the purchaser of wheels should investigate this feature thoroughly.

Not only must the chemical analysis of the material be perfect, but the method of casting as well. All wearing surfaces must be hard to insure the wheel having a long life. These hard surfaces are attained by means of "chilled castings," in which the sand in the mold is replaced by iron castings adjoining the surfaces to be chilled, the depth of which latter is regulated by the thickness of the iron. While it is a comparatively simple problem to chill the rims, it is not so easy to accomplish this at the same time in the hub. The chemical reaction of the chilling process embodies simply the intimate combinations of the carbon with the iron, forming iron carbide. The result is a product of such hardness that it will cut glass.

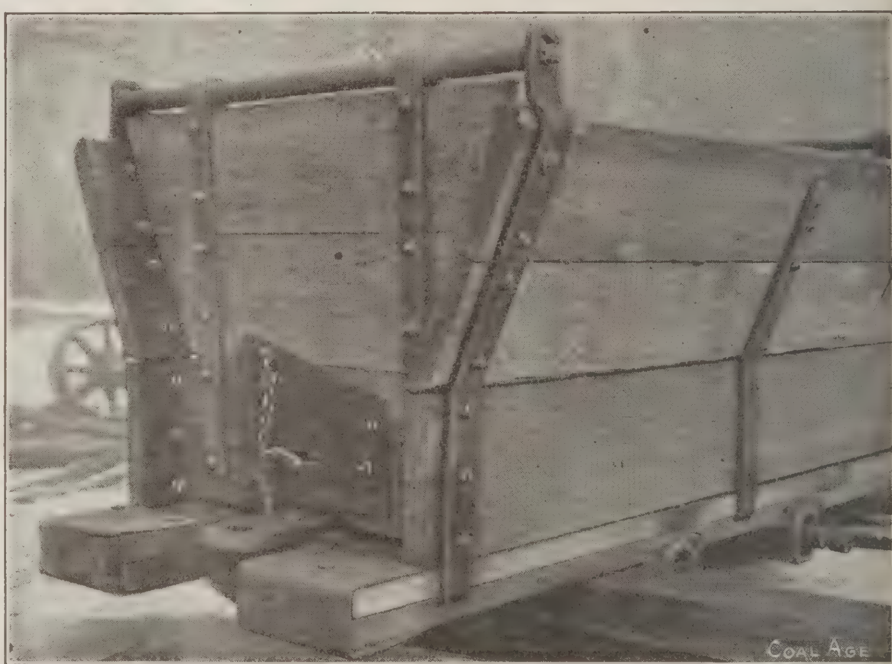


Fig. 6. View of the Door End of a Medium or Large Capacity Bituminous Car

The Mannesman Steel Mine Prop

The Mannesman steel pit prop used in England and on the Continent consists of an outer and inner tube, telescoping within each other. The outer tube is provided with a clamp, which, when loosened, permits drawing out the inner tube to give the required length to the prop. It is then tightened by means of a spanner.

This prop, fitted out with an ordinary cap, is driven into position under the roof with a sledge hammer. It is provided with a ratchet lever and rod by which the clamp is loosened, enabling the miner to withdraw the prop without danger. The safe load for this prop is 16 tons; they neither bend, break or collapse, but in case the load is over 16 tons the prop telescopes until the pressure is removed.

Though the first cost of these props is high, about 30 times that of wooden props, they can, under normal conditions, be used and withdrawn 60 times before repairs are necessary, so that in the end the cost is really about half that of wooden props. The average life of the prop is about five years.

The first cost of steel props is so high that their use at the working face is economical only where every prop is withdrawn and none lost. They are best suited to a moderately hard or strong roof which comes down bodily and breaks in large masses, as this gives a good opportunity for their recovery. They are, however, quite unsuitable for use with a soft, shaly roof, or with fireclay, which breaks easily.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

The Cement Gun

The cement gun has been advocated by mining experts for use in the mines to fill up crevices in the strata and to make a smooth surface on which the coal dust cannot rest. In the French mines several thousands of feet of concreted galleries have been constructed by ordinary methods of concreting. The ease with which they are kept clean of dust is an argument in their favor. But concreting with the use of forms is expensive and the cement gun methods are preferable. It is needless to point out that the cement gun has numberless uses in other building construction around the mines.

The Invention of a Taxidermist

At a meeting of the American Society of Engineering Contractors, William A. Jordan recently gave a description of the machine and its *modus operandi,* from which the following is abstracted:

The cement gun was originally conceived by C. F. Akeley, a taxidermist of Chicago. He desired to build the forms over which the skins of elephants and hippopotami might be stretched.

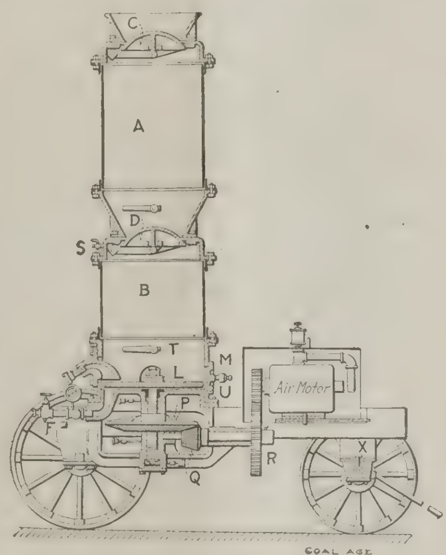
Mr. Akeley was also a member of the Field Museum Committee, and in that capacity sought to remodel and make permanent, one of the old World's Fair buildings in Jackson Park, Chicago, which had been presented to the Field Museum Association. An appropriation of modest proportions had been made for that purpose, and Mr. Akeley conceived the brilliant idea of remodelling the cement gun for that purpose.

Manner of Operation

The gun consists essentially of a hopper *A* into which the dry mixed materials to be used are introduced, through a valve *C*. This valve is closed and compressed air is admitted. Then the valve *D* is opened, and the material drops into the cylinder *B*. The use of the second cylinder is simply for the purpose of permitting continuous action. An air motor shown in the front of the wagon drives a feed-wheel *L* through the intermediate gears *R, Q* and *P*. Through the pipe *F* air is admitted which blowing through the feed-wheel at a pressure of 35 lb. per sq.in. carries the mixture through a flexible rubber hose which may be as long as 200 ft. The exit from the machine is by way of the goose-neck over the axle of the rear wagon-wheels. The mixed materials are perfectly dry and not wetted until they reach the nozzle held in the hand of the operator. A separate hose carries water to the nozzle at a pressure somewhat greater than that which propels the mixture. The water in the form of a fine spray mixes with the cement so that it issues from the gun ready for deposition and traveling at a speed of 300 ft. per sec.

Greater Strength and Adherence, Less Permeability and Porosity

The velocity at which the mixture is propelled serves several purposes. It is sufficiently great that all unnecessary water is driven out. The pressure assures that the concrete will be deposited compactly and hence, with the minimum of porosity. It is not remarkable then that its permeability varies from three-quarters to one-eighth that of hand-made concrete and that the latter will absorb from 1.4 to 5.3 times as much water.



The Cement Gun for Concreting

Any sand which is not coated with cement rolls off the surface and hence does not remain to weaken the aggregate, and this fact together with the greater density explains why the cement gun gives a coating of cement concrete from 1.2 to 3.6 times as strong in tension as hand-made mixtures of the same constituents. In compression the ratio of strength of gun-mixed to hand-mixed mortar vary from 1.2 to 8.2. The gun-work is relatively more successful in depositing the less rich mixtures of concrete. The voids in gun-made concrete are volumetrically 0.52 to 0.75 of those in the hand plastered material; the adhesive strength is from 1.01 to 1.42 times as great. So that the use of the cement gun is not only a cheap and quick way of coating surfaces, but also assures a coat of unusual strength in proportion to the cement used.

It may be added that the cement gun is manufactured by the General Cement Products Company of 30 Church St., New York City. In the cement work of the Woolworth Building as much as 417 cu.ft. have been deposited with a double nozzle gun in an 8-hour day despite some delays in moving the machine about the building.

Men Versus "Melons"

The president of the Plymouth Coal Co., John Haddock, has addressed a letter to the anthracite operators, of which the following is an abstract:

We believe and contend that a just and reasonable reduction of existing transportation rates for anthracite would enable the coal companies controlled by railroads to increase the wages paid to their employees without advancing the prices on prepared sizes. Nor would the wage increase work any hardship on the independent operators, if a corresponding advance were made in the unduly small proportion of the selling price now ascribed to them.

The existing rates of transportation are notoriously exorbitant. These rates are so excessive that the Reading mining operations, with a large annual production, with a great variety of anthracite, with an advantageous and profitable market, both local and coastwise, with operations which are managed with conspicuous skill and ability, and we believe with absolute honesty, showed during the period of six months a mining profit of 3c. a ton! Surely the patient mining Peter might ask and demand that the opulent transportation Paul give him a square deal. Poor Peter has spent many years of his life raising "melons" for Paul, and now in his later days he and his neighbors would like for the future to receive as adequate compensation a small slice of the luscious "melons," which are a result of his enterprise and industry.

How Bookkeeping Makes Profits

By the excessive transportation charges mentioned, practically the entire earnings of a subsidiary company have been con-

fiscated, the unjustifiable charges of the railroad for carriage of the coal being regarded as a primary and paramount obligation. But this method of bookkeeping might well be looked upon as a device of no public interest or concern, did it not have a far-reaching influence on the independent operator. Unfortunately for him, the arbitrary ratio assumed to exist between producing and shipping costs is made to apply to his coal, and it is therefore pertinent for him to consider the justice of transportation rates.

On this very point we have a recent authoritative opinion of the Interstate Commerce Commission. It reads as follows:

It requires no extended argument to sustain the proposition that the maintenance of an unreasonably high rate operates to the advantage of the Lehigh Valley R.R. Co. as a dealer in coal. The record shows that the only line of demarcation between the Lehigh Valley R.R. Co. and the Lehigh Valley Coal Co. is one of bookkeeping. Assuming for the purposes of illustration that the cost of mining anthracite coal is $2 per ton and the cost of carrying it to tidewater is $1 per ton, it follows that the cost of coal at tidewater would be $3 per ton; and if the published rate were $1 the independent operator and the railroad coal company would be on a fair competitive basis, so far as the cost of mining and transportation are concerned. But as between the railroad company and its coal company, it matters not whether the profit comes from mining or transporting the coal.

So, therefore, if, instead of the $1 rate above mentioned the railroad company were to establish a rate of $1.50 per ton, the railroad and its coal company could still sell at tidewater for $3 per ton, standing a deficit of 50c. per ton in the mining price and taking an equal profit in the transportation price. But the independent operator cannot recoup himself in this manner, and the best price that he could make at tidewater would necessarily be the mining price of $2, plus the carrying charge of $1.50, or $3.50; and he would enter the market at a disadvantage of 50c. per ton as compared with the railroad and its coal company.

It is obvious that such an advantage would enable the railroad company and its alter ego, the coal company, to monopolize the field of production and the selling market. Whatever the means employed, it is a fact that the railroad coal company has monopolized the coal field served by it. In 1901, 47 per cent. of the defendant's coal tonnage to Perth Amboy was controlled by it and 53 per cent. by independent operators; while in 1908 the defendant controlled 95 per cent. of the anthracite tonnage over defendant's line to Perth Amboy and the independent operators 5 per cent.

The Life of the Hard Coal Industry

The exhaustion of the anthracite coal supply was offered by the Lehigh Valley R.R. Co. to justify maintenance of the then existing transportation rates to tidewater. On this point, the commission says:

As to the kindred subject, namely, the exhaustion of anthracite coal supply, counsel in their brief thus state the result of the testimony of W. F. Dodge, an expert mining engineer, introduced as a witness on behalf of the defendant:

"The total future shipments from the Wyoming Division, starting with the year 1909, will amount to 91,230,000 tons. The lives of the various collieries will vary from 5 to 50 years. The annual output is estimated for the first five years to be 19,395,000 tons, and will diminish gradually until from the 25th to the 30th year, the annual output is estimated at only 7,055,000 tons, dwindling down in the period between the 45th and 50th years to 500,000 tons per annum. At the end of 25 years, according to the testimony of Mr. Dodge, the output of the Wyoming region will be less than half what it is now, and at the end of 50 years will cease altogether.

On the other hand, the following more optimistic view of the situation appears from the report of the Anthracite Coal Strike Commission, rendered to the President of the United States, Mar. 18, 1903, viz.:

What is of some importance, however, in connection with the discussion of the past production is a consideration of what is to be expected in the future in the way of production and the probable duration of the anthracite coal supply. The original deposits of the anthracite coal field have been ascertained with a reasonable degree of accuracy.

According to the estimate of the Pennsylvania geological survey, the amount of workable anthracite coal originally in the ground was 19,500,000,000 tons. The production to the close of 1901, as previously stated, amounted to 1,350,000,000 tons, which would indicate that there remained still available a total of 18,150,000,000 tons. Unfortunately, however, for every ton of coal mined and marketed 1½ tons, approximately, are either wasted or left in the ground as pillars for the protection of the workings, so that the actual yield of the beds is only about 40 per cent. of the contents. Upon this basis the exhaustion to date has amounted to 3,375,000,000 tons. Deducting this from the original deposits, the amount of anthracite remaining in the ground at the close of 1901 is found to be, approximately, 16,125,000,000. Upon the basis of 40 per cent. recovery, this would yield 6,450,000,000 long tons. The total production in 1901 was 60,242,560 long tons. If this rate of production were to continue steadily, the field would become exhausted in just about 100 years.

Mr. Wm. Griffith, in a series of articles contributed to the "Bond Record" in 1896, considers that the estimates upon which the foregoing computations have been made were too liberal. His estimate of the amount of minable coal remaining at the close of 1895 was 5,073,786,750 tons.

In the six years from 1896 to 1901, inclusive, the production has been, approximately, 308,570,000 tons, which would leave still available for mining 4,765,216,750 tons. This supply, at the rate of production of 1901, would last a little less than 80 years. If we can assume the annual production will have reached its maximum limit at between 60,000,000 and 75,000,000 tons, and that the production will then fall off as gradually as it increased, we may expect anthracite mining to continue for a period of from 200 to 250 years.—(Report of Anthracite Coal Commission.)

Defendant claims the right, to earn enough out of its coal rates to provide for a return of the principal of the investment in that part of the railroad company devoted to the carriage of coal, when and as this principal becomes reduced and extinguished by exhaustion of the coal. We have noted the estimate of defendant's witnesses to the effect that shipments of anthracite coal over the railroad will practically cease in 50 years, and we have quoted the opinion expressed on the same subject by the Anthracite Coal Strike Commission to the effect that production may last for 250 years. Probably the truth lies somewhere between the two extremes. During the years 1903 and 1910, the Lehigh Valley R.R. Co., under the rates in controversy, succeeded in accumulating an unappropriated surplus of $27,219,780. If the company could accumulate this sum for every eight-year period during the next 30 or 40 years, it would have a surplus in the neighborhood of $125,000,000. It seems, therefore, that the present rates are more than required to meet defendant's conception of what constitutes an annual income sufficient to provide for the return of the capital when that part of the railroad devoted to the carriage of anthracite coal loses its earning capacity through the exhaustion of that commodity.

Tidewater Freight Rates

As to the *cost* of carrying coal to tidewater, in this same opinion, reference is made to the testimony of the officers of Coxe Bros. & Co. and the Delaware, Susquehanna & Schuylkill R.R.—the "Coxe" road.

Prior to the sale of the interests of Coxe Bros. & Co. to the Lehigh Valley R.R. Co., the former owned and operated the Delaware, Susquehanna & Schuylkill, a road about 28 miles in length, which reached their different collieries and connected with the Lehigh Valley R.R. They had trackage contracts with the "Valley" covering the delivery of coal to tidewater.

The testimony of Mr. Pennington, superintendent of motive power, showed that the cost of moving coal to Perth Amboy, in cars of 100,000 lb. capacity, from the Coxe collieries, was 62.41c. per ton, which figure includes not only the return of empty cars to the mines, but also the profit of the Lehigh Valley R.R. Co. on its trackage charge and the profit in shipping of 12c. a ton at Perth Amboy.

Profitable Losses

Certainly, this *cost* of 62c., as related to the *charge* of $1.55, the tariff on prepared sizes of anthracite, might and does suggest a large and fertile "melon" patch. In the efforts to combat this testimony, the Lehigh Valley R.R. Co. tried to show that the average cost of carrying anthracite from the Wyoming region to Perth Amboy was $1.49. An exhibit filed by this company shows that its average receipts per gross ton of anthracite at Perth Amboy for the ten years ending June 30, 1908, were $1.46. Its business, under that testimony, during that period would show a loss of 3c. a ton, yet at the close of its fiscal year in 1908 the "Valley" had a surplus available for distribution of $20,722,871. After making certain deductions for dividends, improvements, sinking fund, etc., there was left an unappropriated balance of $16,516,904. At the close of its fiscal year in 1910, this unappropriated balance amounted to $27,219,780.

"Alice in Wonderland" might suggest that if the loss in carrying anthracite had been 6c. a ton instead of 3c., the "Valley" might have increased, if not doubled its surplus!

Storage Battery Electric Locomotives for Tunnel Haulage

Industrial storage-battery electric locomotives, designed for carrying the load on the locomotive itself, have been on the market some few years, but the pioneer locomotives of the storage-battery type, which are built for hauling trailing loads in tunnel work, have only recently been put into service. They are now being used in the New York aqueduct, which is being constructed for conveying the Catskill water supply into the city. Locomotives impelled by storage batteries, find application at present specifically for short-distance hauls at low speds, where it would not be possible or feasible to install the trolley system, as, for instance, over industrial tracks in and around factory buildings, or in places where continual changing of the trolley could not be avoided.

The section of the aqueduct tunnel in which these locomotives operate is about 11 ft. in diameter, concrete lined, and is being driven through solid rock from 250 to 300 ft. below the street level. A series of six shafts has been sunk, each approximately a mile apart, for expeditious operation, and the excavated material is transported to the mouths of the shafts on cars drawn by the locomotives, whence it is hoisted to the surface. Thus each locomotive has a maximum load haul of a half a mile per trip.

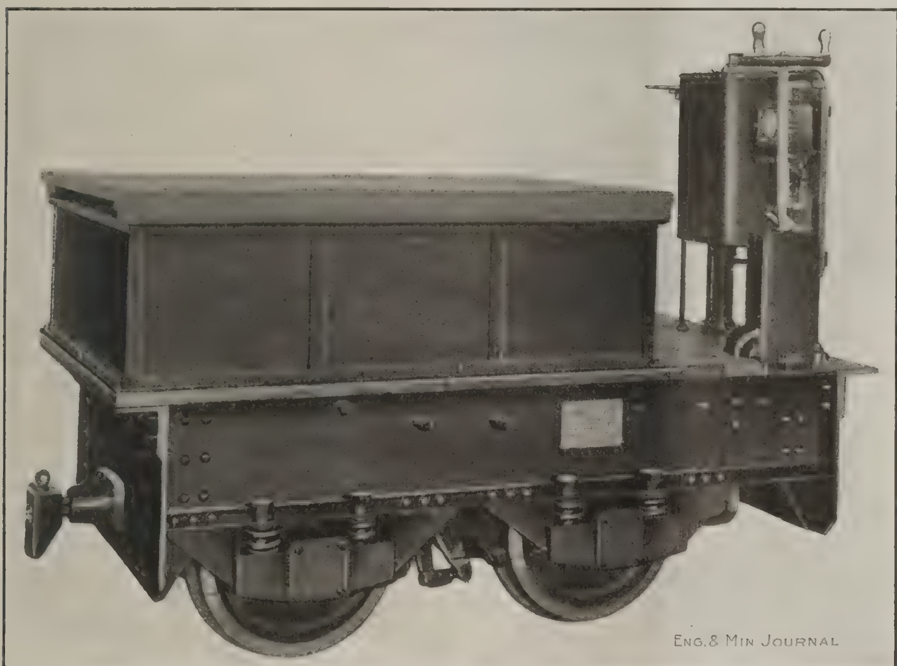
Smith, Hauser, Locher & Co., who are executing this contract for the city, recently placed in operation six storage battery electric haulage locomotives, manufactured by the General Electric Co., and have just ordered six additional locomotives. Trolley locomotives were out of the question because the tunnel headings would not permit their entrance. The operation of the locomotives employed has proved efficient and economical, and has permitted laying the tracks without filling, which hauling by mules would have required.

Locomotive Construction and Equipment

The locomotives in use are illustrated in Fig. 1 and conform to the following specifications:

Type of motor (single motor)	G.E.-1022
Diameter wheels	22 in.
Wheel base	36 in.
Total weight	7500 lb.
Length overall	7 ft. 10 in.
Height over batteries	4 ft.
Track gage	30 in.
Speed at rated T. E.	5 m. p. hr.

The batteries are of the 44-cell, 21-plate type and have a 45-amp. six-hour discharge capacity. The locomotives are equipped with an ampere-hour meter, headlight and gong.



Storage-battery Electric Locomotive

Latest modern practice has been followed in the mechanical design. The frame consists of two steel channel sides and steel-plate ends carefully fitted at the joints and held rigidly together with bolts and steel angles. A coupler suitable to the type of cars employed is attached at the rear end. Cast-steel pedestal jaws, which carry the journal boxes, are bolted to the lower web of the channel-side frames.

Automobile Type Motor

The motor used is of the automobile type, designed especially to operate from batteries, and has characteristics that effect the maximum possible economy in the use of battery current. It has high efficiency, large overload capacity and practically sparkless commutation. The motor is compactly designed, yet readily accessible for inspection and repair. It is dust and moisture proof, and is mounted in a cast-steel suspension cradle, one side of which is supported on bearings on the axle, while the other side is spring-suspended from the locomotive frame, in accordance with standard locomotive practice.

The motor drives the rear axle through double-reduction gearing, and an intermediate shaft, supported in the bearing housing, which is cast integral with the suspension cradle, carries the intermediate gearing. As slow-speed service is ordinarily required of a storage-battery locomotive, the use of double-reduction gearing permits such speeds without undue losses in the rheostat, and, because of the large gear reduction from the armature shaft to the wheel tread, high tractive efforts are obtained at comparatively small current inputs to the motor.

Combating Miners' Diseases

The following is an advance extract from the report of the director of the Bureau of Mines, for the fiscal year ending June 30, 1911:

"An arrangement has been made with the Public Health and Marine-Hospital Service by which one or more surgeons connected with that service will carry on jointly for that service and for the Bureau of Mines investigations looking to the improvement of mine conditions. These inquiries and investigations have already shown the prevalence of tuberculosis and hookworm as miners' diseases in a number of different localities in the United States. It is important that this work should be extended more rapidly, because of the fact that the health conditions, as well as the risk of accidents, may be influenced by conditions susceptible of easy improvement. Furthermore, the large and continuous influx of foreigners into the mining regions of the United States will bring to an increasing extent the hookworm and other diseases that abound in mines in parts of certain European countries.

"Various questions that concern the health of workers in mines, quarries and metallurgical plants cannot be answered finally without investigations and inquiries that are national in scope. Among such questions are the most efficient methods of preventing the diseases peculiar to certain industries, the most effective sanitary precautions to be observed in and about coal mines and metal mines, and the relative healthfulness of occupations pertaining to mining and metallurgical industries. The investigations and inquiries that are essential to the gathering of reliable information on these questions can be undertaken by the Bureau of Mines, in connection with its collection of accident statistics, in a prompt and efficient manner and at minimum expense."

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

All of the recent advances in coal-mining practice haven't been effected by time-worn Methuselahs with gray beards, false teeth and furrowed brows. A whole raft of sane ideas, new theories and improved methods have originated in the fertile minds of the "second generation."

Time was when a man had to lose his hair, contract rheumatism and be granddaddy to half a dozen humans before he could hope for recognition as a competent and practical mine engineer, but we have come to realize that ability to sit tight in a canoe and drift with the current is not as great a virtue as being able to paddle straight to the desired landing. Results accomplished merit greater approbation than time consumed.

No young man engaged in coal mining today has traveled faster or been of greater benefit to the industry than Harry M. Warren, electrical engineer for the Delaware, Lackawanna & Western company. He handles electricity like a Southern darky does a watermelon—goes to the center first, and then eats his way out. Some day, not so far distant, the D. L. & W. won't need anybody in the coal department but Harry, for he will be able to throw on a switch, which will be all that is necessary to mine, prepare and ship his company's coal to tidewater.

Mr. Warren was born in Worcester, Mass., in 1875. Graduated from the Worcester Polytechnic Institute in 1896, taking a P. G. in '97. Following his graduation from college, "H. M." started in contracting work at Montclair, N. J., changing from this work a few months later to the testing department of the General Electric Co., Schenectady, N. Y. On leaving the General Electric, in 1900, Mr. Warren was made electrical engineer for the D. L. & W. Co., and he and they have stuck together like a porous plaster on a lame back.

When Mr. Warren took up coal mining 12 years ago, there wasn't much electricity used in or about the collieries. Some of the companies employed main haulage locomotives, but there were no gathering motors in use. A number of mines had electric hoists on slopes and planes underground, but no electric hoists at shafts. Electric plunger pumps were about the only style used, and there was no electric power in the breakers. Practically all the current was "direct," and power was generated by engine-driven generators at each individual colliery.

One of the earliest and most important developments of the past decade was the gathering locomotive. Following close on this improvement came centrifugal pumps. Concerning the latter, Mr. Warren is an ardent advocate of this style of pump in all cases where large bodies of water have to be handled, and this recommendation he makes regardless of head. Bronze pumps are his choice when bad water is encountered, and it is his idea that the best way to use centrifugal pumps, on a slope, for instance, is to operate them in series, placing the pumps at intervals, so that each will operate on a 100-ft. head. He says that when a centrifugal pump falls down in the handling of a large quantity of water, its failure is due, in nearly every case, to the machine being of improper design. The advantages of centrifugal pumps are their ease of handling, and the fact that they can be placed in a cramped space.

Harry M. Warren

Both direct and alternating current are used to drive pumps, but Mr. Warren recommends the latter for station pumps, because, (1) it permits the use of high voltage; (2) gives advantages of an induction motor; (3) eliminates trouble from variation in speed. He suggests the use of direct current for movable pumps.

Mr. Warren says that his company at present is operating a large number of hoists driven by alternating-current motors. The present maximum capacity of these hoists is 200 hp., but he is firm in the belief that before very long, similar equipments of 600 hp. will be installed. As to the advantages of alternating-current over direct-current hoists, he says that the chief advantage is in the transmission of power, especially as to the size and cost of wire.

One of the most interesting of Mr. Warren's views is in reference to the use of electric hoists for shafts. He believes that it does not pay to operate a shaft hoisting equipment by electricity, when the shaft is located at a colliery where a boiler plant is necessary for other purposes. This is particularly true if the exhaust steam can be used to advantage in a low-pressure turbine, or otherwise be utilized. Although a steam hoist is less efficient than an electrically operated plant would be, the initial cost of a steam operated installation is so much less than for an electrical hoisting-station equipment that the initial saving is sufficient to overbalance any reduction in operation charges that results from the use of an electric hoist.

In this connection, it is necessary to remember that at all anthracite collieries, where the coal has to travel through a breaker, a boiler plant is required to supply heat in the breaker, and to keep the water that is used in preparation of the coal from freezing. All the saving from an electrical equipment results from economy in the use of coal, and, therefore, the higher the price of coal, the more favorable is the proposition to the use of electricity. "H. M." is ready to concede that the electric hoist permits better control and occupies less space.

In breakers, he advocates the use of motors because, (1) they eliminate countershafts, pulleys, belts and ropes; (2) afford greater flexibility, in that each individual equipment can be located with reference to any other part, insofar as the drive is concerned.

In conclusion, "Harry M." believes that all power used in a mine, where practicable, should be electric power. He suggests, however, that the poor steam economy at most collieries is due principally to the losses from radiation and drips when the equipment is not in operation. The ability to burn small sizes of coal at a high rate of combustion has recently been given much attention by his department, with the result that today he finds it possible to burn barley coal and develop at least 60 per cent. over-rating, while a few years ago it was difficult to operate normal rating with the same grade of fuel.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

The Leaders and the Led

Rapid changes have taken place in the anthracite strike since the members of the joint committee appointed by the United Mine Workers refused to accept the settlement of the subcommittee. As that smaller body was not invested by either party with plenary powers to effect a settlement, it is easy to understand why the larger body felt justified in refusing to accept it.

Yet it must be remembered that the members of the subcommittee while meeting behind closed doors had plenty of opportunity to confer with their confrères, and doubtless did so during every recess. The events showed that the body of mine workers refused to stand back of their representatives and abide by their decisions. Nevertheless, it must be admitted that the remarks of George F. Baer were undiplomatic, and it was not well advised to hold the joint committee to any other action than that to which they stood committed by the words of their reference.

On the other hand, the miners will have to learn that they must give plenipotentiary powers to their executive officers. No success can attend them if all their *pourparlers* are mere waste of time, and some irritability in the opposing parties with whom they thus treat so irresponsibly is but natural under the circumstances. We do not think that the operators have acted wisely in attempting to load even a small quantity of coal while the opportunity to settle the strike is still so favorable. Such attempts can only irritate the men.

The English-speaking miners have shown a desire for peaceable methods. The rioting up to date has been confined almost entirely to the Southern fields, where foreign labor predominates. The Northern district, which is inhabited principally by Americans, has preserved the peace, except in one or two localities. The English-speaking miners have shown a politic disposition and view with no little regret that the foreign element is pursuing un-American methods of settling the dispute, and injuring the instruments by which their livelihood is secured.

We think that the operators cannot accede further demands without weakening their position in the market, and as far as a recognition of the union is concerned, the miners have been granted more concessions than seemed likely when the strike started. What recognition the union has received was conceded because the operators believed that the miners' organization would be a reliable body with which to conclude an agreement.

If the United Mine Workers Union is nothing, can do nothing, and stands powerless to meet socialistic violence and the machinations of foreigners, then there will be no value in recognition. The Mine Workers are proving that the early contention of the anthracite operators was true, and that the elements opposed to the union and opposed to law and order will not be bound by anything the union will agree to do.

It is time for the American element in the union to declare that their federation stands for order, and will approve what has seemed acceptable to its representatives.

Consumption

We always supposed the coal miner was healthy, and statistics favoring that belief only confirmed us in that view. But we see that the Bureau of Mines and Marine Hospital Service would not have it so and have combined to decimate the ranks of the miner with phthisis and hookworm. If the *coal* miner is to be thus menaced, we wish to protest. The U. S. Government every ten years gives him a clean bill of health, and Samuel G. Dixon, the Commissioner of Health of the State of Pennsylvania, showed in his report of 1908 that the miner was but little subject to consumption.

We quote, however, as a corrective of all false notions, the words which the director of the Bureau of Mines hopes to incorporate in his report to the President, and which we include today in our

pages: "Inquiries and investigations have already shown the prevalence of tuberculosis and hookworm as miners' diseases in a number of different localities in the United States."

The report of the Health Department of Pennsylvania, to which reference has been made, shows the following figures for tuberculosis, giving the percentage of deaths from that disease to those from all causes for all occupied males, and for miners and quarrymen.

Ages	All Occupied Males Percentage	Miners and Quarrymen Percentage
25-34	30.9	5.3
35-44	24.3	11.8
45-54	14.4	11.6
55-64	7.6	12.8

In the first period of 10 years, consumption is particularly deadly among plumbers and gas fitters, 42.9 per cent. dying of tuberculosis. In the second decennial period the compositors, printers and pressmen show the largest death percentage from that disease; to wit, 49.2 per cent. In the next ten years the mill and factory (textile) workers have the highest figure, 17.5 per cent., and in the final period domestic servants have the greatest proportion of deaths from this malady, 13.0 per cent.

But it may be objected that the miner probably has a high death rate from all causes, especially from that of physical violence. This would account for the low percentage of deaths from consumption compared with those from all causes. But neither the statement nor its deduction is sustained so far as the somewhat restricted investigations of the Census Bureau in 1900 extend. The miner lives a fair span of life. To quote the exact words of the report on Vital Statistics, published in 1902 by that bureau: "The table" of miners' mortality "shows that the death rate of miners and quarrymen was much less than the average rate in this class." Totalling the government table, we find that while only 882.1 miners died in every 100,000 from all causes, 1298.5 occupied males in the same number succumbed to all manner of diseases and accidents. The mining and the quarrying class has, therefore, a distinctly lower death rate as far as the Census Bureau's figures extend.

Moreover, according to the same Vital Statistics, only 120.9 miners died in every 100,000 from tuberculosis, whereas of all occupied males 236.7 individuals died per 100,000 from that disease.

Such tuberculosis as is to be found among miners is largely confined to those men who work in metal mines. An accurate count of the coal diggers would doubtless show a comparative immunity among men working at the coal face.

The Mine Surveyor

State or governmental laws regulating the practice of mine surveying is one of the many serious problems confronting the coal industry today. Great Britain has finally adopted a definite policy in this respect by prescribing certain qualifications for mine surveyors, but there appears to have been such active opposition to the passage of the act that the ultimate result has been a relatively weak and ineffective compromise. Thus a certificate of competency may be obtained either from the Board of Mining Examinations, an approved educational institution, or will be issued on application to all holders of a first-class manager's certificate.

We seriously question the assumption that the college man, devoid of practical experience, is competent to assume responsible charge of extensive surveys. Nor do we believe that the qualifications of the surveyor should be determined entirely by mental examinations in mathematics, surveying, etc., since it is not at all improbable that a well posted draftsman, who has never been in a mine, could successfully stand such an examination.

Those familiar with colliery-engineering departments appreciate the value of a conscientious and thoroughly reliable transitman, and know that such men are found only among the experienced and well seasoned members of the profession. Any of the older engineers, looking back on the time they served as surveyor, can doubtless recall new shortcuts, checks and possible causes of inaccuracies which they continually were discovering.

Should state or government intervention along this line be attempted, it is to be hoped that the practical side will not be ignored entirely, as is too often the case. Errors in mine surveying frequently result, not only in heavy monetary losses, but in numerous fatalities, and if we are to have laws, let them be effective. "Running" a transit might be likened to running a locomotive, in that no experienced engineer would any more consider engaging an instrumentman on his mental attainments alone, than a railroad superintendent would think of hiring a locomotive engineer on like qualifications.

Present Day Waste

The conservationists have discussed the good of posterity so much that conservation has now a bitter smack of priggishness, like several other well meaning words—institutional work, welfare, altruism, uplift, benevolence and the rest of the drab sisterhood. But there is nothing benevolent about most forms of conservation, though the least hopeful and most remote forms have the loudest and most insistent "barkers."

Unfortunately, the figures for the days worked in mines of the United States in 1909 are not yet published, but in the five years preceding the year 1911, excluding the year aforesaid, the anthracite mines in Pennsylvania lost 507 days, excluding Sundays. The bituminous mines of the United States lost in the same period 498 days. This loss of productivity must have resulted in raising all the costs of producing coal.

Of course, miners are often absent from mines during the days when coal is being dumped, but, on the other hand, not a few work when the mines are officially declared idle, so that perhaps the productivity of a mine is normally to be gaged by the number of operating days.

The idleness increases the cost of coal, makes capital meanwhile unproductive, involves losses for upkeep and pumping, and results in the loss of tonnage.

In fact, it is possible that if by a combination of operators, this lost time could be reduced, there might be a reduction in the cost of coal, which would gratify consumers and make conditions better for owners and miners alike. The public must in the long run pay for the time during which the miner folds his arms or saunters casually downtown, or to the commissary.

The British Royal Commission on Mines has recommended the establishment of a lamp-testing station for the investigation of the velocity of explosive currents which different types of lamps can withstand, together with their illuminating power and sensitiveness in testing for mine gas. An excellent suggestion for our Bureau of Mines.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Steel Mine Ties

Steel mine ties have been used to advantage in some districts. The accompanying Fig. 1 shows the latest, best and cheapest form of steel tie made. It is but ½ in. thick as compared to the 4 in. or more of a wooden tie, and this means a corresponding saving in the height to which every pound of coal must be lifted to be loaded into a mine car. The bolts used in the tie are the same as those in the rail-splice bars and no sledges, gages, spikes or spike pullers are needed for either laying or taking up ties. The only tool required is the wrench that is used for the rail-splice bolts.

in. bolts so that the track will be flexible and easily shifted sideways to enable it to be laid on considerable of a curve and yet not spring back but stay where it is put. The amount of flexibility depends on the length of the rails and the shorter they are the greater is the flexibility.

Ties of this general form have been known for years, but the particular improvements that this tie possesses and which make it superior to other types, are the use of loose-riveted clips that cannot get lost, and of washers to make thickness enough so that the same track bolts can be used as for the splice-bars. A further advantage is that the clip is easier to make because it is straight. The bolt

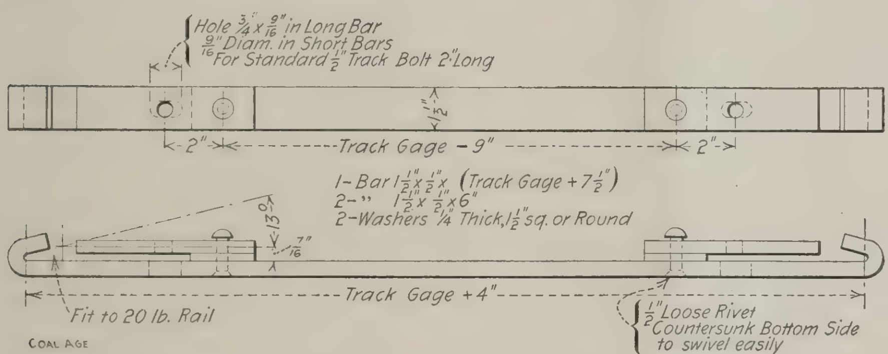

FIG. 1. MINE HAULAGE, STEEL TRACK TIE FOR MINE CARS

When these ties are used approaching the working face, short-length rails can be used with them, cut the same length as the depth of undercut made in the coal, in any particular mine. As the rail rests right on the floor but one tie, per rail length of 6 ft., or less is required. Since the gage is rigidly correct there is less trouble experienced from cars running off the track than when wooden ties are used; and there is less obstruction to travel for a mule, horse or man and less chance of injury to them through getting a foot caught or stumbling. The number of times that a wooden tie can be laid or taken up is limited, but there is no limit to the number of times this steel tie can be used. If bent it is easily straightened.

Each rail should have a pair of splice-bars loosely riveted on one end, so as to insure having splices where and when they are wanted, and to save labor in laying track. The splice-bars will have two of their holes already used, and putting down a length of track simply means putting in two bolts in each tie and two in the splices. The bolt holes in the rails should be ¾ in. for ½-

hole in the tie is oblong to suit the diamond-shaped head end of a track bolt so that it cannot turn while the nut is being tightened or loosened, particularly the latter; because after a tie has been down a while the nut rusts the same as it does in the rail splice. The same track is good for outside use, for slate dumps and other temporary tracks. The first cost, per tie, is twice that of wood, but since not more than half as many are required, per foot of track, the total cost is no greater, while the steel ties are cheaper to lay and take up and are longer lived than wooden ties.

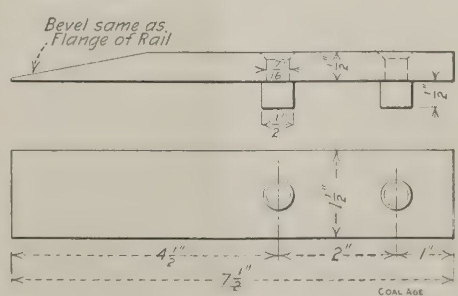

FIG. 2. STEEL MANDREL FOR SHAPING THE BENT ENDS OF STEEL TRACK TIES

In making these ties in an ordinary blacksmith shop, the holes are first punched or drilled by gage, then the bar to be bent is heated and a tool like that shown in the accompanying Fig. 2, is placed on it for a form, over which the bent end is quickly shaped by a few blows of the hammer. All parts are thus made to the same gage. The bottom head of the rivet is countersunk, as shown in Fig. 1, because it is easier to beat down such a head than it is to use a rivet set.

Ellsworth, Penn. F. D. BUFFUM.

Watering vs. Sprinkling

Referring to coal dust in mines, the Royal Commission, appointed some time since to investigate coal-dust explosions in mines, based their conclusions, if I am not mistaken, on the following points:

First. The best way to deal with coal dust is to see that all dusty entries and rooms are kept "watered," not "sprinkled." There is a difference in the meaning of these two words, watered and sprinkled. There is, I think, too much sprinkling and not enough watering done in our mines. In mines where the roads are dusty, the fireboss should be empowered to order that all roads be watered—watered, not sprinkled. In some mines, this watering is done with a watering car, which is, in my opinion, the best method to employ. In other mines, sprinkling is done by means of pipes laid on the roads and airways.

I will confess that the use of the watering car may often prove a disadvantage, especially in mines where there is a large output of coal. Nevertheless, we must consider the lives of the bread-winners and the wives and children dependent upon them. The watering car is often considered an unnecessary item of expense, as it requires the employment of one or two extra drivers and as many mules. If, however, this method would save the lives of even ten men, in one year, in the United States, I am sure that would counter-balance the extra expense, with interest added.

It has given me great pleasure to read the comments of James Ashworth, in COAL AGE, Apr. 20, p. 917. Mr. Ashworth gives his veiws on the watering of dusty mines, which I know will be greatly appreciated by many readers. I hope to see further discussion of this important question.

Terre Haute, Ind. FIREBOSS.

Reducing Ventilation When Firing

I have followed with much interest the discussion of this subject in COAL AGE, and must say that the contributions have furnished many valuable hints. Stress has been laid upon the dangers attending a strong draft, rapidly moving currents of air, and of fine dust carried in suspension in the mine air. There is, no doubt, some wisdom in reducing the ventilation when firing shots in a mine. Perhaps, however, the most interesting phase of the subject has not yet been touched. No doubt, some readers can recall having heard old superintendents say there were never any serious dust explosions in their particular sections of the country before mining laws made larger fans and greater volumes of fresh air compulsory. The popular demand was for fresh air for the miner, and that is the cry today in open light mines, where gas is never found.

But there is another side to this important question. The close analytical study of mine air is now beginning to change many long standing ideas concerning ventilation. There was a time when physicians tried to diagnose a patient's disease by looking at his tongue and timing his pulse. Today, a sample of the blood or waste product is taken and examined under the microscope, or chemically analyzed before the patient's true condition can be known.

In like manner, we are beginning to learn what kind of mine air is necessary to maintain health, also the kind of air in which it is possible to start a dust explosion. The chemist has suggested that the best method for the prevention of dust explosions in mines is to reduce the oxygen content of the air to 20 per cent., and for the most dangerous mines to 19 per cent., with a little carbon dioxide present. Such air, it is stated, is now breathed by men working at the coal face, in most mines, which is given as the reason why dust explosions seldom, if ever, traverse the working face.

We are told that with an atmosphere containing less than 17½ per cent. oxygen (or 17½ per cent. with a little carbon dioxide, say ¾ of 1 per cent.), it is not only impossible to start a dust explosion, but also with this percentage of oxygen in the mine air, firedamp mixed in any proportion will not ignite when a flame is applied to the mixture. It is also further stated that with this depletion of oxygen in the air, a fire of wood or coal, in the roads, cannot be started.

Someone recently wrote Dr. Haldane, suggesting the feasibility of treating the intake air of a mine with furnace gases, and he replied, in relation to the depletion of the oxygen of the air by this means: "I can see no physiological difficulty in reducing the oxygen to 17½ per cent., provided you can eliminate the difficulties with carbon monoxide, also the lighting difficulty."

But in many mines, especially where carbon dioxide is given off by the coal, artificial treatment of the ingoing air will not be necessary to produce certain air conditions in the working places where shots are fired.

Perhaps this phase of the problem is worthy of extended discussion by readers. I will hazard the opinion that in the near future we shall regularly take samples of the mine air, and depend more upon the chemical analysis of such air when regulating ventilation than upon the anemometer. And all modern mines will be equipped with air-sampling and analyzing apparatus, as well as anemometers. Our ventilation laws will also be modified.

SAMUEL DEAN.

Delagua, Colo.

[A practically insurmountable difficulty in regard to any sampling and analyzing of the mine air is that which has always rendered useless such tests; namely, the conditions in the mine are constantly changing, and any such test can only have a local value, which will probably be of no avail by the time the results of the test are known.—EDITOR.]

The Pittsburg Rate Case

While I have no interests whatever in the Pittsburg rate case, I have been following this matter closely, and cannot see wherein any of the Pittsburg operators are benefited, as you seem to infer in your editorial on this subject in the Apr. 27 number. We are advised that the rate on coal to the lakes from the Fairmont and Kanawha fields has been reduced 10c., thus putting these rates on practically the same basis as heretofore. We do not have copies of the tariffs showing this reduction, but we were informed from reliable sources that such is the case.

In another place in the same issue, you state that the Pittsburg operators have increased their prices on coal to overcome the advance given the men. It has been true for the last several years that the Pittsburg operators increase their prices on coal, but they have never maintained these, and I venture the assertion that the prices on coal will be as low, if not lower, this year than last year.

There does not seem to be any question but that the increased development in the coal fields is more than the increased consumption, and, moreover, the railroad companies are in better position to move this commodity more quickly and they are furnishing a greater car supply than they have ever furnished before.

This letter may sound pessimistic, but it is not written with that idea. I believe that there should be an adjustment of the various freight rates, and your article with reference to the anthracite coal freighters bears this statement out. If the various companies and trade papers would follow this up it would surely help considerably.

S. A. CARSON,
General Manager.

So. Connellsville Coke Co.,
Uniontown, Penn.

[Our correspondent in stating that the rate from the Fairmont and Kanawha fields has been reduced 10c. has evidently misinterpreted our editorial or been misinformed. Quoting from the editorial: "As is well known, the Fairmont and Kanawha fields are the most important competitors in the Lake trade, and no revision in rates from these districts has been made." In the cases of the Baltimore & Ohio, the Chesapeake & Ohio and the Kanawha & Michigan lines, the decision was that the present rates from the Fairmont, Kanawha and New River fields of 96¾c., 97c. and $1.12 a ton respectively were fair and just, the proposed rates of $1, $1.06½ and $1.21¼ not being justified. While no increase in these rates was made, there was not, on the other hand, any reduction, as our correspondent seems to infer, although the fact that no increase was granted acts indirectly as a decrease.

With reference to Mr. Carson's assertion to the effect that the price on coal would be as low, if not lower this year than last year, and questioning our statement that the Pittsburg operators have increased their prices to overcome the advance given the miners, we believe in the former instance that such may quite probably be the case. We presume that he is referring to the statement in the first column on page 960, which says: "There is no demand but producers are naming prices on a basis of 7½c. higher than last year's regular or official basis." Further along in the same paragraph it says: "These prices constitute the quotable market at the moment, but whether they will hold is another matter. Last year's prices based on $1.15 were shaded during the major portion of the season." It will be noted here that we give these figures as the quotable market at the moment and question ourselves whether they will hold. And we further note that last year the quoted prices were shaded during most of the season. Our correspondent is thoroughly justified in his belief that the present circular prices will not be maintained throughout the season, as has been amply proved in previous years, but since these are the prices being quoted at the present time, they are obviously of value to the trade.—EDITOR.]

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Will a Carbide Lamp Burn in Carbon Dioxide?

Kindly answer the following questions in COAL AGE: Will a carbide lamp burn in carbon dioxide? What is the chemical formula for calcium carbide and the equation that expresses its reaction with water and shows the resulting gas that produces the light? Is it true that the chief mine inspector of Ohio will not permit carbide lights to be used in the mines in that state?

C. K. ROCKHOLD,
Night Foreman.

Sunnyside, Utah.

The question is often asked, "Will a carbide lamp burn in blackdamp?" and the answer is, "Yes." There is, however, a great difference between blackdamp and carbon dioxide. The former is a variable mixture of one or more extinctive gases and air. It therefore contains some available oxygen, which supports the flame of the lamp. On the contrary, carbon dioxide (CO_2) contains no free or available oxygen; and, for this reason, no flame dependent on oxygen for its combustion can burn in this gas.

It is often asserted and the idea has become quite prevalent that a carbide lamp will burn in an atmosphere of carbon dioxide; that it is not dependent for its combustion on oxygen or air; and this argument has been used, at times, to press the claims of this lamp for mining use. Both statements are wrong. The idea probably grew out of the fact that it is common for mining men to call blackdamp, carbon dioxide. But, as just explained, the two are widely different; and, while the carbide lamp will burn in blackdamp that will extinguish most other lights, it will not burn in pure carbon dioxide, because that gas contains no free oxygen.

The acetylene flame of the carbide lamp, like the hydrogen flame, is extremely tenacious. While a candle and other wick-fed flames are extinguished by about 14 per cent. of carbon dioxide added to the air (artificial atmosphere); or by from 3 to 4 per cent. of carbon dioxide, in a residual atmosphere, where the flame is inclosed in a confined space and allowed to burn till it goes out; the hydrogen flame is only extinguished, in an artificial atmosphere, when the latter contains practically 58 per cent. of carbon dioxide; and the acetylene flame is almost equally tenacious.

It is important, however, in this connection to state that, owing to this property of the acetylene flame, the carbide lamp fails to indicate the presence of blackdamp in the mine air, with sufficient promptness to avoid danger, since 18 per cent. of CO_2, in an artificial atmosphere*, may produce fatal results if breathed but a short time. The lamp is not a safe lamp to use in mine workings generating much blackdamp, any more than the electric lamp is safe in mines generating marsh gas.

The chemical formula for calcium carbide is CaC_2. The chemical equation expressing the reaction of this carbide with water is:

$$\underset{\text{Calcium carbide}}{CaC_2} + \underset{\text{Water}}{2\ H_2O} = \underset{\text{Calcium hydrate}}{Ca\ (OH)_2} + \underset{\text{Acetylene}}{C_2H_2}$$

The equation that expresses the combustion of the acetylene gas in oxygen is:

$$\underset{\text{Acetylene}}{2\ C_2H_2} + \underset{\text{Oxygen}}{5\ O_2} = \underset{\text{Carbon dioxide}}{4\ CO_2} + \underset{\text{Water vapor}}{2\ H_2O}$$

The Ohio mining law, as revised June 11, 1910, and again the following year, 1911, prohibits the use, in any coal mine in that state, of "any fish oil or other luminant whatever, other than those specifically provided for" in the section (974).

The chief mine inspector, June 5, 1911, issued a circular drawing attention to the new law and notifying all mine foremen in charge of mines, in the state, that they would be held responsible for the use of any illuminant, in their respective mines, other than oils of the standard required by law.

*The term artificial atmosphere as here used, means an atmosphere containing a normal percentage of oxygen, the CO_2 being added; in distinction to a residual atmosphere, which is the atmosphere resulting from the burning of a lamp, or some other form of combustion, by which the oxygen content has been depleted. Practically, all mine atmospheres containing blackdamp or other gases are artificial atmospheres, except the afterdamp of an explosion, which may b[e] residual.

Safety Lamps, Types and Construction, Relative Safety

Please explain the essential differences and the construction of the Davy, Clanny and Wolf lamps. Which of these is the safest lamp to use in a gassy mine; and in what does this safety consist?

STUDENT.

Altoona, Penn.

The Davy lamp has no glass but a full gauze chimney surrounding the flame, which permits a free circulation of air passing in and out of the lamp. While this free circulation of air renders the Davy more sensitive to gas than is the case with other lamps, the same fact makes it an unsafe lamp for general work or to place in the hands of the ordinary miner. The lamp, because of its sensitiveness, "flames" readily in gas. When this happens it requires much presence of mind and self-control to avoid making a sudden movement that may force the flame through the gauze and fire the gas outside of the lamp.

The Clanny lamp differs from the Davy in having a glass cylinder surrounding the flame and which forms the lower half of the chimney; the upper half being gauze the same as the Davy. This improves the light, which is not obstructed by the gauze mesh. The air enters the Clanny lamp through the lower portion of the gauze, above the glass, and must therefore descend to the flame. There are, thus, two conflicting air currents in the lamp, which gives all Clanny lamps a tendency to smoke. This lamp is not as sensitive to gas as the Davy lamp, but affords greater protection of the flame against strong air currents.

The Wolf lamp is an improved type of Clanny lamp, having a glass cylinder surmounted by a gauze chimney. It differs from the Clanny in the fact that the air enters this lamp through a gauze ring below the glass, which gives a better circulation in the lamp and improves the light. The Wolf lamp is particularly designed to burn naphtha, a highly volatile and explosive oil. The oil vessel of the lamp contains a specially prepared cotton that is used to absorb the oil and reduce the danger of explosion in the lamp. Owing to the ease with which the naphtha flame is extinguished, the Wolf lamp is supplied with a special igniter for relighting the lamp when accidentally extinguished.

No so called safety lamp is *safe* unless properly handled, and kept in good condition. Its safety depends on the isolation of the flame from the outside air, by means of a chimney of wire gauze, or glass and gauze combined. The cool wire forming the mesh of the gauze allows the free passage of the air and gas, but kills the flame by absorbing its heat whenever the flame approaches the wire. If the gauze becomes heated, or is imperfect or dirty, or the lamp is exposed to a strong air pressure, the flame may pass through the mesh of the gauze. In other words, under these conditions, the lamp may fail.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Sundry Examination Questions

(Answered by request)

Ventilation, to Find Area for Given Length of Airway, Quantity of Air and Water Gage

Ques.—What must be the sectional area of an airway 5000 ft. long, in order that it will pass 10,000 cu.ft. of air per min., under a water gage of 1.7 inches?

Ill. Exam.

Ans.—In order to solve this question it is necessary to know the shape of the cross-section of the airway, so as to be able to reduce the two unknown quantities (perimeter and area) to a single term (diameter or side).

The formula for unit pressure, in terms of the airway and quantity of air, is

$$p = \frac{kloq^2}{a^3}$$

In this case, the values are all given except the perimeter (o) and area (a); therefore,

$$\frac{a^3}{o} = \frac{0.00000002 \times 5000 \times 10{,}000^2}{5.2 \times 1.7} = 1131.22$$

For circular airway,

$$\frac{a^3}{o} = \frac{(\pi r^2)^3}{2\pi r} = \frac{\pi^2 r^5}{2} = 4.9348\, r^5$$

and

$$r = \sqrt[5]{\frac{1131.22}{4.9348}} = \sqrt[5]{229.23} = 2.96, \textit{ say } 3 \textit{ ft.}$$

The diameter of this airway, to meet the requirements in the question, must be practically 6 ft., and its area is then

$0.7854 \times 6^2 = 28.27$ sq.ft.

For square airway (side = d, area = d^2),

$$\frac{a^3}{o} = \frac{(d^2)^3}{4d} = \frac{d^5}{4}$$

Then

$$d = \sqrt[5]{4 \times 1131.22} = 5.384 \textit{ ft.}$$

$$\textit{Area} = 5.384^2 = 29 \textit{ sq.ft.}$$

For a rectangular airway (height = a, width = b), perimeter = $2(a + b)$; area = ab.

Assume $b = na$; then,

$$\textit{Perimeter} = 2(a + na) = 2a(n + 1)$$

$$\textit{Area} = a \times na = na^2$$

Then,

$$\frac{a^3}{o} = \frac{(na^2)^3}{2a(n+1)} = \frac{n^3}{2(n+1)}a^5$$

Suppose the width of the airway is double its height; then, $n = 2$; and

$$\frac{a^3}{o} = \frac{2^3}{2(2+1)}a^5 = \frac{4}{3}a^5$$

Finally,

$$a = \sqrt[5]{0.75 \times 1131.22} = 3.85 \textit{ ft.}$$

$$b = 2 \times 3.85 = 7.6 \textit{ ft.}$$

The airway, in this case, is 3.85×7.6 ft.; its area is $3.85 \times 7.6 = 29.26$ sq.ft.

It is thus seen that a circular airway requires the smallest area; the square airway the next; and the rectangular the largest, to pass a given quantity of air under a given pressure.

Ventilation—Comparing Two Airways

Ques.—Of two airways, one 7 ft. wide and 6 ft. high, the other 14 ft. wide and 3 ft. high, which will pass the greater quantity of air, other conditions being equal; and why?

Tenn. Exam.

Ans.—The areas of these airways are equal; $7 \times 6 = 42$ sq.ft., and $14 \times 3 = 42$ sq.ft. Assuming the airways have the same length, the one having the smaller perimeter will have likewise the smaller rubbing surface, and will pass the greater quantity of air, for the same pressure or power on the air.

The perimeter of the airways, in this case, are, respectively,

6x7-*ft. airway*, $2(6 + 7) = 26$ *sq.ft.*
3x14-*ft. airway*, $2(3 + 14) = 34$ *sq.ft.*

The 6x7-ft. airway will therefore pass more air, under the same pressure or power, than the 3x14-ft. airway. The ratios of the quantities are as follows:

Equal pressure,

$$\frac{q_1}{q_2} = \sqrt{\frac{34}{26}} = \sqrt{1.3077} = 1.14+$$

Equal power,

$$\frac{q_1}{q_2} = \sqrt[3]{\frac{34}{26}} = \sqrt[3]{1.3077} = 1.09+$$

That is to say, for each 10,000 cu.ft. of air in the 3x14-ft. airway, under equal pressure, the 6x7-ft. airway will pass 11,400 cu.ft.; or, under equal power, 10,900 cu.ft. of air.

Percentage of Gas, Height of Cap

Ques.—What is the formula for calculating the percentage of gas from the height of flame cap observed? What percentage of gas is indicated by a ¾-in. cap?

Ans.—When using the unbonneted Davy lamp, the percentage of gas is given by the formula

$$J = \sqrt[3]{36h}$$

Or, for a ¾-in. cap

$$J = \sqrt[3]{36 \times 0.75} = \sqrt[3]{27} = 3\%$$

When using a bonneted Davy

$$J = \sqrt[3]{70h}$$

Or, for a ¾-in. cap

$$J = \sqrt[3]{70 \times 0.75} = \sqrt[3]{52.5} = 3\tfrac{3}{4}\%$$

Horsepower in Ventilation

Ques.—(a) If 10 hp. is producing a circulation of 60,000 cu.ft. of air, in a mine, what is the water gage? (b) What quantity of air and what water gage will be produced in this mine, when the horsepower is increased to 25 hp.?

Ans.—(a) The water gage is

$$w.g. = \frac{10 \times 33{,}000}{5.2 \times 60{,}000} = 1.057 \textit{ in.}$$

(b) In any given mine or airway the quantity of air circulated is proportional to the cube root of the power producing the circulation. Or, in other words, the quantity ratio is equal to the cube root of the power ratio. Then since the water gage (or pressure) varies as the square of the quantity, the water-gage ratio is equal to the cube root of the square of the power ratio. Hence, for the quantity,

$$\frac{q}{60{,}000} = \sqrt[3]{\frac{25}{10}} = \sqrt[3]{2.5}$$

$$q = 60{,}000\sqrt[3]{2.5} = 60{,}000 \times 1.357$$

$$= \textit{say } 81{,}400 \textit{ cu.ft. per min.}$$

For the increased water gage due to 25 hp.,

$$\frac{w.g.}{1.057} = \sqrt[3]{2.5^2} = \sqrt[3]{6.25}$$

$$w.g. = 1.057\sqrt[3]{6.25} = 1.057 \times 1.842 = 1.947 \textit{ in.}$$

Coefficient of Friction

Ques.—What is meant by the term *coefficient of friction,* as used in mine ventilation? Give an example showing how such coefficient is used.

Ans.—For a full explanation of the coefficient of friction and its use in mine ventilation, see Coal Age, Feb. 24, p. 653.

Water Gage Required to Double Circulation

Ques.—If 20,000 cu.ft. of air per min. is circulated in a certain mine, by a water gage of 3.5 in., what water gage will be required to increase this quantity to 40,000 cu.ft. per min.; in other words, to double the circulation?

Ans.—For the same mine or airway, the pressure or water gage varies as the square of the quantity of air circulated. In other words, the water-gage ratio is then equal to the square of the quantity ratio. In this case, calling the required water gage x,

$$\frac{x}{3.5} = \left(\frac{40{,}000}{20{,}000}\right)^2 = 2^2 = 4$$

$$x = 3.5 \times 4 = 14 \text{ in.}$$

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Human Element in Coal Mining

By Sim Reynolds* and W. H. Reynolds

During the last 25 years, we have had experience in mines of all kinds from the crudest, dug in the side of a low hill, to mines approached by deep shafts and as nearly perfect as human thought and effort can make them. And our experiences have driven home, like reiterated sledge-hammer blows, the conviction that perfection is far from being attained when the finest installation, mechanically speaking, has been completed.

No mine, no matter how costly may have been its development, no matter with what almost excessive care it may have been planned and its construction executed, is safer than the most careless employee permits it to be. The mine is always at the mercy of an illiterate and reckless foreigner, or of an over-ambitious, output-crazed mine foreman. The whole chain of caution, mechanical perfection and provision snaps at its weakest link, the human element.

The Near American Steps Aside for the Wholly Alien

Large capital is adopting improved machines and systems, the former more readily than the latter, but we face a difficulty which new mechanism and improved mining practice cannot over-balance. The apex of our former labor pyramid has become its base. While the immigrants, who poured into our coalfields, in the seventies and eighties numbered nine of British, German or Scandinavian nationality to one from other countries, now there is but one man from those countries to eight or nine Italians, Greeks and Slavs.

To quote the mine reports of the State of Pennsylvania in reference to underground labor:

> Information received from 98 per cent. of the operators shows that 40 per cent. of the employees are of the English speaking races, while 60 per cent. are non-English speaking. Of those killed, 73.62 per cent. were of the latter class, and only 26.38 per cent. were Americans, English, Scotch, Irish and German. If the accidents among these people had been proportionate to the total number of each class employed, 102 of the latter class of men would have been killed instead of 67.

*Pittsburg-Buffalo Co., Marianna, Penn.

Discipline Needed More Than Legislation

It is plain, therefore, to the most casual reader that the men in charge of mines where such conditions exist are working under a natural disadvantage, regardless of all the aid which may be given to the managements by generous mine owners. It will be seen at once that mining officials have a more difficult proposition than confronts any other men in charge of employees working in extra hazardous occupations.

James E. Roderick may be quoted again:

> Legislation of the proper kind would, no doubt, bring about a reduction of fatalities, but the most prolific cause, which is carelessness on the part of mine officials and employees, can be removed only by greater discipline, discipline which will enforce obedience to those laws and rules which have been framed to give a greater degree of safety, discipline that will mete out severe punishment to the man in charge, and to the employee alike, who, by their carelessness or recklessness, place the lives of the men in the mines in constant jeopardy.

Polyglot Foremen

The other day a suggestion appeared which is more humorous and decidedly less practicable than that quoted. It was made at a meeting of the American Society of Mining Engineers. In brief it was to the effect that the men in charge of mines should learn the languages of the different classes of workmen so that they could instruct every employee in his native tongue, regarding the rules of the mine and the observance thereof. The idea is good, very good indeed, doubtless too good to be generally carried into action in the great gas-coal fields. Evidently the speaker was never much nearer the average gas-coal mine than an office on Broadway or some such street in a large city.

If he had been, he would have understood that the foreman of an uptodate mine in a gas-coal region hardly has the time to express himself properly in English, certainly not in all the tongues of southern Europe. Unless he had learned the several languages when a miner, or while yet a boy in common school, he could scarcely hope to find such an easy berth that he would have sufficient time left in each 24 hours to become an efficient linguist, unless he could procure his education in this respect by a cash purchase.

If this be possible, we readily acquiesce in the proposition advanced, and think that in view of the chaotic condition of mine labor it would be a profitable investment for every mine operator to purchase an assorted dozen of linguistic proficiencies ready for use in each large mine, as many a foreman or superintendent in the gas-coal country could use them all, with the possible exception of Hebrew and Chinese.

The Care of Mine Mules

By Matthew J. Davies

The mule has never been supposed to possess any surplus brains, while, on the other hand, I believe it has never been given full credit for the intelligence it sometimes displays. Mules vary in their temperaments and dispositions, much as men do. Some are docile and tractable, others lively and spirited, and some are very refractory and even vicious. Occasionally, we have known them to lie in wait craftily for days and even weeks, seeking an opportunity to kick drivers who have mistreated them, and they sometimes accomplish their purpose with fatal results. But, on the whole, in my experience with mules, I have found that they readily respond to kindness, and are amenable to good treatment.

Improvement in Stables

As to care of mules, the first essential is a clean, comfortable and sanitary stable, with plenty of headroom, sufficient ventilation and good drainage, and an abundance of pure water, rather than the foul, ill-smelling and disease-breeding quarters in which mules are stabled in some collieries. The fact that the animal survives any length of time in some of the stables we have seen, despite the hard and severe toil, it is called upon to perform, is a remarkable tribute to its hardiness and endurance.

It is gratifying to note that during the last year, prompted by legislative enactment, a notable change has taken place along these lines. The mule is coming to his own, even though the reform is actuated more from fear of fire and its consequent results, than from any regard for the poor beast's comfort. But the Delaware, Lackawanna & Western R.R. Co. began improving its inside stables many years ago, before there was a hint of legislative compulsion.

There are four or five classes of workmen in our collieries, who come into personal contact with the mule. Upon

their intelligence, good judgment and exercise of common sense, its usefulness and efficiency, largely depend. These are the barn boss, the driver, the driver boss and the shoer, and we might also add, the car runner. The barn boss must feed the mules judiciously, and if an inferior grade of hay and grain is furnished, he should promptly report that fact.

The Barn Boss

The barn boss should be responsible for the proper preparation of a mule for work, see that it is properly cleaned, for which purpose curry combs and brushes must be provided. Sufficient time must be spent in cleaning and harnessing each mule. The barn boss must give special attention to the fit of the collars and thus prevent shoulder galls, which are caused in most instances by the collar being either too large or too small. Drivers should not, under any circumstances, be allowed to change collars. It is the duty of the barn boss to clean the collars every night, and for this purpose he should provide himself with scrapers. Next in importance to the collar is a well fitting hame.

On all harness, the trace chains must be equal in length, about 8 ft. long, composed of 4-in. links of 3/8-in. iron. To secure this when a trace is sent for repair, its mate must be sent with it. Leather chain pipes and special pads for the protection of the mule should be used when needed; also a strong leather cap piece on the bridle to protect its head.

The barn boss should be on hand every night to inspect the mules when they return from work and to see that no injuries have been received during the day. All injuries must be given proper attention at once. If the barn boss suspects the injury to be the result of carelessness or abuse, he should promptly report the matter to the mine foreman for investigation.

The barn boss must keep the barn dry and in good order. The stables should be cleaned every day and lime sprinkled on the floor every other day. Water troughs in front of the mules should be cleaned at least two or three times each week, and the food boxes cleaned regularly each day. Mules should be given fine salt twice a week, not mixed with feed, but placed in a little box provided for it on the manger. Stables should be lighted by electricity.

Mules should not be allowed to work for two consecutive shifts, except in cases of extreme necessity. Their hoofs should be kept in good condition, and each mule should be shod on all four feet once a month. When a mule is taken sick, the barn boss should immediately administer the proper medicine, of which a sufficient supply must be kept on hand. Cases of severe injury, accompanied with loss of blood, must receive prompt attention until the bleeding has ceased and the animal made comfortable. In addition to medicines, the barn boss must keep on hand other articles and supplies appropriate in emergency cases, such as oakum, cotton, bandages, antiseptics, etc.

Duties of Driver

Another important person in connection with the care and welfare of the mule is the driver. We cannot fail to realize this, when we consider that both are closely associated, as a rule, for about 10 or 11 hours each working day. Drivers should not drive their mules faster than a walk, either when working them or in going to and from the barn. As a rule, drivers are in a bigger hurry to get to the barn than to leave it, and are prone to compel the mules to trot and hurry, which severely tries them after a hard day's work.

Care of the Mule

When leaving mules, drivers should first tie them in a safe place, out of danger from moving cars, or other sources of injury. On descending grades, mules should always be unhitched from the trip and walked down behind it. They should always be led, never driven, through narrow places, for the instant they feel pressure in a narrow passage, they fear danger and make a sudden spring forward. I have known mules to receive serious injury in this manner.

When shifting cars into chambers, mules must not be driven beyond the last point at which they can turn easily, nor driven over loose coal lying on or beside the track. The practice of breasting cars into the chambers should be strictly prohibited. The summits of all grades, toward which mules are used to haul cars, should be furnished with safe and reliable headlocks, to prevent the cars from running against the mule. In fact, headlocks should be placed wherever necessary to prevent accidents. When ascending grades, drivers must have drags in place on the rear car of each trip.

Mules should not be allowed to pass under charged electric wires, and in returning to the barn, they should always be accompanied by the driver. The driver must also watch the feet of his mules, and, when shoes are lost, have them replaced at once. Mules must not be worked unshod.

Driver Bosses

The driver boss should confer and work in harmony with the barn boss in all matters relating to the care, protection and general welfare of the mules; and in order to do this, he should be in the barn every morning in time to see that every mule is properly cleaned and prepared for the day's work. He should also see that all haulage roads in his section are kept smooth and level with ashes or dirt and free from coal, rock and timber, and properly drained where necessary. Where headblocks or drags are required for the safety and protection of the mules, he should see that they are provided.

The driver boss and the barn boss should confer with each other and be careful when making up a team to select mules which will mate well. The quick and the slow, the dull and the nervous, the weak and the strong, should not be placed in the same team. This is an important matter, and cannot be given too much thought and consideration.

Where blocks and chains are used, the chains should be four feet long, and it should be borne in mind that, "no chain is stronger than its weakest link." The driver boss should never allow a miner to repair a broken chain with wire. In all cases where a block and chain is used, a drag should be attached to the rear of the car. Wherever two rails form an acute angle, into which a mule is liable to thrust its hoof, it should be properly wedged and blocked. The driver boss should also see that all trace chains and spreader sticks are of proper length. The dimension of the latter is dependent on the track gage, the standard lengths being 31 and 33 inches.

No side hitching should be allowed unless there is ample room to do so without any danger of injury to the mule. Mules should not be changed from one working place to another without sufficient reason. A change may be necessary sometimes, in order to lighten their work.

Great care should be exercised in handling a green mule. It should be first placed in charge of an experienced driver, given light work, and gradually broken in, until trained and fitted for the regular and more difficult work. Overloading or overworking a mule cannot be too strongly condemned. After the mules have left the barn, the driver boss should spend as much time as possible near them and their drivers, and insist that the former receive good treatment and a square deal.

My sympathy is with the poor animal, which is compelled to perform hard, grinding toil, in more or less dust and smoke, for nine or ten consecutive hours without even a drink of water or a grain of food. At little expense, 1/2-in. or 3/4-in. pipe line could be laid to central locations, through which water could be conveyed to a trough, and at noon the mules could be watered with little loss of time.

Every driver could be furnished with a canvas nose bag, containing a small quantity of grain or corn for the mule to eat while the driver is having his own dinner. The renewed vigor with which the mule would attack its work and the resulting gain in efficiency would, in my opinion, amply repay the loss of time, if any, and the expense incurred.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

Dr. J. A. Holmes, of the Bureau of Mines, has made a statement before the House Committee on Appropriations concerning the investigations of the bureau. This has just been made public. He asks for arrangements that will concentrate the work more largely in Washington and will render it more efficient.

Dr. Holmes states that the work now being done outside the bureau offices and laboratories is as follows: At the University of Ohio, a study of clays is being made in connection with general quarry or mineral products; at Princeton, chemical work is conducted in relation to mine accidents. This should go partly to Pittsburg and partly to Washington. At New Hampshire College, work relative to mineral wastes is being carried on.

"We get the supervision of the university men free," he adds, "but we have a man at the University of Ohio, for example, in our own employ, whom we want to bring here. There is great advantage in having all these men and their work brought to Washington; but unless the bureau can get the increase in space asked for, it will be compelled to send other men out to such institutions as will give us space rent free. We are studying clays and other products from the quarries examined, in connection with the quarry methods, and the action of clays and various mineral substances, on coal and ores, and other substances of that kind."

It is expected that the changes thus requested will be made. With further reference to the need of new quarters, Dr. Holmes says that when the present building was arranged for, only about 33 persons were connected with the work of the Bureau of Mines in Washington. At the present time, the building is occupied by between 90 and 100 people. "So the situation today is that the Bureau of Mines is exceedingly crowded in its work, and cannot continue its work efficiently within the limited space of this building."

Market for Alaskan Coal

The Senate has had printed as senate document No. 573, a partial report of the proceedings of the fourteenth annual convention of the American Mining Congress, under the title "Alaskan Problems." It is interesting to note that the problem which figures most prominently in this document is the mining and transportation of coal.

Special attention is given to papers on this subject and notably to a discussion of "Coal Transportation in Alaska." In this paper, great stress is laid upon the question of a market for the coal, stating, in part, that:

It is doubtful if there is a market for much Alaska coal outside of Alaska. Eastern people and those of the Middle West do not appreciate that there is plenty of coal on the Pacific coast, much more accessibly located than that of Alaska, besides fuel oil in abundance, and the most marvelous hydro-electric power in the world. Even in Alaska the Treadwell mines and the Copper River R.R. are being operated by California fuel oil, and it is evident that Alaska steaming coal has little demand upon the Pacific coast of the United States in the face of such competition. A market will ultimately be made for some Alaska anthracite, and the Alaska coking coal will be of great importance, especially in the treatment of the low-grade copper ore along the Alaska coast. The United States Navy, which is now importing coal from West Virginia, might save the price of a battleship in a few years by using Alaska coal, but the Alaska fields really have little bearing upon the great question as to the future policy for the disposition of coal lands upon the public domain of the United States. Some new system must be adopted in Alaska, however, and consequently this subject has been given mature consideration. Two methods have been suggested: One a leasing system, and the other, government operation of the coal mines.

Alabama

Birmingham—An explosion took place in the third right heading, bottom slope, of the Roden Coal Co.'s mine at Marvel, Bibb County, Ala., at approximately 10 a.m., Apr. 30. This resulted in the injury of eight men. None of them was seriously burned, although one was nearly dead when rescued, from suffocation.

At every mine in the Cahaba coal field there is more or less gas. In the Marvel mine, gas has only shown up on four out of 28 headings, and in very small quantities. The explosion was caused by a driver carrying an open lamp by a room in which men, employed by the company, were fanning out the gas to make the room safe for working the next day. That the amount of gas was small is evidenced by the fact that there was very little concussion, merely a sheet of flame, which lasted only a few seconds. The force of the explosion was not felt on the surface and in but few of the other working places. The news was telephoned to the top, and immediately a rescue party was organized. All the air was thrown from the top slope to the bottom slope, giving it double the usual quantity.

Helena—It is generally rumored here that the Wadsworth Red Ash Coal Co. is negotiating for a lease of the old No. 2 mine, from the Tennessee Coal, Iron & R.R. Co. It is also stated that the Red Ash company will purchase the Otto Marks property which adjoins the No. 2 mine. The properties lie about two miles from Helena and if the negotiations are successful it is expected that operations will begin at once.

Colorado

Denver—Coal operators in the southern Colorado district have consented to recognize the check weighing system and hereafter this system will be in use at the Green Cañon, Suffield, Royal, Shaft and Empire mines. Union weighmen have been reinstated in all mines in the Aguilar district. The men also have been granted a "checkoff" of the checkman's wages. This recognition has been the direct result, it is claimed by union labor leaders, of the efforts of the United Mine Workers' organization in this state.

Pueblo—By a compromise effected between the federal land office and the Denver and Rio Grande R.R., 8465 acres of coal lands in Colorado, having a market value of $1,755,750, held by the Atlas Utah Fuel and the Calumet Fuel companies, subsidiaries of the railway system, have been conveyed back to the United States government and will be thrown open to purchase. The lands are situated in Gunnison and La Plata counties and comprise some of the best bituminous coal deposits in the west. The largest tract is in La Plata County and embraces 5385 acres of unpatented and 640 acres of patented lands. Close to the city of Pueblo is a tract of 400 acres and the remaining 840 acres are in Gunnison County. The last named acreage is the most valuable, there being 8 seams, which have a total thickness of 70 feet.

Illinois

Panama—An explosion in the mine of the Shoal Creek Coal Co., recently killed two men who had been left in charge of the mine, which was idle at the time.

Other men who were in the mine escaped without injury.

Canton—The tipple of Star mine, No. 2, burned to the ground recently before help could arrive to extinguish the flames. The fire is supposed to have been started by lighting, but the blaze did not break out until about half an hour after the storm. The tipple was built 5 years ago and will probably be rebuilt inmmediately as there is still much good coal on the property.

Republic—The Interurban Electric Co., which operates an electric line between Carterville and Herrin, Ill., has been reorganized by officials of the National Light & Power Co. of St. Louis, who have arranged to extend the service to the coal-mining district of southern Illinois. St. Louis capital will finance the proposed extensions. The present plan is to extend the line from Herrin through the towns of Craneville and Reeves, and to supply power for the operation of the coal mines, of which there are about 60 in the territory reached. The present headquarters of the Interurban company are at Carterville, Ill.

Indiana

Terre Haute—Indiana coal operators and members of district No. 11 United Mine Workers, after three sessions of the joint wage conference, which opened at Terre Haute, Apr. 30, were no nearer an agreement than they were at the beginning of the conference. The question of resuming work at the mines pending a settlement of all differences and demands was the principal contention, and a motion advocating resumption made by Mr. Penna was promptly voted down by the miners. It now looks as though there will be weeks of parleying before an agreement will be reached and work resumed. This is unfortunate and disappointing because the demand for coal is becoming persistent. The operators charge that the miners are going beyond their sphere in trying to set the price of powder, the selling price of coal and in making other demands. Some of the demands made by the men are:

> A weekly pay. A reduction in the price of blacksmithing to ½c. on the dollar on the gross earning for pick miners and nothing for machine miners. A charge of $1.25 a keg for powder. That when a part of a mine is shut down the men so affected shall be entitled to their share of work in the parts of the mine that continue at work. That a reasonable price for house coal be charged from those working in or around the mines. Reasonable price not to exceed 5 per cent. of actual cost. That where a company wrongfully stops a man's turn such company shall remunerate him for time so lost.

A deadlock likewise has been reached by the scale committee of District No. 8 meeting at Brazil, and there is no indication of an early settlement. The matter has been referred to a sub-committee composed of four miners and four operators. The operators refuse to even consider the clause which provides that they shall not discriminate in the employment of men on account of creed, color or their activity in matters affecting the miners' union. The operators declare that they have a perfect right to consider the kind of men that they employ, and under no circumstances will they sign the scale containing a clause which provides for the employment of men in the order in which their cards are deposited. The miners insist that this clause must stand.

Kansas

Pittsburg—Two new coal companies have recently been organized to conduct stripping operations in this vicinity. These are the Nesch Coal Co. and the Pittsburg-Scammon Coal Co. The latter concern is allied with the Pittsburg Brick Co. and will not place its product on the market to any great extent.

Kentucky

Louisville—Failure to agree upon an interpretation of the Cleveland wage-scale compromise which was to be the basis of settlement between the miners and operators of western Kentucky, led to a proposition on the part of the Western Kentucky Coal Operators' Association to submit the matter to arbitration. The wages offered by the operators will be submitted to a referendum vote of the miners. The mines affected have been idle for more than a month pending a settlement of the questions at issue.

The Interstate Commerce Commission has suspended, until Nov. 1, tariffs of the Louisville & Nashville R.R., advancing rates on coal and coke from points on its line to points on the Big Four. The rates were to have become effective May 1.

Providence—The coal mine and other property of the Fairmount Coal & Mining Co., of Providence, will be sold at public auction May 22 Glenn R. Fudaley, of Madisonville, Ky., is trustee in bankruptcy for the company.

Whitesburg—The Schoberth Syndicate of Philadelphia, has purchased 5000 acres of coal and timber land along Carr's Fork and Beaver Creek in Knott County.

Henderson—Thinking he was hoisting a load of coal the engineer of a mine at Clay, Ky., recently ran the cage up hastily and dumped it, dropping a miner 100 ft. to the bottom of the shaft and killing him instantly. Two others were hurt.

Ashland—A new company has been incorporated in Kentucky by officers of the Norfolk & Western Ry. Co., to build a line from Williamson, W. Va., to Pikeville, Ky. It will be 20 miles long, with branches, and is to be completed by June 1, 1913.

Missouri

Kansas City—Conferees representing coal miners and operators of the Southwest have renewed their agreement that there shall be no suspension of operations while negotiations for a new contract are pending. This provision of the old contract expired May 1. It is said that the sub-committee which is considering the arbitration clause of the new agreement is making good progress.

Montana

Missoula—After a thorough examination, the Butler Creek Coal Co. is about to commence active development work on its properties located between La Valle Creek and Butler Creek, about seven miles from Missoula. A shaft is now being sunk to a coal seam having a thickness of between 5 and 6 ft. The coal is a lignite of the miocene formation and carries only about 4 per cent. of ash. It is particularly adaptable to briquetting, and with this treatment its fuel value will be increased materially. It is proposed to install a briquetting plant in the near future.

Ohio

East Liverpool—Six thousand acres of valuable coal land, north of East Liverpool and Wellsville have been taken over by the West Point Coal & Coke Co. Confirmation of this deal, the most extensive in some years, was secured recently from J. L. Francis, president of the company. The deal involves an immediate outlay of from $100,000 to $150,000. It is conjectured that the purchase means an early beginning on the construction of the proposed Ohio River & Northern R.R. from Midland, Penn., past East Liverpool and Wellsville and thence to West Point. Mr. Francis stated that the newly acquired coal lands for the most part face the railroad right of way. The opening of this coal territory means direct delivery to the Crucible Steel company's plant at Midland, Penn. This company is spending over $5,000,000 in improvements. The exact boundaries of the property acquired by the West Point Coal & Coke Co. have not been announced. However, it extends from about three miles back of Wellsville, north for a distance of five miles to West Point.

Columbus—A ruling by the State Public Service Commission makes the Hocking Valley R.R. Co. liable for a number of damage claims on short weights. A test case was brought, to determine whether or not the practice of underbilling coal 1000 lb. to the car, released the carrier from shortage claims when a car arrived at destination with contents un-

der the weight called for by the shipper's bill of lading. Underbilling has now been done away with, but the case was filed under the old system. Other claims that have arisen will now be pressed. The railroad company will probably carry the matter into the courts.

Massillon—A committee representing the operators and miners of subdistrict No. 3, of district No. 6, United Mine Workers, met here May 1, to draw up a wage contract for the next two years. The cost of supplies, such as oil, powder, and house coal promised to be the principal bone of contention. The committee have no power to change the basic scale of $1 a ton and proportionately increased wages for other kinds of work, fixed by the Cleveland conference in March. They will deal exclusively with questions arising out of conditions that exist in this sub-district.

Pennsylvania

Bituminous

Pittsburg—Maintaining that the reduction of 10c. a ton in the freight rate on coal from Pittsburg to the lakes, recently ordered by the Inter-State Commerce Commission, does not grant them the relief desired or necessary to enable them to compete with West Virginia, the Pittsburg coal operators, through John W. Boileau, with the Pittsburg Coal Co. intervening, have filed another petition asking for a further reduction in the rate. They want the rate reduced to 50c. a ton, the figure named in the original petition; but whether this is granted or not, they hold that the Inter-State Commerce Commission should further modify the rate.

Waynesburg—Josiah V. Thompson and associates of Uniontown have closed a deal by which they have sold to Edward H. Jennings of Pittsburg 2896 acres of coal and 220 acres of surface located in Washington township, Greene County. It is reported that $780,000 was the amount paid. The land is on Ruff Creek. It is west of the holdings of the Emerald Coal Co. and is bounded on the north by holdings of the Westmoreland Coal Co. Thomas Ross of Washington township, Greene County, sold to Thompson, 370 acres of coal land on Ruff creek, for $131,000. The purchase of the Ross property gave Thompson possession of the tract which amounted in all to about 3000 acres.

Du Bois—Reports from the locals of district No. 2, United Mine Workers, indicate that the referendum vote of the men will ratify the wage-scale agreement which was reached at a conference here several weeks ago.

The contention between the Cascade company and their Sykesville miners over the taking in and out of cars has been adjusted and the mine resumed work recently after a suspension of over a month. Not all the men returned to work at once, as it will require some time to get the big plant in full operation and the entire 600 miners and cokers back at work.

The coal mines at Savan, Indiana County, which have had a hard time of it, financially and otherwise, are at last to be opened up and put in active operation. Work was commenced recently on a new tipple and also on a new opening.

Brockwayville—According to reports, the Shawmut Mining Co. is preparing to open up a coal field in the Shawmut valley that has hitherto remained undeveloped. The main opening will be in the vicinity of former operations at Shawmut which have been closed down for several months and sufficient territory will be tapped at once to insure the employment of a large number of men.

Anthracite

Scranton — Women were the leaders in a riot in the Scranton district May 7, leading a force of men in an attack upon repairmen at the Dickson shaft of the Delaware & Hudson Co. at Green Ridge. Forty repairmen were routed by 500 men, women, and children. Four of the 40 fell in their tracks, and two of them were seriously injured. The rioters gathered at the colliery as the 40 men reported for work, which the union had said they were privileged to do. The mob was made up of foreigners, but many English-speaking people joined in the attack because they were led to believe that some wrong had been committed, and that they were justified in taking the law into their own hands.

Wilkes-Barre—At a conference of the general scale committee of anthracite miners and operators, held in New York, May 2, the representatives of the miners refused to accept the terms of the agreement which was reached by the subcommittee of four operators and four miners on Apr. 25. A general convention of mineworkers of the three anthracite districts has been called to meet in Wilkes-Barre, May 14 and the question of ratifying the proposed agreement will be decided at that time. The operators decline to enter into a further discussion of the matter, insisting that the men should endorse the work of their committee. In the event of the miners refusing to do this the proposition of the owners to refer the controversy to a strike commission still remains as a basis of negotiations.

Mayor John V. Kosek has notified the various coal companies with mine workings under the city, to send maps of their mines to the city clerk. The action of the mayor followed a mass meeting of the citizens of North Wilkes-Barre, who have taken steps to protect their homes from surface subsidences.

Shenandoah—Serious riots took place here and at Mt. Carmel on May 6, and some trouble of the kind was also experienced at Mahanoy City. The rioters were Italians. They went armed upon the highways and clubbed and stoned workmen, overran two collieries, and prevented union men from reporting for work, which the union had declared permissible.

At Mt. Carmel, the rioters took up positions along the road leading to the Richards colliery of the Susquehanna Coal Co. Four union men were stopped and the rioters beat them until they were helpless. The rioters then marched to the Sayre colliery of the Lehigh Valley Co. and stretched ropes across the roadway, refusing to permit workmen to leave the colliery, and refusing admittance to those who wanted to work.

At Shenandoah the rioters started marching early. They went to a stripping and drove away the men and then went to the William Penn Colliery of the Susquehanna Coal Co. and the Shenandoah City Colliery of the Reading. Pumpmen, engineers and firemen were driven from their posts and the rioters refused to allow anyone to work. The sheriff sent to Pottsville for a squad of state troopers and they charged the rioters and drove them from the highway. The police remained upon the scene and are patrolling the highway.

West Virginia

Clarksburg—The mine of the High Grade Coal Co. at McWhorter, near here, was placed under a heavy armed guard Apr. 27, following threats of striking miners to blow up the mine with dynamite. The situation in the coal fields became so menacing that calls were momentarily expected to be made on Gov. Glasscock for state militia.

Charleston—The miners and operators who have comprised the subscale committee in conference here formulated a wage agreement on May 1 which was ratified immediately by the miners in convention, while the operators now have the proposition under discussion. Under the new agreement the Kanawha miners will receive one-half of the increase stipulated in the Cleveland wage scale and the semi-monthly payday will be restored. The miners abandoned their demand for the check-off system.

Wellsburg—About 600 acres of coal land, the tipples, cars and equipment of the La Bell Coal Co. have become the property of the Lewis Finley Co. and it is expected that the new concern will greatly increase the coal output of this section.

Welch—Contributions to the Jed relief fund asknowledged by H. N. Eavenson, Gary, W. Va., secretary of the committee, up to May 2, amounted to $12,030.66.

Personals

E. L. Sternberger, of the E. L. Sternberger Coal Co., Cincinnati, recently made a business trip to Chicago, Cleveland, Toledo and other Lake cities.

Carl Scholz and W. H. Skaggs, both of Chicago, Ill., are prospecting a large area of coal land, presumably in the Corona Seam, in Walker and Fayette Counties, Alabama.

William Monay, superintendent of the Central Coal & Coke Co.'s coal mines, at Rock Springs, Wyo., has accepted a position as assistant general manager of the Kemmerer Coal Co., and will enter upon his new duties at once.

Frank H. Crockard, vice-president of the Tennessee Coal, Iron & R.R. Co., has returned to Birmingham from New York, where he attended a meeting of the rail committee appointed by Judge E. H. Gary, of the Steel Corporation, to discuss the betterment of steel rails.

C. P. Collins, civil and mining engineer, of Johnstown, Penn., has been appointed mining engineer of the Berwind-White Coal Mining Co., with headquarters at Windber, Penn. Mr. Collins has leased his engineering business in Johnstown to S. E. Dickey, preparatory to taking up his new duties.

A. B. Jessup, mining engineer of the Lehigh Valley Coal Co., Wilkes-Barre, Penn., has resigned, effective May 1, to become general manager of the J. B. Markle coal properties, at Jeddo, Penn. Mr. Jessup was tendered a banquet by the employees of the Lehigh Valley company, on May 4, and will take up his residence in Jeddo in the near future.

C. P. Ludwig, general superintendent of the Alabama Consolidated Coal & Iron Co., and S. B. Sheldon, of New York, representing a large number of men financially interested in the properties of the Southern Iron & Steel Co. and the Alabama Consolidated Coal & Iron Co., were in Birmingham recently, inspecting the properties of the two companies.

E. Kelly Rothstein, formerly vice-president and general manager of sales for the Davis Coal & Coal Co., has become manager of the Messrs. B. Nicoll & Co.'s coal and coke department, with offices in the Singer Building, New York. The latter company has been appointed sales agent for the Davis Coal & Coke Co. in all territory except New England.

William L. Martin, for several years assistant superintendent of Pratt No. 1 division of the Tennessee Coal, Iron & R.R. Co., who, on Apr. 1, this year, was engaged by the State of Alabama as superintendent of the Banner mine, has resigned this position, effective at once. The Banner mine is being operated with convict labor by the state for the Pratt Consolidated Coal Co., of Birmingham.

Chronology of Coal Mining for April

Apr. 2—Complete suspension of work at anthracite mines of Pennsylvania and at a large proportion of bituminous mines in central competitive field.—Wage increases granted in southern Colorado field.

Apr. 6—Coal strike in Great Britain officially declared at an end.

Apr. 10—Bituminous miners ratified Cleveland wage-scale agreement by a referendum vote of 109,709½ to 32,139½.—Conference of anthracite operators and miners opened in Philadelphia.

Apr. 18—Fifty thousand miners in Pittsburg district returned to work.

Apr. 20—Central Pennsylvania operators and miners agreed on a two-year contract.

Apr. 21—An explosion of gas in the Coil coal mine, Madisonville, Ky., killed six men.

Apr. 25—Two-year bituminous wage contract formally signed at Indianapolis. —Subcommittee of anthracite operators and miners reached wage-scale agreement.

Apr. 30—Explosion in Hokkaido Coal Co.'s mine, Yubari, Japan reported to have entombed 283 men.—Miners in southwestern field agreed to remain at work pending the signing of a contract. —Explosion in Roden Coal Co'.s mine at Marvel, Ala., injured 8 men.

Book Review

THE USE OF MICE AND BIRDS FOR DETECTING CARBON MONOXIDE AFTER MINE FIRES AND EXPLOSIONS. By Geo. A. Burrell. Technical Paper No. 11, Bureau of Mines, 1912. Paper Covers. 15 pp., 6x9 in. No. illus.

This is a valuable monograph, but as it contains, to all appearance, nothing new, there would seem, therefore, no reason why it should depart from the announced purpose of the bureau to make these technical papers easy for the average miner to understand. How, for instance, he would stumble over the words, "physiologically indifferent," on page 7, is not clear. The bulletin contains a complete account of the properties and sources of carbon monoxide and the dangers to be apprehended from it.

It discourages the prevalent idea that a small percentage of monoxide will form a cap and will warn the miner of danger. Mr. Burrell declares that less than 2 per cent. of carbon monoxide cannot be detected by the use of a lamp, a percentage which would kill a man in a few seconds. Some short remarks are made on the chemical tests used for determining the presence of the gas. The last section treats of the action of monoxide on birds and mice and of their use in exploration of mines after an explosion.

Construction News

Viper, Ky.—The Kelley Coal Co. is considering the construction of a coking plant at Viper.

Nanty-Glo, Penn.—The Estep Coal Co. has under consideration the complete electrification of the Nanty-Glo mine and contemplates making an additional opening.

Salt Lake City, Utah—The Castle Valley Coal Co. has increased its capital stock from $5,000,000 to $7,500,000, to provide a new tipple at Mohrland and make other improvements.

Boswell, Penn.—The Merchants Coal Co. contemplates opening a new mine and making necessary improvements to tracks, yards, etc.; $25,000 will be expended on the erection of miners' houses.

Red Ash, Ky.—The Proctor Coal Co. will develop several additional mines to a total daily output of 2000 tons. Machinery will be electrically driven. Charles F. Finley, Williamsburg, Ky., is president.

St. Paul, Minn.—The Pittsburg Coal Co. has taken out a permit for the erection of a coal elevator on East Eighth St., to cost, with machinery, about $4000. The building will have a storage capacity of 2500 tons of hard coal.

Morgantown, W. Va.—Mine No. 7, of Elkins Coal & Coke Co., is now being opened up, two miles southwest of Bretz, and it is estimated that the actual mining of coal will be under way within three months. A tipple, houses, stores, tracks, etc., are to be built.

Ashland, Ky.—The Kentucky Solvay Coke Co. has purchased a 65-acre site in this city and plans the immediate construction of a large coking and by-product plant. The cost of the plant will total $900,000, it is stated. The tract which has been secured was purchased from the Ashland Coal & Iron Co.

Birmingham, Ala.—A. H. Woodward, vice-president and general manager of the Woodward Iron Co. has announced that $2,000,000 will be spent on improvements to the company's properties. It is estimated that $1,000,000 of this will be applied to the mining properties, but no definite plans for this work have been announced.

Shamrock, Ky.—The Climax Coal Co. has organized with Edward L. Douglass, vice-president and general manager, and has taken over the Edgewood Consolidated operation at Shamrock. It is making numerous improvements. Shaker screens, a washer and other modern equipment are to be installed. The Hignite seam will be opened.

Louisville, Ky.—The Oliver Chilled Plow Works, of South Bend, Ind., is reported to have purchased 15,000 acres of coal and timber land in Harlan County, Ky., for immediate development. The land was purchased from the Wisconsin Steel Co., a subsidiary of the International Harvester Co. The steel company now has several hundred coke ovens in operation in Harlan County.

Cincinnati, Ohio—The Reliance Coal & Coke Co. has determined to expend about $20,000 in modernizing the property formerly occupied by the Cincinnati Gas, Coke, Coal & Mining Co., recently purchased by Julium Fleischmann and associates, at the southwest corner of Blair Ave. and Weatherhead St., Avondale. A new system of overhead trestles, bins and a modern stable will be installed, the work to be started in the near future.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The opening of the Lake trade and the unexpected deadlock in anthracite have steadied the market up materially. Hard-coal supplies are down to a low point, and the unprecedented action of the miners in rejecting the scale fixed by the sub-committee is causing considerable apprehension among consumers. This has also had a stimulating effect on bituminous and tended to check a further decline in this branch, which has about held its own during the past week. The outlook in soft-coal is not, however, so bright, as there are still evidences of strike surpluses, and some difficulty is experienced in placing the new arrivals which are again about normal.

The Eastern bituminous market is settling down to the usual spring dullness, although fairly active and with a satisfactory movement. The arrivals are mostly on contract and are naturally slow, due to the heavy shipments in March and April. Very little anthracite is coming in, but there is as yet no evidence of any particular distress over the shortage in this grade. Production in the Pittsburg district is increasing, but is still low, probably only about 50 per cent. capacity. The new circular of the Pittsburg operators has not been severely tested as yet, but there is already tangible evidence that it will not hold.

The Ohio mines in the Lake trade are starting up and operators are anticipating a banner season in that market this year. Production in West Virginia has eased off some, but the tonnage dumped at the Virginia piers during April was the highest on record. The union mines in the western Kentucky fields are still closed, and the demand is light, although a good season is expected. In the Middle West there is a fair buying movement, principally from the railroads and large steam users, and the market is somewhat stronger.

Boston, Mass.

The bituminous market is settling down to the usual spring dullness. Prices are easy on only a slightly higher basis than last year, but buyers are not showing the interest that was expected. The few cargoes of Southern coals that arrive are mostly on contract and for the largest consumers. Inland trade is well supplied for the present and it will take lower prices than now prevail to induce any buying, ahead of actual needs.

Reading transportation is still available for bituminous out of Philadelphia and a fair tonnage is coming from Pennsylvania in that way. All the shippers are in a position to clear boats promptly. Transportation generally is easy, with rates from Hampton Roads at 70c. or less for large boats.

Shipments all-rail are rather slower than usual for this season, due to the heavy volume moving in March and early April. Few contracts are reported placed, and those only by large concerns, and at prices little if any in excess of last year.

The news of the disagreement in the anthracite scale conferences, following the meeting May 2, came as a surprise. If negotiations are much further extended the dealers will be getting apprehensive again. There is practically no premium coal offering, and so far as the trade goes, hard coal is at a standstill.

In Boston retail contract prices on soft coal are $4.50 to Oct. 1, and $4.75 from Oct. 1 to Apr. 1, net tons delivered, or 25c. higher than last year.

Wholesale prices are about as follows:

Clearfields, f.o.b. mines	$1.10@1.35
Clearfields, f.o.b. Philadelphia	2.40@2.60
Pocahontas, New River, f.o.b. Hampton Roads	2.70@2.80
Georges Creek, f.o.b. Baltimore	2.60@2.70

New York

The refusal of the anthracite miners' full committee to ratify the agreement reached by the subcommittee, resulted in a decided stiffening in the hard-coal market here the early part of the week. While the larger companies continue to quote their regular circular, they concede that there is little or no coal available at these figures, and that there are prospects of an acute shortage should the lockout continue. Coincident with the announcement of a break in the wage-scale conferences, the dealers withdrew the low prices put in effect May 1 on the supposition that this matter had been settled, and domestic is now back to the full March circular.

The bituminous trade, in sympathy with the anthracite, developed some strength during the past week, in that no further decline was in evidence, as has been the case during the past month. Spot quotations are slightly higher than last week, the lower grades being quoted around $2.65, f.o.b., with the better grade Pennsylvanias about $3.05. Some demurrage coal was disposed of at $2.50, but this cannot be considered the market. The trade reports plenty of fuel available, and the large operating companies say the mines are working well up to capacity and normal tonnages for this period are coming in.

The anthracite companies do not expect operations to be resumed at the mines before June 1. While buyers in the open market find it necessary to pay substantial premiums, the companies continue their regular circular as follows:

Broken	$4.50
Egg and stove	5.00
Chestnut	5.25
Pea	3.25
Buckwheat	2.75
Rice	2.25
Barley	1.75

Pittsburg

Bituminous—There has been a slight increase in activity at the mines in the Pittsburg district, but production is still far below normal and hardly amounts to more than one-half capacity. The stocks accumulated by consumers are still in evidence, so that buying is light. Shipments in the lake trade were started May 1 but have not yet reached important proportions, little coal being loaded since navigation is only getting started. Only a few vessels started last week on the down trip from the head of the lakes, ice having interfered to a much later date than usual. The new season prices have not been seriously tested as yet, but there is already tangible evidence that they will not hold universally. We repeat them, however, as there is no other basis for quotation: Mine-run and nut, $1.22½; ¾-in., $1.32½; 1¼-in., $1.47½; slack, 82½c. per ton at mine, Pittsburg district.

Connellsville Coke—Production is back to normal, about 400,000 tons weekly, and the prompt furnace market has grown still easier. There is little coke offered, but demand is almost equally limited. There have been negotiations on second-half contracts for furnace coke, but none appear to have reached a head yet. There is no reason to believe the recent report that a contract for the second half has been made at $2.35. Foundry coke continues in fair demand. We quote: Prompt furnace, $2.40@2.50; contract (nominal), $2.25; prompt foundry, $2.75; contract foundry, $2.40@2.50, per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Apr. 27 at 401,-

494 tons, an increase of 5000 tons, and shipments at 4313 cars to Pittsburg, 6281 cars to points West and 1288 cars to points East, a total of 11,882 cars, or an increase of 228.

Philadelphia, Penn.

The unexpected developments of last week entirely changed the situation in the anthracite trade. It was confidently expected that it was a mere matter of form for the general committees to confirm the findings of the subcommittees of the operators and miners, but opposition developed which will more than likely postpone operations at the mines for at least a couple of weeks. The first of June is now the prediction for a resumption of work at the mines, and this entirely dependent on the attitude of the convention to be held on May 14, at Wilkes-Barre.

The idleness of the mines is not, however, causing any particular stress up to the present time. There seems to be a fairly plentiful supply of coal for domestic purposes, and the storage supplies acquired by the manufacturing interests and other steam users early in the spring, seem to be holding well. Of course, some sizes are very short, notably pea coal, and this seems to be the rule rather than the exception, although there are a few dealers who are fairly well stocked on this size, and claim that they have sufficient to carry them for a month or so.

Spasmodic arrivals of anthracite are reported, some domestic sizes and a little buckwheat coming in, but most of the dealers are doing very little beyond looking forward to the announcement of prices and the resumption of work at the mines. Nothing definite has been announced as yet regarding prices or what the policy will be, and the operators are noncommital when asked as to what changes, if any, are likely to be made. The invariable reply is that prices will not be discussed until there is a definite understanding with the miners, and until this takes place, it is useless to speculate.

Baltimore, Md.

A strike among the laborers employed at the coal piers of the various railroads in Baltimore, arose during the past week, which seriously interfered with business in the local market. For two days matters were simply at a stand-still at both the Curtis Bay pier of the B. & O. R.R., and the Port Covington piers of the W. M. Ry., and as the differences between employers and employees have not yet been settled, there is no telling just how long present conditions will continue. The laborers employed to unload at the piers have been receiving 20c. per hour, while the coal trimmers, who handle the fuel after it is loaded on the steamers, have been paid 25c. per hour. The men have struck for an increase of 5c. an hour, and recognition of their union. The railroads will probably act together in any settlement which might be made.

Buffalo, N. Y.

The bituminous market sagged slowly all the week, till there came news that the anthracite miners might not go to work right away, when there was a visible stiffening. After two or three days it again looked as though there would not be a strike, which left the market weak again. There is plainly more bituminous coal mined than is needed, even though a good many mines returned to work only partially, or to meet business in sight. A week ago the reports made by the bear members of the trade that they could get Allegheny Valley mine-run for 95c. at the mines was stoutly denied by operators, but there appears to be much truth in the statements now, though some mines are refusing such offers and would close rather than accept them.

All that can be done in the line of quotations is to repeat former figures, which some are getting and some not, as follows: Pittsburg three-quarter, \$2.87½; mine-run, \$2.47½; slack, \$2.25, with Allegheny Valley about 25c. lower. Coke went too high and is now suffering a reaction, being down to \$4.50 for best Connellsville foundry.

There seems to be plenty of anthracite in Buffalo and none of the consumers have so far complained, but there is none for Lake shipment, though the demand in that branch of the trade is urgent. It now looks as if it would be impossible to meet that demand this season, even if mining should begin very soon. The anthracite operators always take care of the Eastern trade first and regard the Western trade as a sort of an overflow.

Columbus, Ohio

Within the past week, mines have started up in both the Hocking and eastern Ohio fields; this activity is confined largely to the lake-shipping companies. Though the ice in the upper channels makes it uncertain as to when the first fleets will be able to move, cargoes are being taken on by boats in their winter quarters at the Ohio ports. Coal will also be loaded on cars and held at the mines ready for movement to the docks as soon as navigation is fairly under way.

Aside from the Lake trade, the market is lifeless and mines might remain idle for several weeks to come without inconvenience. Stocking of fancy domestic coals, which usually sets in early in May, is slow, as dealers seem inclined to take a breathing spell after an exceptionally busy winter and spring. The prospects, however, are for an excellent business along this line. Owing to the increased cost of mining, producers will attempt to hold summer domestic prices well up to the formal circular of \$1.50, although this figure will probably be subject to some shading at the outset.

Fine coal is on the down grade with respect to price, because of the large tonnage that will soon accumulate as a by-product of lump in the Lake trade. The average selling price has dropped to 75c. and there is only a fair demand. Railroad fuel and mine-run for general industrial purposes is suffering from a period of readjustment, many big consumers still having storage on hand. This is having a bad effect on the closing up of contracts. Many large steam users seem inclined to take a chance on the open market for the coming year's requirements.

Hampton Roads, Va.

While there appears to be a lull in the market, coal has been moving quite freely through Hampton Roads this week, and prices are still good, though probably from 10 to 25c. less than last week.

Shipments here during the month of April set up an enviable record, reaching the high mark of 1,213,164 tons, and exceeding any previous for a month's loading at this port. These figures exceed by 94,014 tons the shipments during the month of March, which hitherto had been the record month, and is at the rate of 14,557,968 tons a year.

Both the Norfolk & Western at Lamberts Point and the Chesapeake & Ohio at Newport News, broke all their previous records. The Virginian Railway at Sewalls Point fell considerably below its usual dumping and was the only rail road that did not have a big month, which was due to washouts and other troubles.

Lamberts Point easily led the others, having a total dumping of 571,187 tons during the month, or an average of 21,968½ tons a day for the 26 working days. Newport News was second with a total dumping of 475,801 tons, while Sewalls Point was last with 166,176 tons.

From present indications the coal railroads at Hampton Roads are entering upon the greatest prosperity in their existence. While a great part of the increase in shipments from Hampton Roads was caused by the strike in England, considerable of the business will be held. The English strike was the opening wedge for Pocahontas and New River coal shipped from Norfolk and Newport News into ports heretofore supplied by Welsh coal exclusively and it has proved so satisfactory that new and steady markets have been opened.

Charleston, W. Va.

Practically all the mines in the Kanawha district are again in operation, after about two-thirds of them had been idle for a month, owing to the failure of the operators and miners to get together on the wage question. The settlement of the difficulty late last week was due to

the miners waiving the check-off and the operators granting an increase of one-half of the Cleveland scale. This means an increase ranging from 3c. to 5c. per ton, an increase in all other labor, and the two weeks' pay. Many of the operators had been willing for some time to give a small increase, providing the check-off was waived, but all efforts earlier in the contest failed because the miners were willing to concede everything as a compromise, providing the operators would agree to the check-off. The latter concession, however, the operators of the district absolutely refused to grant under any condition.

It is expected that before long, many of the cars that have been used in this section will be returned to the roads which loaned them, and that West Virginia will then again suffer through a lack of cars.

Birmingham, Ala.

The Birmingham coal market maintains a satisfactory firmness with bright prospects for the year. The most vital factor affecting the market during the week has been the advance in the wages granted a large percentage of the Alabama miners. The advance was 2½c. per ton, effective May 1, for all operations on what is known as the Pratt seam. Practically all mines were compelled to follow some of the leaders who agreed to make the advance.

Contracts for domestic coal which have been pretty well concluded for the year, were negotiated at a slightly better price than last year. In the Alabama market, domestic coal contracts are largely covered during April and steam contracts date from July 1.

The commercial coke plants are running full capacity in Alabama with a ready market at firm prices. The Alabama coke producers have not followed Pittsburg and Virginia in coke advances, for the reason that Alabama's general prices are higher than in Pennsylvania and Virginia and local labor conditions have not operated against production as in the more northern market. Standard 72-hour foundry coke is very firm at $2.25@2.50 per net ton at Alabama ovens, with retort grades quotable at from $2.75@2.85 per ton at ovens.

Nashville, Tenn.

The union operators in the west Kentucky field on the L. & N. R.R. and I. C. R.R. have not as yet effected a settlement and their mines are still idle. There have been many conferences held between the operators and miners in Louisville for the past six weeks. A meeting was held last week in which the operators delivered their final ultimatum and this is to be acted upon this week by a referendum vote of the miners in this district. It seems as though the principal contention has been to get a correct interpretation as to the meaning of the Cleveland agreement.

The nonunion mines in this field, located both on the I. & N. and I. C., have been supplying all the coal from this district. As the demand is light they have been able to do this very easily, and at the same time it has given them an unusually good tonnage for this season of the year. There is very little request for any coal except the finer grades, which are in great demand at high prices.

It looks as though better prices will prevail on contract coal for the coming year and a rather good season is looked forward to by the mining interests in this field.

Chicago

While coal dealers are not inclined to make predictions, it is regarded as certain that the present buying movement will absorb a very substantial amount of coal during May. It is expected this will increase in vigor during the latter part of the present month. At present the buying comes principally from the railroads, although there has been a certain amount of business coming from the users of steam coal who recently found themselves at the end of their resources. This enables the commercial mines to continue doing some business, but it is not expected these mines will have a big market until toward the end of May.

The coke market is active and spot business in furnace and foundry coke is fairly good at firm prices. The supply of Indiana and Illinois coal is not sufficient now to warrant any fixed market quotation.

Prevailing prices at Chicago are:

Sullivan County:	
Domestic lump	$2.62@2.87
Egg	2.50@2.75
Steam lump	2.17
Screenings	1.67@1.82
Springfield:	
Domestic lump	$2.57@2.82
Steam lump	2.17
Mine-run	1.97@2.07
Screenings	1.67@1.82
Clinton:	
Domestic lump	$2.52@2.77
Steam lump	2.17
Mine-run	1.97@2.07
Screenings	1.67@1.77
Pocahontas and New River:	
Mine-run	$3.15
Lump and egg	$3.30@3.55

Coke—Prices asked for coke are: Connellsville and Wise County, $4.75; byproduct, egg and stove, $4.55; byproduct, nut, $4.55; gashouse, $4.75.

Indianapolis

There is nothing particularly encouraging about the coal-mining industry in this state. Both operators and miners are greatly disappointed because the mines have not resumed work. The operators say that orders are piling up and the scarcity of coal in localities is becoming acute. Public institutions and manufacturing plants are borrowing coal of railroads fortunate enough to have some in storage.

When the joint conference of operators and miners meets again, it will be to hear a report from a policy committee composed of Kelsheimer and Stewart for the miners, and Hewitt and Gould for the operators. The operators, notwithstanding their desire to open the mines, seem determined to refuse to enter into negotiations until the men return to work, and the men are as determined to obtain some of their demands first. It is said that President Walker, of the Illinois United Mine Workers, has promised money to aid the Indiana miners during the prolonged deadlock.

Minneapolis—St. Paul

Coal trade in the Twin Cities and the Northwest is still very inactive, and the majority of coal men look for another month of quietness before business will be normal again. Prices have been received on Pocahontas Smokeless, Splint, Hocking and Youghiogheny Coals, and contracts are being let at 10c. per ton less than circular prices prevailing last year on all these coals. Contracting this year has not been quite as heavy as last, owing to the fact that the shipper has not known where he was at in the way of prices, but of late many contracts have been signed and it is rumored several of the larger ones have been made at a low price.

Franklin County and Harrisburg coal is being quoted at $2 and $2.10 on lump, egg and nut sizes at mines, screening from $1.10 to $1.30, and Carterville and Springfield district coals are quoted at from $1.75 to $2 for lump and egg, f.o.b. mines. The retail business is very quiet and will probably continue so.

St. Louis, Mo.

Mining has been partially resumed in Illinois, although on a very small scale. Mines in practically all the districts in southern Illinois are working, but in some sections there are but two or three that have started up.

There is absolutely no demand, and that produced is sometimes held at the mine for a couple of days until a market is found. It is evident from the prices quoted that several operators are not figuring the new insurance feature. The casualty companies are asking approximately $12 on each $100 of the payroll, as they claim it is impossible to do business under the recent Illinois law at a figure less than that.

There would be a good demand in St. Louis for anthracite, were it possible to get any, and smokeless is not as lively as it might be. The same applies to coke, both byproduct and gas house. There is nothing to indicate that the market will

pick up on any of the fuels in St. Louis in the immediate future, and it opened the earlier part of the present week, as follows:

Carterville	
6 in. lump and 3x6 egg	$1.50
2x3 nut	1.35
Screenings	1.00
Mine-run	1.10
Standard	
2 in. lump	$1.05
2 in. screenings	0.90
Mine-run	1.00
Nut	0.95

Portland, Ore.

While oil is being substituted for coal in a good many instances, it is also true that coal is taking the place of wood, particularly in sections where the forests have been thinned out. It is pointed out that could coal be obtained at a little less cost it would soon make a heavy inroad on the demand for wood fuel.

The coal trade in Portland is not very active at this time of year because spring is well advanced, but dealers report business this year about equal to the average for May. There has been no change in quotations here and it will probably be another month before storage prices are put into effect.

Receipts of coal are light in that the stocks are pretty full and it is not expected there will be any heavy shipments again until next fall.

San Francisco

For the past two or three weeks the local trade has been very quiet and the movement far from brisk. On the other hand, deliveries of domestic have been exceedingly meager, and as a consequence the stock on hand has not decreased.

The arrivals up to nearly the close of last month consisted of 4971 tons of Australian and 4593 tons of Wellington. The U. S. Government has received three cargoes of Pocahontas for the Navy, aggregating 16,683 tons, and the Pacific Coast Co., 4524 tons of steam coal from its Washington collieries, for use on the coast steamers.

The receipts of Rocky Mountain coal have been fairly good, considering prevailing conditions.

Prices to the trade are as follows per ton:

Wellington (British Columbia)	$8.00
Pelau Main (Australian)	8.00
Rocky Mountain	8.50
Anthracite (Lehigh)	15.00
Cumberland	12.50

Production and Transportation Statistics

The Car Situation

Increases in number of idle coal cars were most noticeable through the Middle Atlantic States and Middle West. In the Middle Atlantic territory the car surplus jumped from 22,500 to almost 50,000, and in the Middle West the increase during the fortnight exceeded 100 per cent. Both of these sections have on hand a comparatively large number of idle cars, although the present surplus of cars in the Middle West is not as large as the surplus at this time last year. In the Northwest there was about a normal number of freight cars idle. While the increase in the box-car surplus was not as marked as the gain in coal cars, it was by no means confined to any particular section of the country. There was a better demand for box cars in Montana, Wyoming, Nebraska, and on Canadian lines, but not sufficiently large to reduce the total surplus in those territories.

The following table shows the surplus and shortages of cars on 169 roads on Apr. 25 last:

	Surplus	Short	Net Surplus
Box	19,583	6,152	13,431
Flat	6,857	1,613	5,244
Coal, gond. and hopper	94,692	2,144	92,548
Other kinds	30,054	2,396	27,658
Total	151,186	12,305	138,881

Various Railroads, Rivers and Canals

The following is a comparative statement of the fuel movement over various railroads, rivers and canals for February, 1911-12[1]:

Railroads	1911	1912
Baltimore & Ohio[2]	2,187,226	3,397,088
Buffalo, Rochester & Pittsburg[3]	612,341	790,801
Buffalo & Susquehanna[3]	157,031	167,375
Chesapeake & Ohio[2 4]	1,530,710	1,337,216
Erie[4]	637,734	721,481
Huntingdon & Broadtop Mountain[2 3]	83,127	136,811
New York Central & Hudson River[3]	632,564	706,573
Norfolk & Western[2 3]	1,402,765	1,922,225
Pennsylvania (east of Pittsburg & Erie)[2 5]	4,646,198	6,217,396
Pittsburg & Lake Erie[2 5]	1,023,056	1,476,748
Pittsburg, Shawmut & Northern[3]	114,239	202,137
Southern[4]	358,917	451,081
Virginian[2 3]	162,343	294,041
Western Maryland	192,284	255,063
Rivers and Canals		
Canals and Falls at Louisville	239,173	18,050
Chesapeake & Delaware Canal	8,193	2,700
Davis Island Dam	448,160	101,245
Green River, Lock No. 1	2,202	1,356
Kanawha River	93,580	78,320
Kentucky River, Lock No. 1	6,100	4,600
Monongahela River	1,005,461	450,352

[1]Figures throughout this table have been reduced to a uniform basis of short tons

[2]Includes coal received from connecting lines.

[3]Includes company's coal.

[4]January figures.

[5]Does not include company's coal hauled free.

Foreign Markets

Russia

Bituminous-coal production of the Donetz district for 1911 was 16,607,600 tons, as compared with 14,013,390 tons for 1910 and 14,952,745 tons for 1909. Production of anthracite in 1911 was 2,903,870 tons, as compared with 2,398,000 tons in 1910 and 2,546,300 tons in 1909. The production of coke was 2,705,000 tons in 1910, as compared with 3,292,000 tons in 1911.

France

The imports of coal into France during the first two months of this year totaled 2,751,400 tons, as compared with 2,906,000 tons in the corresponding period of 1911. The imports of coke for the same period of 1912 were 388,900 tons, as compared with 446,200 tons in 1911, while the imports of briquettes were 204,300 tons, as against 207,000 in 1911. The exports of coal during the first two months of 1911 were 192,736 tons, as compared with 356,209 tons for the same period of the current year. Coke exports during this same period of the current year were 27,831 tons, as against 30,488 tons in 1911.

Austria-Hungary

During 1911, 10,872,928 tons of coal were imported into Austria-Hungary, as compared with 9,864,462 tons in 1910 and 10,482,264 tons in 1909. The imports of coke in 1911 totalled 702,707 tons, as compared with 670,089 tons in 1910, and 701,281 tons in 1909.

Exports of coal during 1911 were 609,737 tons, as compared with 615,082 tons in 1910, and 633,253 tons in 1909. Coke exports for 1911 were 299,915 tons, as compared with 230,735 tons in 1910, and 198,313 tons in 1909.

Financial Notes

The Lehigh Coal & Navigation Co. has listed $3,000,000 collateral trust 4½% gold power bonds, due Dec. 1, 1921, and $1,750,000 collateral trust 4½% gold bonds due Nov. 1, 1930, on the Philadelphia Stock Exchange.

Although comparatively speaking the Nova Scotia Steel & Coal Co.'s earnings are small, 8% has already been paid on the preferred stock, the issue amounting to $1,030,000. In 1909 a common stock dividend of $1,000,000 was distributed, which increased the total outstanding to $6,000,000.

It is estimated that the Pittsburg Coal Co. will benefit to the extent of $1,160,000 a year by the ruling of the Interstate Commerce Commission in reducing the freight rate to lake ports 10c. per ton, but this will be offset to some extent by the increase of 5c. a ton in wages to miners. The net advantage to the company, however, will be about $600,000 a year.

The Delaware & Hudson coal operations during 1911 included the mining of 7,280,939 tons of coal, an increase of 633,280 tons. Gross revenue from the coal mining department was $13,355,014, an increase of $1,548,126 over 1910; gross expenses amounted to $13,238,304, an increase of $1,790,077, leaving a net revenue for this department of $116,710, a decrease of $241,951 for the year. Construction and betterments included in the coal department expenses amounted to $823,654, as against $766,673 in 1910.

In the year to June 30 last, the Philadelphia & Reading Coal & Iron Co.'s income account wound up with a loss of $103,316. For 1910 the loss was $71,500 and for 1907, $71,482, an aggregate deficit for the three fiscal periods of $246,298. In 1909 and 1908 profits of $66,973 and $207,523, respectively, were shown, or $274,496 in total. Thus the net profits for the five years were $28,198. This only partially measures the unprofitableness of Reading's coal business, as the foregoing balances make no allowance for full interest on capital invested in coal lands.

Alphabetical Index to Advertisers

Classified Index to Articles Advertised

Did you read the talk on Advertising on the front cover of this issue? It contains a moral for every reader of COAL AGE.

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COAL AGE

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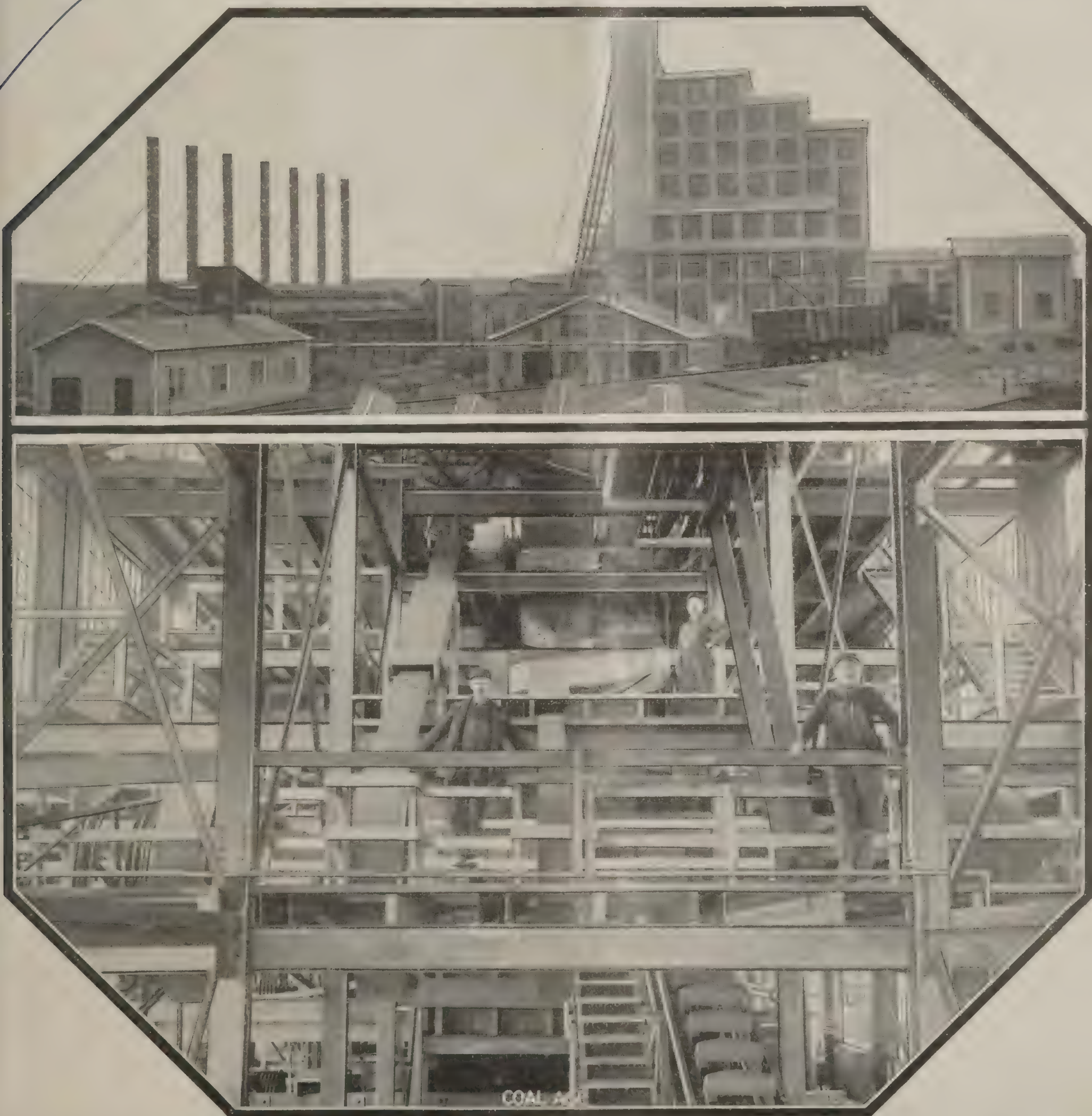
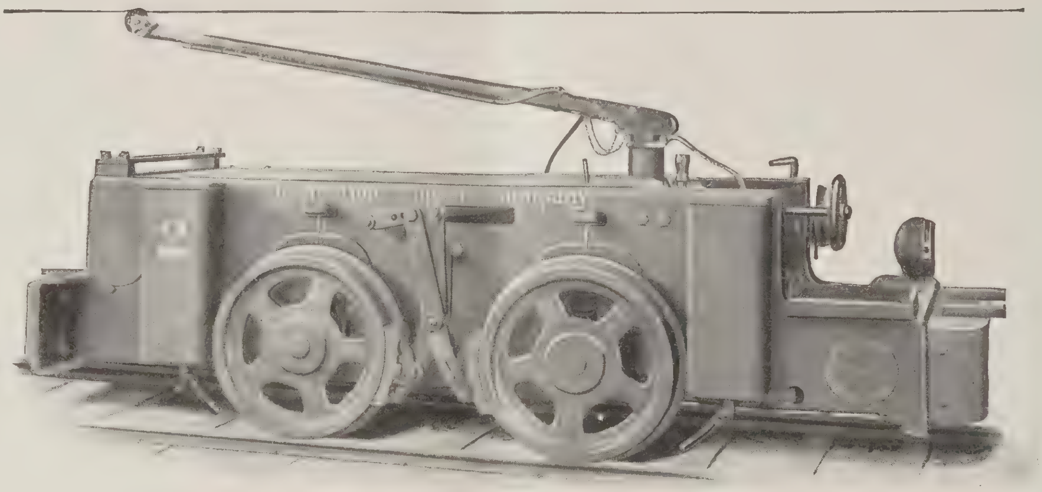


L. V. Coal Co.'s Buck Mountain Colliery, Mahanoy City, Penn., and Interior View of Breaker



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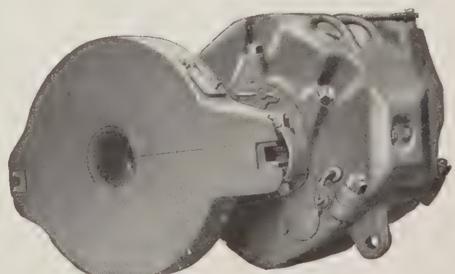

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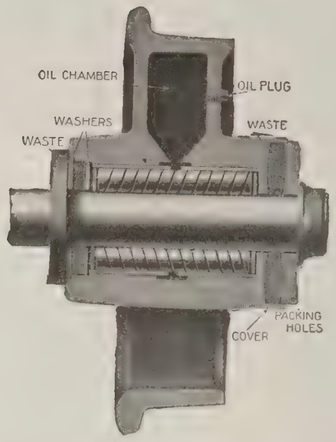

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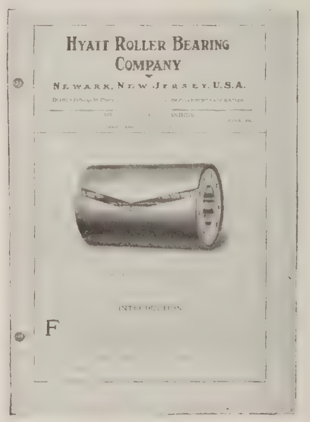

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COAL AGE

Vol. 1 NEW YORK, MAY 18, 1912 No. 32

EVENTS of the past few weeks have proved that the foreigner at our coal mines is a factor to be reckoned with. If John White and his lieutenants can't control this hot-headed, lawless element in their organization, certainly no lasting good can ever result from even the slightest recognition of the Miner's Union.

Innocent people have been slaughtered, bad feeling engendered and public confidence in the power of labor leaders to negotiate a contract destroyed—all because an ignorant and excitable body of men have been herded into our anthracite collieries through the short-sighted economic policy of mine owners. The future of native labor has been seriously injured, and a soil adapted to the cultivation of radical socialism and anarchy has been provided.

In handling our most recent controversy, one or two anthracite managers acted unwisely in attempting to load coal with men drafted from their engineering department, but there was no sufficient and excusable reason for the riots that occurred when repair men were sent underground, and surely no one believes that an operator must allow his mine to flood when only a suspension is in force and a strike not yet ordered. The course of conduct followed by the American members of the Union has been admirable, and we begin to wonder whether in this matter of alien labor, the industry has not "sowed a wind from which it will reap a whirlwind."

In 1910, only 27 states exceeded in population the number of immigrants who came into this country. Up until 1880 these newcomers were mostly from the countries of Northwestern Europe. They were not dissimilar to our early colonists, were skilled artisans and were accustomed to a representative form of government. During the past 30 years, the tide of immigration has begun to flow from Southern Europe, bringing people trained under an autocratic government, and not far removed from serfdom.

In 1860, Germany, Great Britain and Ireland furnished 88 per cent. of the total immigration, while Austria-Hungary, Italy, Russia and Poland sent only four-tenths of one per cent. During the decade 1881–1890, the percentages were 55.6 and 17.6 respectively. Then the balance turned; industries were centralized and employers called for the unskilled peasants of Southern Europe. During the period 1891–1900, the percentages were 31.6 and 51; in 1909 the figures were 13 and 63 respectively.

Advocates of unrestricted immigration contend that large-scale industry requires a floating and unemployed labor force. It might be better, however, to dovetail industries so as to spread the demand more equally over the entire year. Irregular working habits demoralize labor. It is also a fact that wage-earners having a low standard of living delay the introduction of improved labor-saving machinery. Today we are more dependent upon the utilization of mechanical ingenuity than upon the presence of a mass of unskilled workers.

The immigrants who came to this country in 1909 brought with them $17,331,828, and more than one-half of them brought less than $50 apiece. During one year of ordinary prosperity the total amount of money sent abroad by foreigners is approximately $200,000,000. That ablest of labor leaders, John Mitchell, says: "The American people should not sacrifice the future of the working classes in order to improve the conditions of the inhabitants of Europe. Unregulated immigration is certain to degrade labor in this country."

The only way the native American has been able to rise has been by delaying marriage, and by reducing the average size of families. One authority goes so far as to claim that immigration has not increased the population, but merely replaced the native with foreign stock. Furthermore, unrestricted immigration aggravates cycles of overproduction, produces a sort of caste system, and generates political evils. It would be better to raise the standard of living in this country and let our influence spread by contact and example, rather than to try and lift all nations at once and only a little way.

Our mines can produce 50 per cent. more coal than we can consume or export, so why flood the market with alien labor that cannot be controlled by employer, nor led by fellow worker?

The New Buck Mountain Breaker

By E. L. Cole

A thoroughly modern anthracite plant of 1800 tons daily capacity is here described. The breaker embodies several new and important features of design, notably a belt conveyor for loading out all coal, and requires only 36 employees for its operation. The structure is of concrete and steel fireproof construction, thoroughly equipped, excellently lighted and practically free from dust.

The Lehigh Valley Coal Co. has just completed the construction and equipment of the surface plant for its new Buck Mountain colliery. This is located on top of the north spur of the Broad Mountain, 1642 ft. above sea level, two miles east of Mahanoy City, Penn.

The new plant has been erected for the purpose of handling the output which was previously prepared at the old Buck Mountain and Vulcan breakers, situated about three-quarters of a mile east and west respectively from the present operation, and these older structures have now been abandoned. The Buck Mountain, Seven Foot, Skidmore, Mammoth and Primrose seams are worked in this locality.

The plant, as a whole, is thoroughly modern and complete. It comprises a breaker, boiler house, shop, warehouse, office, etc., all of concrete and steel fireproof construction. The general layout of buildings and tracks is shown in the plan, Fig. 1. The feature of greatest interest, however, is the breaker. This is built beyond the outcrop of the underlying coal and adjacent to the tracks of the Lehigh Valley R.R.

Novel Departure in Breaker Design

The Buck Mountain breaker embodies a number of new and unusual features, notably the loading of all transportation cars, one at a time, by means of a belt conveyor, which serves a double row of storage pockets running at right angles to the loading track. In this respect, and in general design, it is similar to the Lehigh Valley company's Mineral Spring breaker near Wilkes Barre, Penn., which has been in successful operation for nearly a year. In construction, however, it differs from the Mineral Spring plant, in that the pockets and entire substructure, up to the level of the jig floor, are of reinforced concrete, instead of steel and timber, as in the previous design.

Some apprehension was felt by the designer in regard to the disintegrating action of acid water on the concrete of the storage pockets, and to adequately provide against such action, the bins were lined as follows: The concrete surfaces first having been coated with a special waterproof paint, a layer of 2-in. plank was laid down and covered with prepared roofing, and on top of this was placed a flooring of 1-in. boards. The whole was then covered with 1-in. hard wood to take the wear of the sliding coal.

Above the jig floor, the breaker framework is of structural steel, sheathed with corrugated iron. Timber is used to some extent for supporting machinery, in the construction of chutes, and in some instances for walk ways and stair treads. But taken as a whole, the structure is obviously non-inflammable and practically fireproof. Too much emphasis can scarcely be given to the desirable results obtained by the liberal provision of large steel-framed window sash. These afford ready means of ventilation, in addition to an abundance of light which is remarkable in comparison with the murky interior of the average breaker.

Method of Preparation is "Wet"

The method of preparation adopted at Buck Mountain is in some respects distinctly different from that usually employed. In the first place, it was not desired to make any size of coal larger than egg at this plant, and consequently the lump, steamboat and broken sizes, separated at the head to facilitate cleaning, are immediately broken down. Moreover, it was determined that the most dependable results could be obtained by submitting the entire output (excepting the smaller steam sizes) to a jigging process, and this results in a system of preparation which is consistently "wet" throughout.

Coal is hauled to the breaker in mine cars by two Vulcan Iron Works steam locomotives from the Vulcan and Buck Mountain slopes, located, as previously mentioned, about three-quarters of a mile east and west respectively from the new operation. The cars enter the double tracks, under the extreme northern side of the breaker, which is partitioned off from the rest of the building by a wall of vitrified tile. This serves the dual purpose of a fire wall, and an inclosure for the under part of the breaker structure.

The coal cars are hoisted to the top of the breaker, a distance of 162½ ft. on single-deck self-dumping cages, operating in a double-compartment steel tower. During a recent trial run, 22 cars were hoisted and dumped in 16 min. The coal empties from the mine cars into a dump chute or hopper and is fed, under control of hand-operated gates, onto a pair of 4x16 ft. double-deck shakers.

Picking Done at Head of Breaker

Steamboat and lump sizes are taken off the top deck of these shakers and led to a moving picking table, 5 ft. wide and 28 ft. long, which is centrally located on the headroom floor. Stationary platforms about 6 ft. wide are built up flush with the moving table on each side, and the four pickers who are stationed here to examine the coal (two each on the right and left) work in pockets about 2 ft. deep. This arrangement enables the men to slide the coal or rock from the moving band without any lifting, thus lightening their task and increasing the efficiency of their labor. At the center of table, the headroom floor slopes up from either side to provide alleyways for the removal of particularly large pieces of rock. Doubtful coal is pushed by the pickers to the right and left of the moving table, and the slate is here chipped off by four men and thrown into the rock chute. A clutch lever, near the end

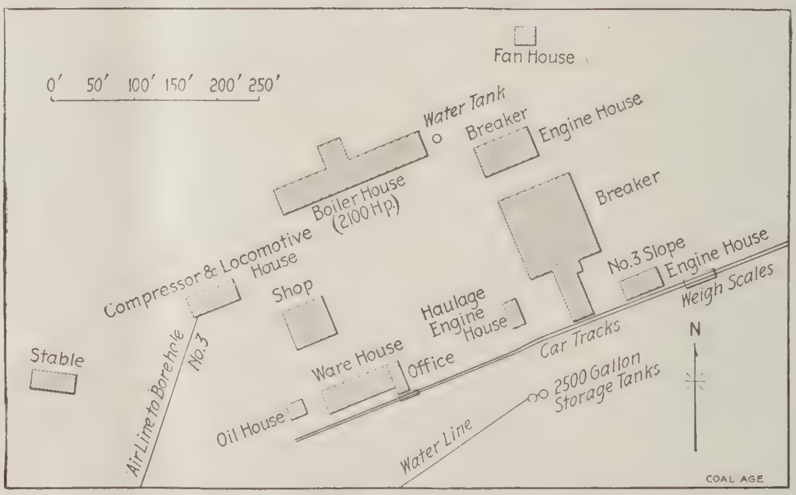


Fig. 1. Layout of Colliery Buildings and Railroad Tracks

of the picking table, affords a ready means of stopping it when desired.

A diagram indicating the flow of coal through the breaker is shown in Fig. 2. When the steamboat and lump coal leaves the picking table, it enters a set of compound-geared crushing rolls, which have a peripheral speed of 300 ft. per min. These rolls are of the segment

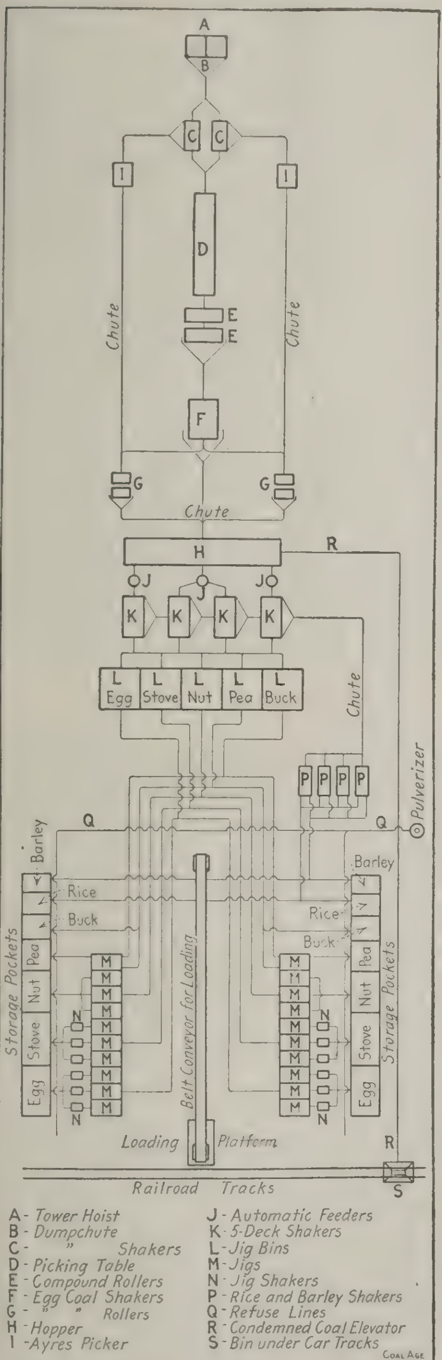


Fig. 2. Diagram Showing Run of Coal

type, affording a convenient means for changing their size and facilitating repair work when needed.

From the crusher rolls, the coal drops through a waterfall chute, a distance of 12 ft., to a single deck shaker, which takes off coal of egg size. This may be led directly to the pocket *H* or sent to the No. 3 rolls and broken down. The under size from the above mentioned shaker and the broken-down egg go to the hopper *H*.

Breaker Automatically Fed from a Large Receiving Hopper

The broken coal, which is made over the lower deck of the dump-chute shakers, passes to a pair of Ayres pickers and then enters the No. 3 rolls. All coal smaller than broken drops into the hopper *H*. There is thus collected in the hopper, all the coal which passes through the breaker and when it reaches the hopper it is all of egg size or smaller.

From the hopper, the coal is fed out through three Tench automatic feeders to four banks of shakers of the five-deck Parrish type, which separate it into egg, stove, chestnut, pea and buckwheat sizes. Coal of each size is then conducted through water-fall chutes to its proper 30-ton pocket, five of which are located immediately above and behind the jigs. The jigs are of the standard Lehigh Valley type and are 20 in number, 10 on each side of the breaker, and, as to service, are divided as follows: 5 egg, 5 stove, 6 chestnut, 2 pea and 2 buckwheat. The pea and buckwheat jigs are interchangeable, so that four jigs are available for either size.

All coal screened through the buckwheat shakers passes to four sets of rice and barley shakers, having $\frac{3}{16}$-in. and $\frac{3}{32}$-in. round mesh on the upper and lower decks respectively. Coal passing through the $\frac{3}{32}$-in. mesh goes out with the wash water, which is used for flushing ashes from the boiler house.

From the egg, stove and nut jigs, the coal is discharged by the individual jig scraper lines onto small shaking screens, which remove any undersize material that may have resulted from breakage in the chutes and jigs. It then passes to the pockets after examination by pickers stationed on the jig floor. The jig refuse is carried away by two scraper lines, one in front of each battery of 10 jigs, and is conveyed to the rock chute. Rock from all parts of the breaker is collected in this chute and led to a No. 6 Gates crusher, furnished by the Allis-Chalmers Co., Milwaukee. After passing through the crusher, the rock is conveyed, at the present time, by a scraper line, about 125 ft. to a rock dump on the mountain side.

The jig tanks are flushed out by means of hand-operated gates, which discharge into concrete hoppers and troughs under the jigs. This slush is carried over a shaking screen, and the material screened out is returned to the breaker by way of a scraper line, which discharges into the condemned-coal elevators.

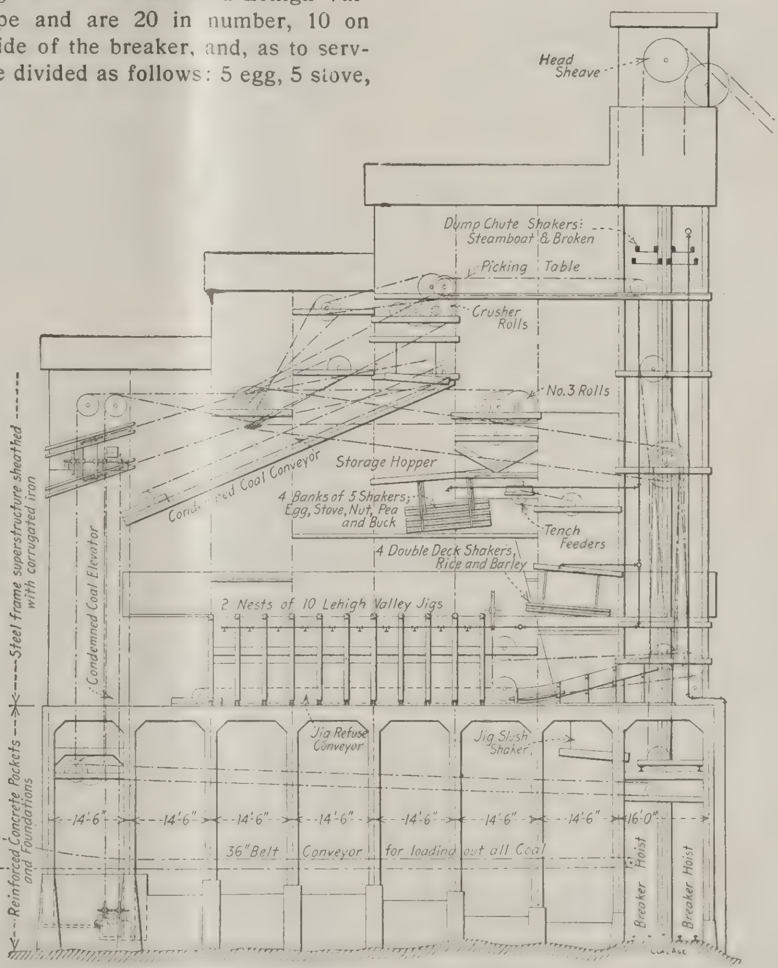


Fig. 3. Side Elevation, Buck Mountain Breaker

Cars Loaded by Belt Conveyor

A view of the loading headroom, looking down on the 36-in. conveyor belt and operator's platform is shown in Fig. 5. This

conveyor belt runs centrally between the two rows of storage pockets, which are in duplicate, so that every size of coal is stored symmetrically on both sides of the belt. Coal is led to the belt by curved chutes, which deliver it longitudinally in line with the direction in which the belt moves. Its flow from the pockets is regulated by a number of pivoted lift gates, all of which are operated from the loading head through a system of shafting and levers, under the control of the one man employed there.

The belt conveyor is provided with a steam-operated boom end for adjustment to suit the several sizes of railroad cars, so that unnecessary breakage is avoided. All this mechanism, the belt itself, pocket gates and the boom end, is run and controlled by one man, who is thus enabled to load seven cars an hour without other assistance than a man outside to drop the cars into place. It will be noted from Fig. 5, that the operator's position at the head of the loading platform is inclosed by large windows, which protect him from inclement weather and at the same time afford an unobstructed view up and down the tracks.

To provide for the economical handling of condemned coal, hoppers are built under the railroad tracks, a short distance below the breaker, and cars which fail to pass inspection are brought here and dumped. The coal passes from the hoppers to a slightly inclined scraper line that carries it to the elevators *R*, in the front of the breaker, whence it travels to the hopper *H*, or No. 3 rolls, as the case may be, for repreparation. It will be noted that there is but one set of elevators in the breaker. This handles all screenings, pickings and material from the jig-slush shakers as a usual load, but is of ample capacity to take care of the condemned coal in addition, and this latter material is thus prepared at a minimum of expense, since no additional labor is involved, except possibly one man to handle the railroad cars.

Railroad Cars Handled by Continuous Cable Haulage

Transportation cars are handled to and from the breaker by a continuous cable haulage, which is driven by a Litchfield compound-geared endless-rope haulage engine. This cable runs up and down throughout the length of both empty and loaded storage yards, and is so arranged that a car on any track may be moved by it in either direction. The cars are attached to the rope by a Morgan patent cable grip, carrying a 25-ft. length of chain for hooking on to some handy part of the car. The tracks throughout have a grade of about one-fourth of 1 per cent. in favor of the loads. This method of handling cars eliminates the delays consequent upon dropping them down by gravity in severe winter weather and enables one man to keep the plant supplied.

The breaker is driven by two separate engines, a 12 and 16 x 24-in. tandem-compound Corliss jig engine and an 18 and 36 x 30-in. cross-compound Corliss engine for the main drive, both built by the Vulcan Iron Works, Wilkes-Barre, Penn. Rope and belt transmission systems are employed, there being about 1670 ft. of belting, as compared with 3500 ft. of 1½-in. manilla rope.

There is in this building a noticeable absence of the vibration usually encountered in breaker structures, due in great measure to the fact that all shaking screens are balanced. An item worthy of special mention is the careful manner in which all bearings are housed, each being provided with a Philadelphia automatic grease cup.

A notable feature of the electric signal system in the breaker is the construction of the push buttons. These are made of two pieces of No. 12 sheet brass, mounted on oak blocks. The top plate, when bent down, affords a considerable rubbing surface on the under plate and a reliable contact is readily secured. The ordinary type of push button has failed to meet

Fig. 4. Ayres Picker for Broken Coal, and Shaking Screens

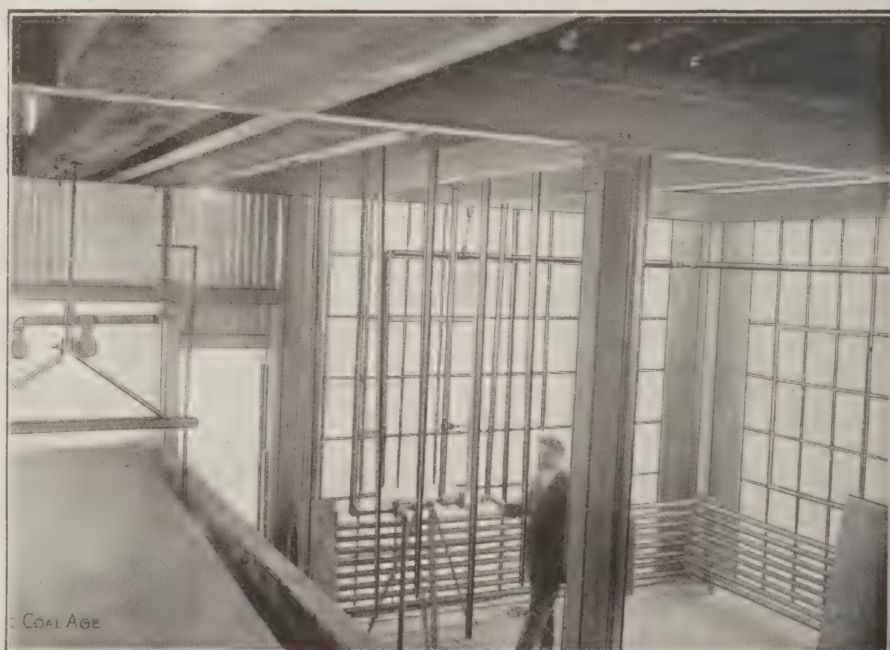


Fig. 5. Loading Conveyor and Operator's Platform, Showing Control Levers

the rigid requirements of breaker service, and hence this more rugged form has been devised. The breaker is electrically lighted when required, and is heated by exhaust steam, 15,000 ft. of 1½-in. pipe having been installed for this purpose. "Childs" fire extinguishers are located at convenient points throughout the building,

Fig. 6. Breaker Head Room, Showing Moving Picking Table

Fig. 7. Jig-room Floor, Showing Chutes from Jigs to Pockets

although the fire hazard has been reduced to a minimum by the elimination, as far as practicable, of inflammable material.

Conveniences for Employees

The space beneath the coal pockets is divided into two large rooms, closed on all sides by walls of hollow tile, plastered with cement mortar. The west room will be utilized for the storage of such heavy repair parts of the breaker machinery as will be kept on hand. The east room is being fitted up with toilet, etc., for the accommodation of employees. The floors are of concrete, and when completed, the facilities here provided will compare favorably with those of most modern factories.

The Buck Mountain breaker is designed to prepare 1500 to 1800 tons of coal per day, with a force of 36 employees, who are paid the usual wages for this class of work. That a very high degree of efficiency in operation has been attained is evident from this fact, and from an inspection of the working of the plant. Effective measures have been taken to reduce to a minimum the breakage of coal in its progress through the breaker. Every precaution has been taken to insure the safety of employees and to increase the efficiency of their labor, as, for instance, by providing abundant light, easy and convenient means of access to machinery and stairways of reasonable pitch. Perhaps the most comprehensive criticism that can be made of the plant as a whole is that it everywhere gives evidence of having been thoroughly and carefully planned, taking advantage of the best features of modern construction, applicable to this kind of work. The design radically departs in many particulars from the beaten path of breaker construction and marks a big advance in attaining greater efficiency and economy of operation.

The plant was designed by Paul Sterling, mechanical engineer, Lehigh Valley Coal Co., under the general direction of S. D. Warriner, vice-president and general manager, and I wish to express to Mr. Underwood, division superintendent, under whose supervision the colliery-construction work was carried on, my appreciation of the information and courtesies extended.

In our next issue will appear an article dealing with the loading conveyor, car-haulage system and some details of the breaker construction, together with a description of the steam-generating plant and engine equipment.

New Base Map of Illinois

A new map of the state of Illinois, on a scale of approximately eight miles to the inch, is ready for distribution by the State Geological Survey. It is prepared in three colors so as to represent drainage features in blue; railroads, land lines, towns, etc., in black; and county boundaries and figures showing altitudes above sea level for various towns in red. This map eliminates the errors of early land surveys, so that places are now shown with correct latitude and longitude. Railroad alignments are all highly accurate.

A copy of this map on heavy paper will be sent on receipt of 10c. in stamps to cover cost of mailing. A similar copy mounted on cloth and sticks will be sent if in addition to 14c. postage, a money order for 30c. is inclosed, payable to Fred Mees Bindery, of Chicago. Remittance should be sent to the Director of the State Geological Survey, Urbana, Ill.

The best and most economical form of gangway timbering is without doubt the three-piece all-steel form of support, as the steel legs cannot be split or crushed and are in the end more economical than wooden sets. Simplicity and economy have their highest development in this system of timbering.

Mining the No. 8 Seam in Ohio

By William Hibbs *

An interesting description of the No. 8 Seam roof conditions in Ohio, and some notes on the best method of controlling same. A heavy overlying stratum of fire-clay occurs and is difficult to handle. The poor top has caused enormous losses of coal.

The No. 8 coal sea.n is considered one of the most important in the country. It is better known to the mining profession as the Pittsburg seam. The underlying stratum is, in many places, composed of hard limestone, although a soft seam of clay is often found immediately beneath the coal, varying from a few inches to a foot in thickness. This forms a good floor upon which to work, though a difficult one in which to cut drains, as is often desirable.

Roof Conditions

Near the top of the seam is usually found a stratum of clay, varying from a few inches to 3 ft. in thickness. Above this is the roof coal, which, like the other parts, is irregular, and varies from an inch to several feet in thickness. When this latter is thin, the roof is usually poor, and when it is thick, a foot or more, the roof is good or favorable to any system of propping, as it forms a bond for the capping, which is placed on top of the timbers.

Above this roof coal is found a great obstacle to economic mining, especially in eastern Ohio. This is a stratum of clay and limestone, mixed irregularly, and sometimes stratified to some extent, with slate; it is from 3 to 20 ft. in thickness. Taken as a whole, it is soft and brittle, and when too small pillars are left, or the pressure becomes great, it is very difficult to hold, and often comes down without warning, especially where the roof coal has fallen.

This one difficulty, in connection with mining the Pittsburg seam in this state, has taxed the ingenuity of every mining official, and calls for the best judgment and experience to successfully handle. Many have succeeded fairly well, but others have failed, and not a few companies have gone to the wall on that account. Many of these difficulties have been overcome, but there still remain some errors in practice and customs, which are seemingly overlooked.

Mistakes in Timbering

In the accompanying line cuts, Fig. 1 shows a geological section of the strata in the vicinity of, and including No. 8 seam, while Fig. 2 is a sketch showing a cross-section of a working chamber or room. On the map, in Fig. 3, is shown a proposed plan for future mining of a section of a mine, consisting of a pair of butt entries. This is done sometimes by the engineer, but more frequently by the superintendent in the office, and Fig. 4 shows how it not infrequently works out.

Referring to Fig. 2, it will be noted that the main seam has been worked out, and that the thin seam of clay, sometimes called the head-stone, has also been taken down. The roof of coal has, owing to its spongy nature, sprung down and left a thin opening between it and the overlying clay at *F*, thus removing the support for the latter.

A portion of this material will soon slip out and rest on the coal beneath. Its opening will make way for more, and it will not be long until enough has fallen to overload the roof coal. It will then crack open at *A* and throw off chips at *C* and will be considered dangerous. By setting two props against the roof, it will hold until the load on the coal becomes heavy enough to break the posts or shear the coal around the caps, when the whole mass will fall.

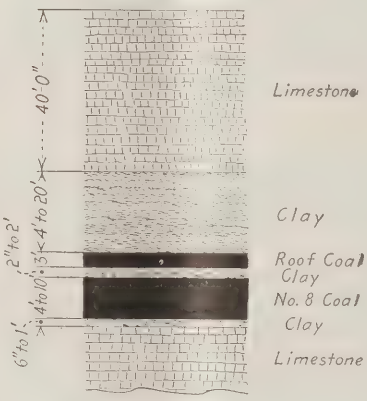


Fig. 1

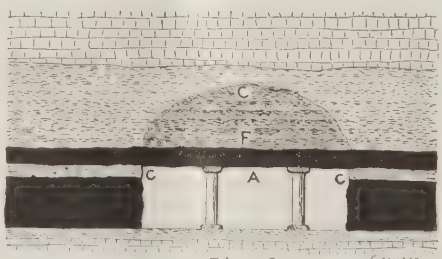


Fig. 2

No. 8 Seam Roof Conditions

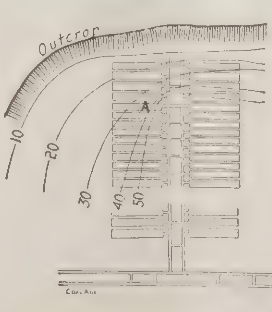


Fig. 3

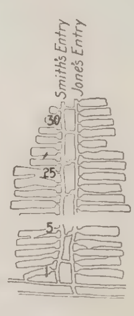


Fig. 4

*Mining engineer, Scio, Ohio.

The error in this case lies in not setting posts hard up against the roof, thus preventing the roof coal from springing away from the clay. Probably nine falls out of every ten in the No. 8 coal in Ohio are due to this cause, and I have seen as many as 20 per cent. of the posts set in a room, which were serving no purpose whatever. They were not carrying any load, and as soon as the roof settled, the capping would roll and displace the post instead of carrying the weight.

Proposed Plan and Actual Plan

In Fig. 3, the superintendent's plan looks splendid on paper, but he did not make any allowance in the pillars for a difference of weight, due to more or less cover. His rooms are just as wide and his pillars just as heavy under 20 ft. of cover as they are under twice that much. Also the entries were not driven by sights, and as a consequence are very crooked. As soon as the miners made a turn, they knew not which way to go, nor how far. The rooms were marked off by measuring along the crooked entries, and consequently are not evenly spaced, which resulted in thin ribs at some points and thick ones at others. The room necks widen gradually into full room width, instead of in the square way, shown on the plan, Fig. 3. As a result, there is always a place in the neck where it is so narrow that the miner thinks it not worth while to set posts, yet it is too wide to stand long alone, and the results before described are repeated. Two out of every five of the room necks on these entries broke down and gave trouble before the work was finished.

The rooms, like the entries, were driven without sights, and probably by sound through the ribs and an occasional crosscut. Often too many crosscuts were driven, some of them accidentally, and very frequently the law was violated as to the distance between them. The Nos. 1 and 2 rooms on both entries should never have been driven, as they rob the entry pillar.

Losses of Coal

On Smith's entry, all of the rooms were driven near a line, but owing to poor timbering and shutdown of the mine, the roof caved at the faces, and the management would not go to the expense of recovering them. The balance of the coal beyond their faces was left for future generations. On the same entry, rooms 24 and 25 were driven together when in

about half their distance. They were timbered at this place, but the roof broke down before the rooms were finished, and this was repeated several times in these entries.

These entries were driven just fast enough to make room for new working places as they were needed, and so proceeded slowly. By the time the last rooms were reached, all of the entry roof in both entries up to the third crosscut from the face was broken down to a height of 8 ft. above the coal. This roof material had all been removed from the mine. The last rooms on Smith's entry were abandoned, before reaching the limit, because it did not pay to send a mule and driver there to haul the coal out for only a few men. Thus the remainder of the coal was left, and practically lost to this and succeeding generations. On account of the roof breaking down in the entries and room necks, square with the coal, it was too dangerous to mine many of the ribs and entry pillars, and they, too, were left in.

Owing to this haphazard way of mining, only about 60 per cent. of all the coal was recovered. This is a common sight in many of our mines but improvements are being made. Many are driving their entries to the limit, timbering as they go, and by turning rooms at the back end first and bringing everything minable with them on the return, are meeting with much better success.

An Interesting Overwind Preventer

Special Correspondence

A new device for preventing overhoists is especially interesting if it has been proved effective and reliable. The arrangement here described possesses the virtue of leaving the engine entirely under control of the operator except when an overwind is imminent, and tends to insure careful running by registering mistakes.

The question of preventing overwinds, both in connection with vertical shafts and inclined haulages, is a matter which deserves the careful and constant attention of mine operators. The disastrous effects of an overwind are too well known to require emphasis, and inasmuch as even the most careful and skillful engineers are liable to lapses of attention and judgment, it is advisable to supplement human control by some form of mechanical protection. From time to time, numerous devices have been proposed for this purpose, each being more or less peculiarly adapted to the special conditions for which it has been devised, and it would be unfair as well as difficult to designate any one type as universally better or worse than others which have met with extensive application.

One of the most recent types of overwind preventers is shown in Fig. 1. It consists essentially of a screw, traveling nuts, and adjustable clutch points. By referring to Fig. 1, the nuts will be seen at some distance from either end of the screw, this position, of course, corresponding to that of the cage somewhere near midway in the shaft. The screw is driven by bevel gearing from some suitable part of the engine. In the case of a shaft hoisting engine, for instance, an extension of the governor driving shaft may be used. The gear ratio is such that the speed of the screw is increased to a sufficient extent to give quick and accurate operation. This speed is, of course, determined by that of the main engine, and the length of the screw is in proportion to the length of the hoist through which the cage travels.

Nut Traveling on a Threaded Shaft Represent the Cages

From the illustrations Figs. 1 and 2, it will be seen that the traveling nuts each have a gland *D*, made in halves and furnished with a pin which may be fitted into any of the holes around the periphery of the nut. These glands are so shaped that one side of the joint forms a jaw which engages and slides on a guide bar *E*. The nuts are thus prevented from rotating, and hence are made to travel along the screw from end to end. At each end of the screw, are mounted the clutch points *CC*. The nuts come into contact with either set of these clutch points according to the direction in which the engine has been rotating. It will also be noted that on each of the nuts *B*, there is provided a tripper *F*, which revolves freely around the nut. This tripper has points *G* which engage with the clutch points *C*, mentioned above, should the cage which is represented by a particular nut reach a predetermined point above the landing

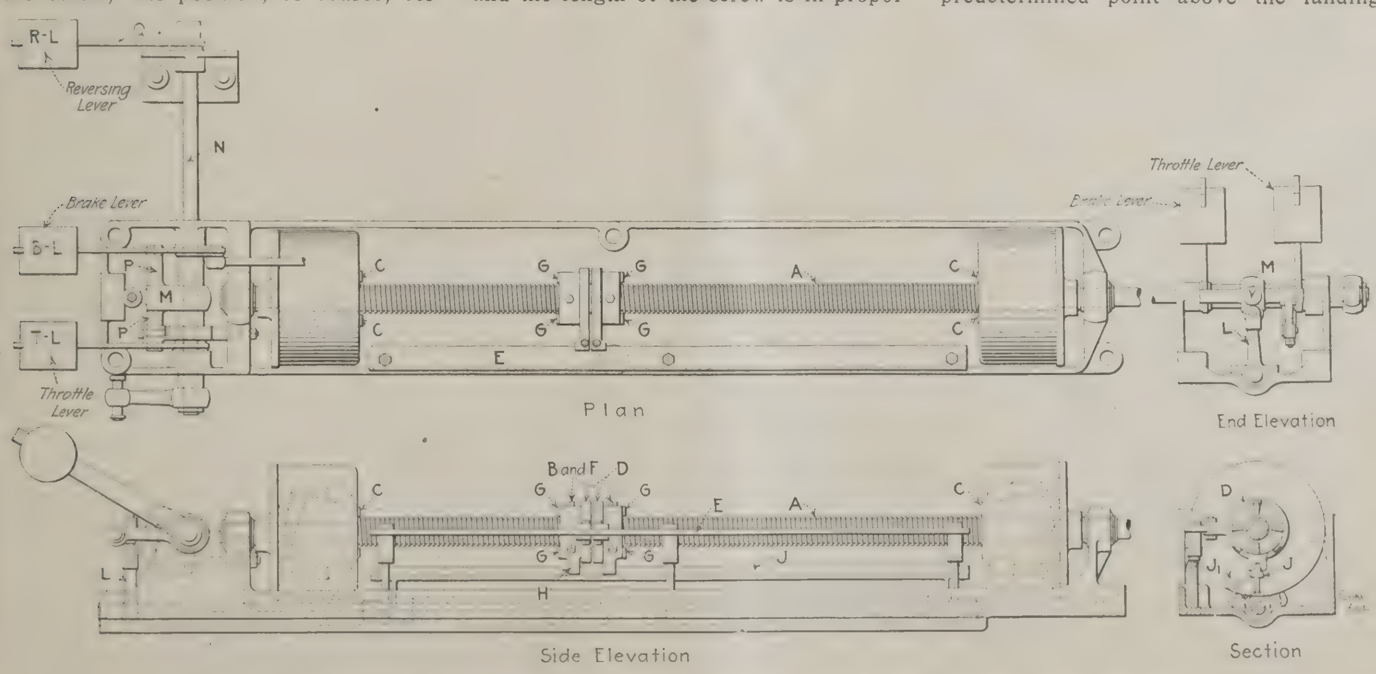


Fig. 1. Device for Preventing Overhoists, Showing Means of Control over Engine

position; or, should the speed be excessive in approaching the end of the wind, contact is made a few revolutions before the landing point is reached.

The way in which this is done will be seen by reference to Fig. 1. The tripper F has two teeth H, engaging the single tooth mounted on the trip lever J, this lever being of just sufficient length so that the teeth are engaged with it during the whole of the wind. The trip lever is secured to the shaft which also carries the supporting lever L. As long as this latter is perpendicular it prevents the lever M from leaving the horizontal position. The lever M is secured to the shaft N and so is the lever carrying the weights RL. The two levers carrying the weights BL and TL are, however, loose on the shaft, and are supported by the arms P until the tripping is effected. Fig. 2 shows an enlarged sectional view of the tripper nuts and the screw, giving a clearer idea of the construction.

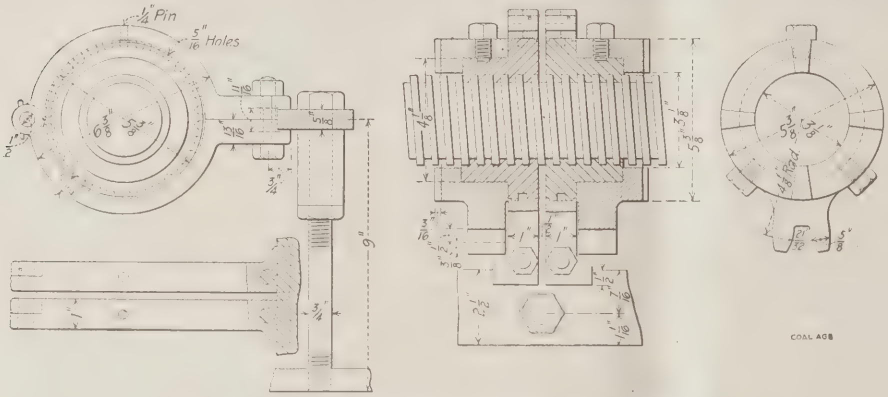


Fig. 2. Details of Traveling Nut and Guide

Purpose of the Governor

Turning now to Fig. 3, which illustrates the arrangement of the governor, it is seen that the purpose of this device is obviously to bring the engine to rest at a time when, owing to some mishap, the engineer has lost control of it. This is effected by advancing the clutch points from the position P to P_1. The two centrifugal weights B are mounted on the head casting C by means of pivoted bell-crank arms, which enter slots in the sleeve portion of the casting C and there engage the sliding shafts of the clutch points. As the weights fly out the clutch points are correspondingly advanced from P to P_1. A spring E is fitted behind the bell crank levers at the pivot points A, in order to prevent the weights from flying out too quickly at the beginning of the wind.

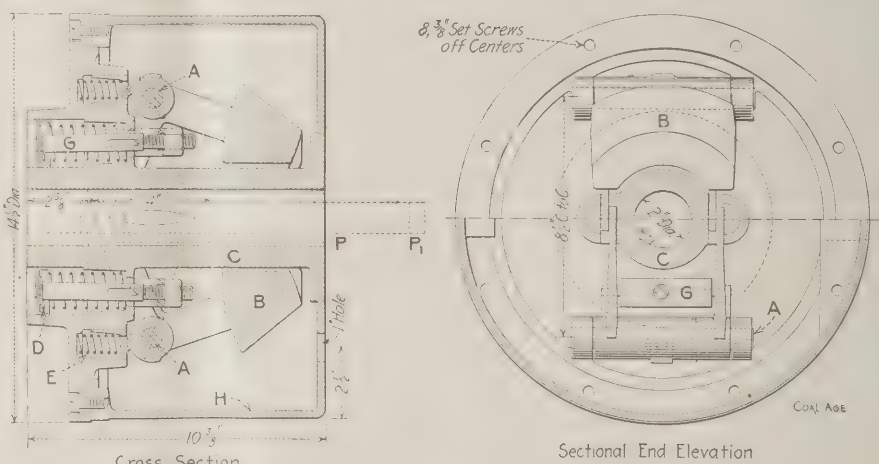


Fig. 3. Details of Governing Mechanism

Examination of the drawing wil. show that these springs are so placed as to become neutral when the governor weights are in their "out" position with the engine running, and only the tension springs D are left to restore the balls to the "in" position, when the engine is approaching the end of its wind. In addition there are two tension springs fitted between the weights for the purpose of securing better adjustment, and also to aid in bringing the weights back to normal position as the engine comes to rest. It will therefore be seen that the governor provides the automatic means previously referred to, of arresting the motion of the cage a little way below its landing position, should its speed at the time be too high.

Reliability and Accuracy

This governing device is securely incased and, if necessary, may be sealed in order to prevent interference. It has been found that in practice its sensitiveness, and at the same time its reliability are so great that the apparatus can be regulated to operate within an inch of the actual cage travel in either direction by means of the nuts, sleeve and pin, referred to above. If for any reason a release is effected, the engineman cannot put the apparatus again into normal position without help from someone else, and this means that he is made particularly careful in preventing such overwinds, as every time he makes a mistake publicity is given to the matter. If a further check is required, it is also possible to put a recording apparatus on the gear which will automatically register without the possibility of controversy every time the engineman makes a careless wind.

One of these gears has been installed recently at the Valley Field Colliery of the Fife Coal Co., Ltd., one of the largest colliery organizations in Scotland, in connection with a pair of Corliss engines having cylinders 36 in. in diameter and a 6 ft. stroke, with a working pressure of 150 lb. The drum is of the parallel type, 18 ft. in diameter, and fitted with double post brakes, while the ratio adopted for the bevel gearing driving the overwind preventor is three to one, an extension of the governor driving shaft being utilized. In operation, the plant has given considerable satisfaction and this method of automatically preventing overhoists, owing to its simplicity, comparative economy in first cost, and value in providing effective protection is worthy of the consideration of mining engineers in all parts of the world. This device is the outcome of considerable work and numerous experiments on the part of Mr. Landale, head of the firm of Douglas & Grant, Kircaldy, Scotland.

Gold Bearing Coal at Cambria, Wyo.

In explanation of the occurrence of gold in the Cambria, Wyo., coals, as noted in Coal Age, Vol. 1, p. 766, we quote the following excerpt from a recent U. S. Geological Survey Press Bulletin:

> An interesting feature about the coal mined at Cambria, Wyo., is that it is claimed to be gold bearing. Some of the coal has contained as much as $2 per ton in gold, and the coal was sold for only $1.50 per ton. When coke made at Cambria was selling for $3.50 per ton samples were taken from 31 cars during a period of three weeks and assayed. The samples showed an average of $2.46 per ton in gold and 28c. in silver. The explanation offered for the presence of gold in this coal is that the sands which submerged the old peat bog and now form the roof of the coal bed were derived in part from gold-bearing alluvium. While the sand was being deposited the gold worked down into the underlying bog and is now found in the coal.

Mining Coal on the Virginian Railroad

By Floyd W. Parsons

A new field containing more than twenty billion tons of high-grade minable coal has been opened. The chief markets in the immediate future will be New England and South America. Consolidation necessary. Low mining cost possible.

The richest coal field in the world is that territory situated in the southern part of West Virginia. The fuel here mined runs from 14,800 to 15,300 B.t.u., which heat value is not excelled by any variety of anthracite or bituminous coal in any country. Because of their excellent quality, these West Virginia beds, although located somewhat distant from important markets, have been rapidly developed. The extreme southern part of the field is reached by the Norfolk & Western Ry., while the upper edge of the district is touched by the Chesapeake & Ohio Ry. Both of these roads haul a considerable tonnage of the coal to tidewater, and a smaller tonnage to Western interior points.

Since the two roads above mentioned traversed the field on lines approximately 40 miles apart, there remained a large area of undeveloped coal that even branch lines from these main roads could not reach for many years to come. This situation was brought to the attention of Henry H. Rogers, and, in 1907, construction of the Virginian R.R. was commenced.

The initial aim of Mr. Rogers was to furnish a satisfactory outlet for that coal acreage in the Kanawha and New River basins, lying between the two older roads and not yet touched by them. The average haul from the coal field to the terminal at Sewalls Point, Va., is 410 miles.

Note—Substance of an informal talk before Eastern Bankers on an inspection trip over the Virginian Railroad.

Winding Gulf Coal Company Tipple, Store and Power House

The principal coal measures reached by the Virginian R.R. are as follows:

Series	Subdivision	Group	Seam
Allegheny		No. 5 block coal	Usually but one commercial bed.
Pottsville	Upper Pottsville or Kanawha	Upper Kanawha (splint coal)	Lewiston
			Coalburg
			Winifrede
		Lower Kanawha (softer coals)	Cedar Grove
			No. 2 gas
			Powellton
			No. 1 gas
	Middle Pottsville	New River group	Sewell seam Beckley
			Fire Creek
	Lower Pottsville	Pocahontas group	Pocahontas No. 6
			Pocahontas No. 4
			Pocahontas No. 3

The No. 5 Block Coal

The No. 5 Block coal is a good steam and domestic fuel. Its low sulphur content gives it freedom from clinker. In composition it is hard and stands transportation well. Its thickness ranges from 4 ft. to 20 ft., attaining the latter enormous size over a limited area near Bald Knob in Boone County. In physical structure it is between a typical splint and the ordinary type of hard bituminous coal, and stands transportation well. Following is an average of six analyses:

ANALYSIS OF NO. 5 BLOCK COAL

	Per Cent.
Moisture	1.81
Volatile matter	33.17
Fixed carbon	57.56
Ash	7.46
Total	100.00
Sulphur	0.79
Phosphorus	0.008
B.t.u.	13,581

Kanawha Group

The Upper Kanawha coals are hard and split into oblong blocks, having much the appearance of cannel coal. The three beds vary in thickness from 3 to 12 ft.

AVERAGE ANALYSIS OF UPPER KANAWHA COALS

	Per Cent.
Moisture	2.06
Volatile matter	33.99
Fixed carbon	57.59
Ash	6.36
Total	100.00
Sulphur	0.85
Phosphorus	0.006
B.t.u.	13,672

Lower Kanawha Coals

Separated from the Upper Kanawha beds by about 250 ft. of strata are the Lower Kanawha coals. These seams are softer than the beds above and are chiefly celebrated as gas coals. They are excellent for coking purposes, having the essential columnar structure.

AVERAGE ANALYSIS OF LOWER KANAWHA COALS

	Per Cent.
Moisture	1.39
Volatile matter	32.88
Fixed carbon	60.56
Ash	5.17
Total	100.00
Sulphur	0.95
Phosphorus	0.007
B.t.u.	14,405

nous Welsh coal used by the navy and so often compared to the New River product is as follows:

ANALYSIS OF RHONDDA VALLEY, GLAMORGANSHIRE COAL

(Authority, R. H. S. Redmayne, H. M. Chief Inspector)

Moisture	1.24
Volatile matter	18.53
Fixed carbon	77.19
Ash	3.04
Total	100.00
B.t.u.	14,159

The Welsh anthracite runs about 94 per cent. fixed carbon, with only 4 per cent. volatile matter and less than 2 per cent. moisture and ash. An average ultimate analysis of 37 samples of Welsh coal gave:

AVERAGE OF 37 SAMPLES

Carbon	83.78
Hydrogen	4.75
Nitrogen	0.98
Oxygen	4.15
Sulphur	1.43
Ash	4.91
Total	100.00
B.t.u.	14,858

It is evident from the above that the Welsh coals are a high-grade fuel, but I do not see any reason to believe they are equal in heating value to the New River product, or superior to the Pocahontas coals.

The New River group lies about 1000 ft. below the Lower Kanawha coals. They take their name from the fact that these beds were mined first along New River in Fayette County, W. Va. They occupy a rock interval of about 325 ft., with the Sewell bed at the top, the Beckley seam 225 ft. lower and the Fire Creek coal 100 ft. below the Beckley. These beds are low in ash and sulphur and have the typical physical structure of a coking coal; their only weakness for this latter purpose lies in their unusual purity, the low-ash content preventing their having a good burden-bearing capacity for furnace use.

MacAlpin Coal Co., MacAlpin, W. Va. Drift Mine with Steel Tipple

The New River Coals

The New River seams are without doubt the best steam coals in the world. The only other fuel product ever compared to them is the Welsh coal. This latter is bituminous in Monmouthshire, but becomes less so toward the southwest, until in Mid Glamorgan, the coal is an excellent smokeless steam product used by the British navy. Toward the west (Pembrokeshire and Caermarthenshire) the seams pass into anthracite. An average analysis of the semibitumi-

In the future, it is probable that these New River coals will be largely used in coke manufacture by mixing them with other coals higher in volatile matter and ash. This practice is already being followed by the United States Steel Corporation at its plants in Illinois.

For steam purposes, and especially for use in naval vessels, where a high heat value and a low rate of depreciation in storage are essential, these coals are un-

equaled. Their low sulphur content makes them comparatively free from spontaneous combustion. Their composition is shown below.

ANALYSIS OF NEW RIVER COAL
(Average of the Three Seams)

Moisture	1.16
Volatile matter	18.22
Fixed carbon	76.94
Ash	3.68
Total	100.00
Sulphur	0.78
Phosphorus	0.010
B.t.u.	15,094

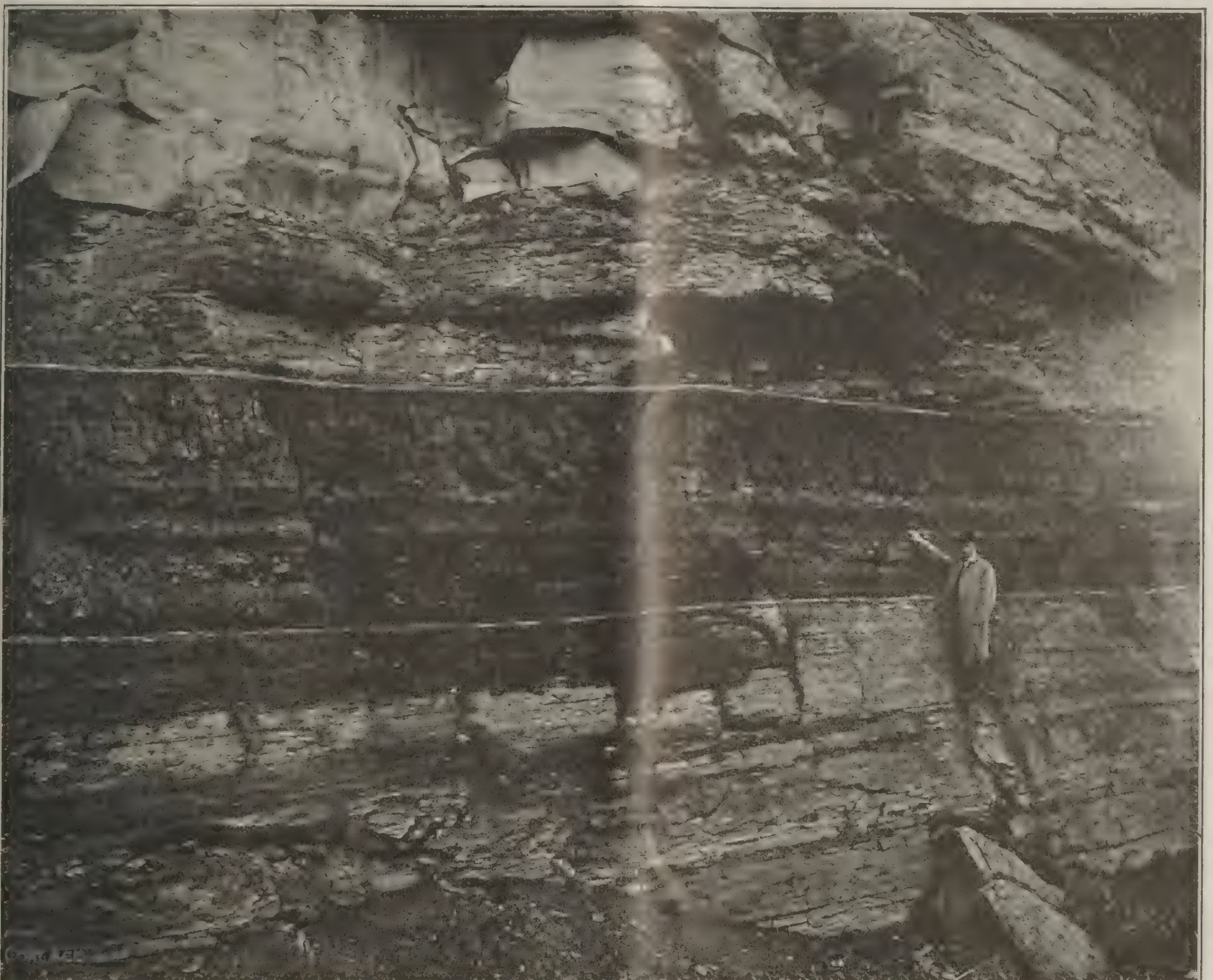
ANALYSIS OF POCAHONTAS COAL

Moisture	1.92
Volatile matter	16.60
Fixed carbon	76.63
Ash	4.85
Total	100.00
Sulphur	0.640
Phosphorus	0.008
B.t.u.	14,947

Estimated Tonnage Available

Carefully prepared reports by Dr. I. C. White, state geologist of W. Va., and the greatest living authority on the Appalachian coals, indicate that within the region tributary to the Virginian Ry. and its branches, there are available approximately 750,000,000 tons of the No. 5 Block coal; more than 7,000,000,000 tons of the Upper Kanawha coals; 8,250,000,000 tons of the Lower Kanawha coals, and 4,000,000,000 of the New River and Pocahontas. This estimate shows a total of approximately 20,000,000,000 tons of coal in the territory traversed by the Virginian Ry. These measures lie adjacent to the road for a distance of 85 miles, as we travel east from the western terminal at Deepwater.

The future of this southern West Virginia field is well assured, (1) because the coal is equal to any fuel anywhere in the world; (2) it is the nearest high-grade fuel to tidewater and will forever monopolize the seaboard trade at Hampton Roads, since no coal further west equals it in quality, and it is, therefore, impossible for any other fuel to cross this field and participate in tidewater shipments; (3) large cities, great industrial corporations and government bureaus are purchasing practically all their fuel supply according to specifications, which are based on the heat units contained in the coal, and as before indicated, the New River product averages higher in British thermal units than any other fuel; (4) the seams are thick, clean, and as a general rule, have good top and bottom, with few faults and squeezes, and as a result, mining costs are as low as can be attained in any other field; (5) labor is unorganized.



An 8-ft. Seam of Clean Coal Exposed by Railroad Cut on Winding Gulf Branch of the Virginian R.R.

Pocahontas Coals

The Pocahontas group lies about 350 ft. below the New River beds, and consists of the Pocahontas Nos. 6, 4 and 3. These coals have a similar physical appearance and chemical composition to those of the New River group, except that the former are slightly lower in volatile matter and have a little higher ash content. This greater percentage of ash makes the Pocahontas coals slightly better for coking purposes.

Markets

New England purchases approximately \$110,000,000 worth of coal every year. Of this annual expenditure, about \$30,000,000 goes to the mine operator, while \$80,000,000 goes to transportation companies and coal dealers. Most recent statistics indicate that of 28,000,000 tons of coal consumed in New England in one year, nearly 20,000,000 tons entered at New England ports, the remainder coming in by rail. If transportation and handling charges, therefore, amount to more than 70 per cent. of the total expenditure for coal, it is evident that the consumer must interest himself in the amount of incombustible matter that the coal contains. For each per cent. of impurities (ash and moisture) a ton of coal contains, 20 lb. of worthless weight must be transported and handled. Furthermore, after the coal has been burned, the consumer himself is obliged to dispose of the greater part of this weight in the form of ashes.

The largest proportion of the New England coal trade should go to operators in southern West Virginia, not only because of the quality of their product, but for the reason that the greater part of the haul is by water, and ocean freight on a bulky commodity like coal is not a large item. For the same reason, the Mediterranean trade eventually will be secured by the operators in this country. We hear much about not being able to secure bottoms, and about the difficulty of engaging a return cargo. Government action favorable to shipping is certain to come, and thereafter we will have ships aplenty. The argument that we cannot contract for sufficient return freight is absurd, and is refuted by all import statistics.

E. E. White Coal Co., Glen White, W. Va.

The South American Trade

The recent English strike permitted some of our operators to get a foothold in the coal markets of eastern South America. Indications already point to our not only being able to hold what business we have taken, but give us reason to know that American coal will surely supplant the European product within a short period of time.

We all realize the importance to the coal industry of the completion of the Panama Canal. There is no plausible excuse for our not commanding the entire trade of western South America. The greater part of this immense new coal business that is about to open to American mine owners should go to operators who ship coal from Hampton Roads. No other product that can be loaded for long-

Gulf Smokeless Coal Company, Toms, W. Va., on Winding Gulf Branch

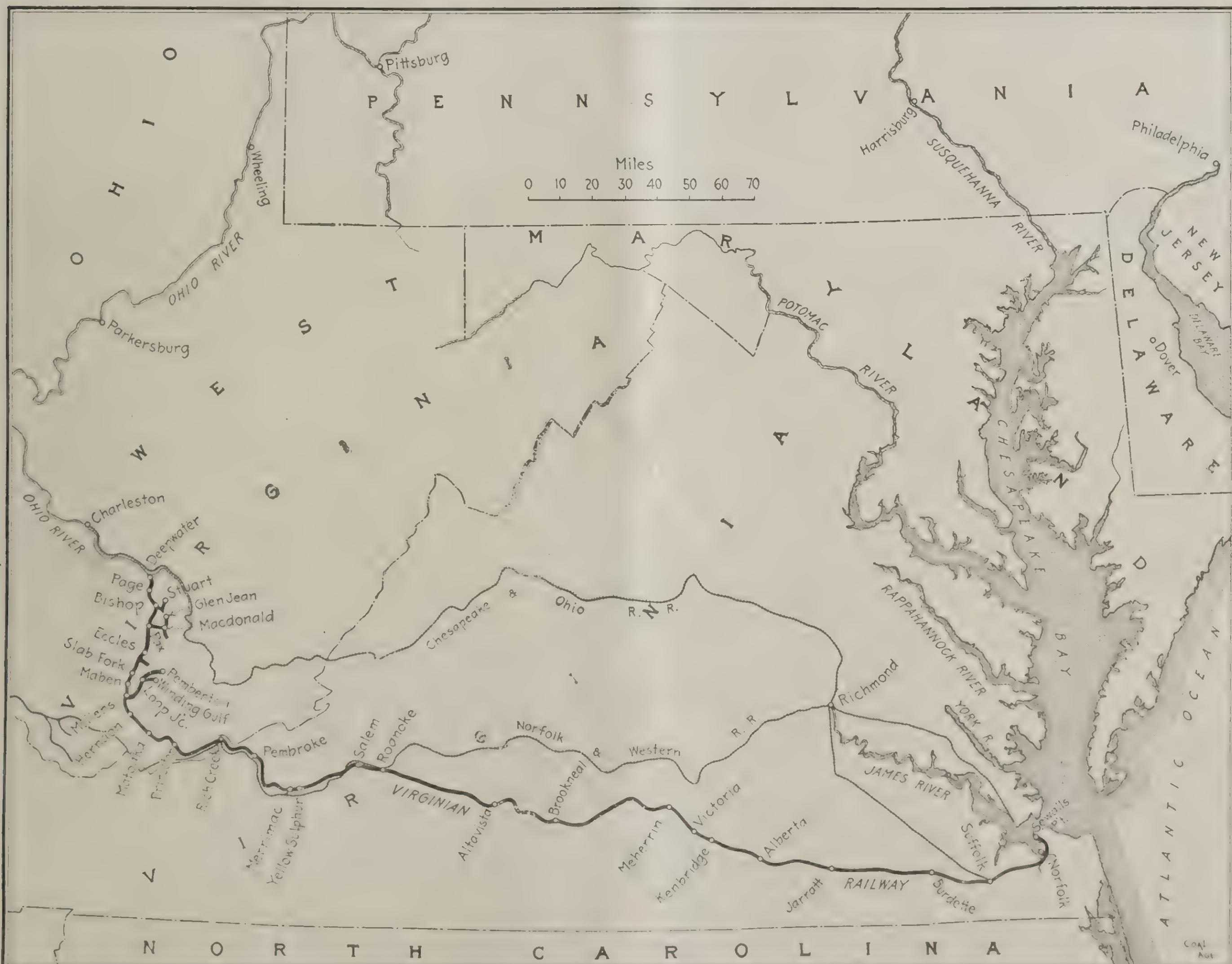
Mine No. 1, Slab Fork Coal Co., Slab Fork, W. Va.

distance shipment will stand transportation any better, or because of low sulphur content, will be more unlikely to spontaneous combustion.

The hope of the coal industry in southern West Virginia lies in the elimination of a shameless, inexcusable and merciless competition that has existed for many years. Recently there has been some improvement in selling conditions, but there are still in the neighborhood of thirteen selling agencies, which is about a dozen more than is necessary. The new business that lies open to West Virginia coal may be secured with present arrangements still in force, but it will be gained quicker and with greater certainty should a couple of powerful "business-getters" go after the markets in an aggressive and determined way.

In conclusion, although I know but little about railroading, I appreciate the great task Henry H. Rogers undertook when he started the construction of the Virginian Ry., and his death, May 19, 1909, 1½ months before the road went on an operating basis, was one of those unfortunate occurrences that seem dictated by the very irony of fate. I believe in southern West Virginia, its product and its men, and in spending practically his entire fortune—$50,000,000—in opening a new empire, Mr. Rogers performed a service to his country and to the people of the Virginias that will benefit posterity, and at the same time, will uphold his sagacity as a far-sighted business man.

[*The next issue of* Coal Age *will contain a short description and views of the coal unloading terminal of the Virginian Railroad at Sewells Point.*]



The Coal Field Tributary to the Virginian R.R., Extends from Deepwater to a Point Just North of Princeton

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Men and "Melons"

The Plymouth Coal Co., through John C. Haddock, its president, makes the following remarks on the anthracite coal situation in extension of his observations quoted in our issue of May 11:

In our first paper, with its citations from the opinion and decision of the Interstate Commerce Commission, in the Meeker-Lehigh Valley R.R. case, we believe that we proved conclusively that if there was a fair and equitable division of the excessive and oppressive anthracite transportation charges, there would be little, if any, difficulty in making a substantial concession to the mine workers, and in the granting of corresponding relief to the independent and individual operators.

As indicated in that statement, the Lehigh Valley R.R. Co., at the close of its fiscal year, June 30, 1910, had an unappropriated balance-surplus of $27,219,780. At the close of its fiscal year, June 30, 1911, this surplus was increased to $30,330,647. On Saturday last, the stock of the Lehigh Valley R.R. Co. sold at $168 a share, while on the same day, the stock in the "melon," the Lehigh Valley Coal Sales Co., sold at $260 a share! During the past ten years, since the award of the Anthracite Strike Commission, the admitted net earnings of the Delaware, Lackawanna & Western R.R. Co. have exceeded $60,000,000. At the close of the year, June 30, 1911, the Reading interests made the following "surplus" exhibit: The Reading Company, $32,287,000; Philadelphia & Reading Railway, $9,665,000; Central R.R. of New Jersey, $13,519,000; surplus of Reading companies, $55,471,000.

Of course, a statement of the operations during the past year, with a careful analysis of working assets and liabilities, would simply add to the magnitude of these impressive figures. They should be a convincing evidence that we have not been hasty nor unjust in pointing out the possibility and necessity of making an equitable and speedy adjustment with the mine workers and the independent and individual operators.

In making further comments upon the relation of the anthracite-carrying companies to the mining interests, we are compelled to point to the Lehigh Valley R.R. Company, not because it is the chief offender, but for the reason that in the Meeker-Lehigh Valley case, the able opinion and decision of the Interstate Commerce Commission, revealed conditions and methods, clearly and impressively, that are simply typical of the entire anthracite field.

Of course, in one respect, the "Lehigh Valley" has an exceptional advantage. The presidents of other roads may have claimed divine appointment. That was merely a claim, but it remained for the "Lehigh Valley" to offer a proof of the possession of a divine attribute, in demonstrating beyond the peradventure of a doubt, by incontestable evidence, that it could perform miracles. The loss of three cents a ton in the carriage of anthracite to Perth Amboy, as asserted before the Interstate Commerce Commission, is converted into a profit that is reflected in its Unappropriated Surplus Account, which grew from $1,620,681, at the close of its fiscal year, June 30, 1903, to $27,219,780, at the close of its fiscal year, June 30, 1910. We are aware that there is an old Celtic dictum, that there should be no miracles among gentlemen, but when a miracle *is* discovered in these latter days, and the manifestation of the gift, is explanatory of a balance sheet, then, we submit, that we should and must recognize it.

In the Meeker-Lehigh Valley R.R. case, before the Interstate Commerce Commission, the railroad company, in its defense, asserted, as reported by the Commission, that the rates on anthracite must be sufficient to produce four results, viz.:

(1) An income sufficient to make up for past deficiencies in current return on investment.

(2) A reasonable current annual return upon the investment in the railroad and transportation adjuncts.

(3) An amount sufficient to provide reasonably for keeping the property constantly up to modern standards, for making such improvements as are necessary to provide for public convenience and safety, and to enable the railroad to get business in competition with other roads.

(4) An amount, sufficient to provide for the return of the principal when, and as the principal becomes reduced and extinguished by the exhaustion of the coal freight.

The commission replies: Under the first proposition, the railroad company argued that the present rates should be sufficiently high to enable it now to earn the amount, by which it has fallen short of paying a 6 per cent. annual dividend in the past, or at least as far back as 1894. It shows that a dividend rate of 6 per cent., applied to its common stock of $40,441,100 for the period from Nov. 30, 1894, to June 30, 1908, would amount to $35,091,276; that during this period the dividends paid amounted to $7,260,264; and argues that upon a 6-per cent. basis, the common stock shareholders suffered a deficiency in dividends during this 14½-year period of $27,831,112.

Assuming, without conceding, that the present producers and consumers of anthracite coal must bear the burden of the misfortunes or mismanagement of a previous generation, it is worth while to inquire whether this claim does not amount for the most part to a declaration, not that the shareholder is entitled to a fair dividend, but rather to an assertion that he may invest his dividends in improvement of the property and have it in cash also.

The devotion of earnings to permanent improvements and betterments was, no doubt, a wise policy on the part of those in control of the road. But the indications are that the shareholders have already received the benefit of that policy, even though it has not come in the form of cash dividends covering the period in question. From 1894 to 1903, the average market value of Lehigh Valley Railroad stock was in the neighborhood of $75 per share. At this writing (June, 1911), the same stock is quoted at $178. Thus a person, who had invested in Lehigh Valley at par, prior to 1904, has benefited by an appreciation in value of his stock to the amount of 5 per cent. per annum since 1894 and has received dividends gradually increased from 2 per cent. to 5 per cent. since 1905. The earnings in 1910 were sufficient to pay a dividend of 20.12 per cent., but the company elected to increase its unappropriated surplus from $19,212,252, in 1909, to $27,219,780, in 1910. Moreover, the Lehigh Valley Railroad Co. has been carrying amongst its assets certificates of indebtedness of the Lehigh Valley Coal Co. amounting to $10,537,000, upon which no interest is collected. Interest on this indebtedness would be sufficient to pay a 1 per cent. dividend on the stock.

We should hesitate to assent to the Lehigh Valley R.R. Co.'s proposition that present shippers must bear the burden of earlier misfortunes of the road, but it is unnecessary to decide that point in this case because it has been sufficiently demonstrated that the shareholders have

received a fair return on their investment, taking into consideration the money actually received in dividends, the increased value of their shares, the increased value of the property, and the large unappropriated surplus.

In reviewing the claims of the Lehigh Valley R.R. Co., we may be allowed to express an opinion as to the character of its first contention, viz.: That its charges should be sufficient to make up for past deficiency in current return on investment.

That it has been done, as has been clearly shown by the evidence submitted, simply makes the wrong committed not only apparent but real. Suppose the mine workers had included in their recent demands, a claim for wages extending back for several years, to cover all lost time, had asked pay for the idle days caused by shortage of railroad cars, accidents in the mining, movement, and delivery of coal; idleness that may have been the effects of dissipation, if you will, would such a presentation have been any more absurd than the present claim that rates of transportation on anthracite must be adjusted to care for every expenditure, however improvident or ill advised, and pay a dividend thereon and accumulate a surplus besides. Are stockholders of an anthracite carrying company in a preferred class and are they exempt, ultimately, from any or all of the liability, incident to bad management? It is notorious that for a number of years, the "Valley" was "skinned" for the benefit of stockholders. The money that was paid in dividends, should have been applied to the betterment of the road. Under the efficient administration of the late president, Alfred Walter, that policy was changed, and his successor, as a result of Mr. Walter's masterful ability and experience, succeeded to the management of a property, adequately equipped and perfected, to serve the public and to meet the competition of its rivals. Well might the commission inquire if this claim does not amount for the most part, to a declaration, not that the shareholders are entitled to a fair division, but rather to the assertion that they may invest their dividends in improvement of the property, and have it in cash also!

As to the remaining contentions of the railroad company, the commission says:

"That the rates should be sufficient to guarantee a fair annual return on the investment and to provide reasonably for keeping the property up to improved modern methods, are sound but have little bearing on this case. It will be noted that the Lehigh Valley's corporate income was sufficient to pay a dividend on the capital stock of 16 per cent. in 1905, 17 per cent. in 1906, 20 per cent. in 1907, 18 per cent. in 1908, 14 per cent. in 1909, and 20 per cent. in 1910. Instead of paying such dividends, it has paid 5 per cent. on its capital stock, appropriated to additions, betterments, and improvements sums ranging from $580,206 to $2,068,590 per annum and has increased its unappropriated surplus from nothing in 1902 to $27,219,780 in 1910. Certainly, it must be conceded that the present rates provide liberally for a fair annual return on the investment and the proper maintenance of the property.

"As noted, the Lehigh Valley R.R. Co. carries amongst its assets $10,537,000 noninterest-bearing certificates of indebtedness of the Lehigh Valley Coal Co. At 5 per cent. per annum, the interest on these certificates would be $526,850. The latter sum is, in all substantial respects, a rebate to the Lehigh Valley Coal Co. The proportion of the total tonnage from the anthracite field shipped by the Lehigh Valley Coal Co. does not appear, but it is of record that it ships about 95 per cent. of the coal to tidewater. If its proportion of the total traffic is the same as that to tidewater, its tonnage for 1910 was in the neighborhood of 10,500,000 tons; and the net result of the transportation as between it and its competitors was the same as if it had had its coal transported for 5 cents per ton less than the independent dealers."

An Outburst of Carbon Dioxide*

A German periodical publishes some information on a sudden liberation of carbon dioxide which occurred in a mine at Altwasser:

As the workings were subject to outbursts of this gas, the mine management always provided an ample ventilating current to dilute that impurity. To reduce the dangers resulting from a sudden liberation of the gas, a series of precautionary measures were prescribed to be observed in the development work. On Dec. 7, 1910, an outburst of carbon dioxide was caused by the firing of a shot. Of the six workmen laboring near the face, four fell in the vicinity of the gallery.

Rescuers Summoned by Mine Telephones

Two of them succeeded in saving themselves and were able to give warning to the men outside by telephone. They then walked to the station where electric lamps and oxygen tanks are kept. The running of the fan outside was at the same time increased as much as possible. Forty minutes after the outburst, the first of the four fallen workmen was discovered. He was carried to the intake airway and was revived by oxygen apparatus. Artificial respiration was applied to the second man, oxygen being also employed. Dr. Brat's apparatus was used on the other two also, but without effect. The corps of rescue men from the "Central Station of Succor" did not arrive upon the spot until the time the fourth victim was discovered.

*Translated by E. P. Buffet for Coal Age, from L'Echo des Mines et de Métallurgie, Paris, France.

One hundred and fifty cars of coal and rock had been cast out by the outburst. The analysis of the air in the gallery gave 7.82 per cent. of carbon dioxide and 14.43 per cent. of oxygen. Breathing in it was very difficult but the air would maintain life.

According to this account of the accident, it appears that the methods of rescue which were available in the mine (the telephone, electric lamps and oxygen) rendered great service and that men from the Central Station arrived too late to do any effectual work. It would be desirable to introduce electric lighting into such galleries, to employ electric shotfiring from a distance and, by the establishment of safety double doors, to prevent the pressure from the disengaged gas from befouling the air of the entire mine.

Mine Inspectors' Institute

The fourth annual meeting of the Mine Inspectors' Institute of U. S. will convene at Columbus, Ohio, June 18, and conclude June 21, 1912. The executive committee will hold a business meeting on June 17. All members of the Institute as well as all state, territorial or provincial mine inspectors in North America are invited to attend the meeting and those not now members are desired to present their applications for membership.

The Ohio inspectors have made extensive provision for the entertainment of those who may attend, and the meeting has promise of being the most successful of any yet held.

Under the provisions of the constitution of this Institute, each state prior to the annual meeting of the Institute has the privilege of placing in nomination the names of the candidates for the several offices to be filled. The president, first vice-president and treasurer cannot succeed themselves in their respective offices.

The offices to be filled, together with the names of the present officials are as follows: President, John Laing; first vice-president, James Taylor; second vice-president, J. B. McDermott; third vice-president, D. C. Botting; treasurer, Thos. Morrison; secretary, J. W. Paul; asst. secretary, F. W. Cunningham.

A tentative program has been arranged which includes a number of interesting addresses and the presentation of papers on many pertinent subjects. The works of the Jeffrey Manufacturing Co. will be visited and a banquet held at the Great Southern Hotel, in the evening of June 30.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

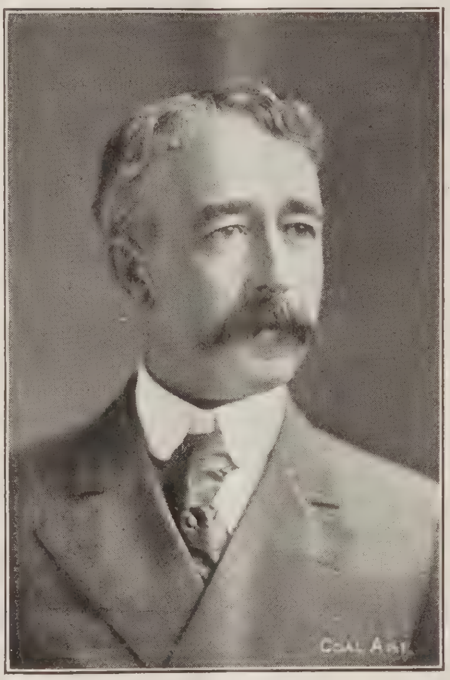
Coal mining is one class of work a man has to be born to, and if a fellow doesn't relish the smell of the air in the upcast shaft, he had better throw up his job and get a new position as clerk in the perfumery department of a big department store. Ability to stand hard knocks, grit to stay to the finish and a nature that fears neither man nor devil, are requisites to success. The fellow who lacks fear through ignorance is a menace; the man worth while is the one who can perform his work day after day, conscious every minute of the dangers that surround him.

Of course, the time does come to each diligent coal-mining man when his trips to the face grow less frequent; more time is spent in God's sunshine, and the younger element must bear the burden of the underground work. To be a real success, however, it's necessary to have gone through the mill, and many a manager today would be better for having lived longer at the face, and experienced some of the trials and tribulations of the men who labor beneath the ground.

Eli Conner always struck me as typical of what a coal man should be. The marks acquired by a regular in the army or a sailor at sea stick through life even when the individual turns to civilian pursuits. It is just so with Mr. Conner; there's something about him that reminds you that he has plugged up and down many an entry, head bent, dodging low places and projecting timbers, and, believe me, Eli has to do some bending in low places for a six-foot rule will hardly reach from the ground to the place where he parts his hair.

In Mr. Conner's particular case there has been no retirement, even temporarily, from the mines. Since way back in 1864, when he first saw daylight at Mauch Chunk, Penn., there has been but little time when the call of the mines hasn't been ringing in his ears, so getting out of practice has been an utter impossibility. Educated in the public schools of his native town, he continued his studies privately under the eyes of certain mining engineers whose names are history in the industry.

In 1882, Mr. Conner was employed by M. S. Kemmerer & Co., at Sandy Run, Penn., in the Lehigh region of the anthracite coal field. He served in various subordinate capacities under the superintendent, Walter Leisenring, and later became the engineer of the Sandy Run & Pond Creek collieries, which



Eli T. Conner

mines were operated by the Kemmerer people.

In the fall of 1883, he was sent to Harleigh, Penn., where another mine of the same company was located, and while there served first as shipper and engineer, later (1885) being made superintendent of the mine. In December, 1885, the Harleigh colliery, as well as the adjoining one, known as Eberdale, were filled with water, due to the disastrous floods of that year. After this occurrence, Eli returned to Sandy Run as engineer and assistant superintendent.

In the fall of 1887 and the spring of 1888, Mr. Conner had charge of the construction of the Moosic Mountain & Carbondale R.R., extending from Peckville to the Moosic Mountain colliery. In September, 1888, he became superintendent of the Mount Jessup Coal Co., which was controlled by the Kemmerer and Leisenring interests. In 1894, upon the death of the late Austin Moore, he was appointed superintendent of the Florence Coal Co., and of the Spring Brook Coal Co.; all this in addition to his duties as superintendent of the Mount Jessup mines. While in charge of the Spring Brook colliery, Mr. Conner designed and erected a complete new plant on the property, located near Moosic, Penn.

In the spring of 1896, the Lehigh Valley Coal Co. purchased the operations of L. A. Riley & Co., at Centralia, Penn., in the Shamokin district. The late W. A. Lathrop, who was then general superintendent of the Lehigh Valley Coal Co., selected Mr. Conner as superintendent of the new Shamokin division, which included the Riley operations and all other properties of the Lehigh Valley Co. in that region.

In December, 1896, I. R. Moister, superintendent of the Wyoming division of the Lehigh Valley Coal Company, died. Mr. Conner was transferred from Centralia to Wilkes-Barre as his successor. The Wyoming division is the most important part of the company's interests, and includes the properties of the Connell Company and the Seneca Company, which properties were purchased by the Lehigh Valley people during the time that "Eli T." was superintendent of that division. While in charge of the "Valley" mines around Wilkes-Barre, Mr. Conner designed and erected a new plant at Prospect colliery, which mine now holds the record as being the largest single producer in the anthracite region. The output through this breaker last year was in the neighborhood of 1,200,000 tons of marketable product.

In the spring of 1902, Eli Conner was selected by W. A. Lathrop, then president of the Webster Coal & Coke Company, to fill the position of general superintendent of that company, with headquarters at Cresson, Penn. During this time the Webster Company was merged with the Pennsylvania Coal & Coke Co.

In 1907 "Eli T." accepted a position as general manager of the New River Collieries Company, a consolidation of mines bought up by the Guggenheims, and located in the celebrated New River field of West Virginia.

In the spring of 1909, Mr. Conner gave up his work in West Virginia and opened an office as consulting mining engineer in Philadelphia. A year ago he was retained to make an exhaustive investigation of all the properties of the Delaware & Hudson Co. in the northern anthracite field.

Eli Conner was also retained, together with another engineer, Wm. Griffith, by the city of Scranton to investigate mining conditions under that city with relation to mine caves. The advisory board, under whom this work was done, consisted of John Hays Hammond, W. A. Lathrop, D. W. Brunton, R. A. F. Penrose and L. B. Stilwell.

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Of this issue of Coal Age, we will print 7500 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

The Cost of a Strike

A review of the effects of the British coal strike, on industrial conditions in general, presents an interesting example of the importance of coal in the business world. No previous coal controversy was ever conceived along such broad comprehensive lines, or so disastrously effective in its consummation.

One of England's eminent economists estimated the loss to Great Britain as not less than 50 million dollars per week, and suggested that since the aggregate demands of the miners totaled only a quarter of a million annually, these demands should be acceded to. This appears a very simple and reasonable solution of the problem, but he unfortunately neglected to provide a means for securing the necessary quarter of a million.

One of the most noticeable features of the British strike was the almost immediate curtailment in the associated industries. Four days previous to the suspension there were 284 pig-iron furnaces in blast, and nine days after, two-thirds of these were idle, while at the end of 30 days only about one-seventh remained in operation. In the tin-plate industry there were 489 mills in operation at the beginning of the strike, and one month later 413 of these were shut down. Of the half million men employed in the manufacture of iron and steel, less than 190 thousand remained at work at the end of 30 days.

Nor were these suspensions confined to the iron and steel industries. Twenty-three days after the strike was called, over three-fourths of the pottery workers and one-fourth of the brick workers had been laid off entirely, while many of the latter were working only part time. Engineering projects in general were seriously interfered with and there was much unemployment among seamen, coal trimmers and dock laborers.

In thirteen representative industries, employing 330,000 men, 7 per cent. were thrown out of employment at the end of 23 days, and there was a shrinkage of 12 per cent. in wages. The average percentage of unemployed, 30 days after the strike went in effect was 11.3, as compared with 2.8 at the beginning, and 3.0 for the corresponding day the year previous. These figures do not include the mine workers themselves, practically all of whom were out during these periods.

Leveling Down

The hope of the workman who strives for a minimum wage per day is, that by so doing there will be a leveling up, but unfortunately this is too often unrealized. It appears that the minimum wage in Great Britain is going to follow the general rule, and a dead and low wage level will result which will be disadvantageous to the workingman.

Everyone has expected that the cost of producing coal would be increased by the new provision, but recent developments tend to show that the opposite action will result. The expectant miners congratulate themselves that they emerge from the conflict in triumphant possession of the existing piecework system, whereby they earn high wages when working in good places and to the best of their abilities. They expect that in addition to these advantages, they will also enjoy the benefit of a time wage—a guaranteed daily wage when working in bad places or when failing to put forth their best efforts. The miners expect the combined advantages of piece work and time work, but none of the disadvantages of either system. If that iridescent hope were realized, then, of course, the cost of coal would be unreasonably enhanced.

It must be observed, however, that human nature being what it is and the conditions of coal mining being what they are, a guaranteed time wage must carry with it constant supervision in order to check malingering. Under the piecework system, supervision is hardly required, but time work or day wages must be accompanied by much supervision.

The longwall system in use in England makes close superintendence more possible than in the United States, but at

the same time, while one foreman may boss a hundred men in a work shop, in the workings of a coal mine it would take him all his time to supervise a small percentage of that number of men. A mine employing a thousand miners would need possibly almost one hundred foremen. Obviously the industry would endeavor to evade such a burden as this. The problem of supervision would have to be faced and solved whether the miners liked the solution or not. If they enforce the minimum wage they will take the consequences which naturally arise from such a system.

Under the new law, elderly, delicate, slow and inefficient men will be weeded out. Only the efficient will be employed, and they will have to exercise their efficiency. What is called the "Butty" system, already in existence at a few mines and strongly resented by the best of the men, will be made universal. The "Butty" is a kind of contractor and he will be given charge of a stall or room, a longwall or a number of working faces. He will contract to get the coal at the existing price, employing the necessary miners, timberers and car-pushers. The men will be under the strict supervision of the "Butty"; they will get the minimum wage and no more, but for that low wage they will have to do the maximum amount of work. Thus they will work at a piecework pressure for a time wage, and the "Butty" will pocket the surplus money.

One good feature of the change will be that there will be a large increase in the use of mechanical coal cutters in some of the seams. Possibly a few of the poorer and meaner beds will be abandoned. Nothing is more patent than the fact that before long the miners will be completely disillusioned in the outcome of their agitation, and it is probable that other strikes will result, in order to produce the desired corrections along other lines. The "Butty" system is especially to be deplored as it amounts in a degree to an exploiting of the work of less skilled laborers by their more fortunate coworkers. An analogy on a small scale has been observed for many years in the anthracite region of this country in the relation borne by the miner to his laborers.

Perhaps the strike may do a great deal of good in exhibiting to a numerous body of British workmen, the inexorable character of the national economy. Time and again there has been a disposition to divorce payment from efficiency, and wherever that is done the inevitable result is to reduce the payment for labor performed. It is getting harder and harder to understand year by year that wages are not an artificial institution of modern society. They are rather a gift of nature in return for work duly performed, and cannot be regulated as a whole by any whim of the governing body. A resolution on the part of all mankind to live more comfortably must always be accompanied by a resolution to increase productivity. We can meddle with the distribution of wealth, but its total quantity is the outcome of the efforts of present and past economies.

Carbon Monoxide

A certain percentage of carbon monoxide can probably be inhaled without injury to the human organism. In fact, it has been found that it is generated in at least one mine in Germany, and in such mines the coal workers must normally breathe small quantities of the gas. The report of the Prussian Firedamp Commission shows that at the Glückhilf colliery, Waldenburg, Lower Silesia, carbon monoxide was found in large percentage. A drift running to the dip was found to contain 1.87 per cent. of this gas as a constituent of its atmosphere.

In a communication of M. Mahler to the Academie des Sciences, he details tests of gases from coal dug in mines located at Decazeville, Azincourt, Courrières and Anzin. When this coal had been powdered and exposed to the air, carbon monoxide among other gases was given off.

When exposed to a current of air for 30 hours, at a temperature of from 77 to 86 deg. F., the coal previously freed from hygroscopic moisture and occluded gases, emitted 2.4 per cent. of its volume of this gas. When using coal containing the ordinary mine moisture, the generation of carbon monoxide was reduced to 0.94 per cent., even though the temperature was raised to 95 deg. Fahrenheit.

This suggests much activity in the production of the gas, the dry coal appearing at low temperatures to produce nearly three times as much monoxide as dioxide. Bovey Heathfield lignite gives off gas containing 1.20 per cent. of carbon monoxide at 122 deg. Fahrenheit.

It has long been debated whether the human blood contains carbon monoxide under normal conditions. It was stated by G. A. Buckmaster and J. A. Gardner in 1909 that three dogs showed a volumetric percentage of carbon monoxide in their blood of from 0.144 to 0.16 per cent. It is interesting to point out in this connection that in air containing 0.2 per cent. of monoxide, a mouse will show decided symptoms of distress in 8 minutes.

We are not obliged, however, to accept the dictum of these physiologists alone. Other experimenters have found such traces of the gas in the blood of invertebrates, but its presence was frequently attributed to the chloroform used in killing the animals. Messrs. Buckmaster and Gardner show that the impregnation of carbon monoxide is not the result of their manner of death, but is a normal constituent of the blood.

Wages and Financial Stringency

One of the effects of increasing wages, which has been more generally overlooked than its importance justifies, is the need of an increasing capital to meet them. If wages double, the capital account must also be doubled or credits must be reduced. Thus an increased stock of money will be needed in order that a continuous volume of business may be conducted.

Increasing wages reduce the effectiveness of the monetary tokens. If it takes a half more capital to engage in business, then only two-thirds of the business will be done. Short time for many of the workers, and lack of employment for the rest, results. This may be circumvented by creating paper substitutes, with resultant reductions in the value of the medium of exchange. Thus a meretricious wage will be paid with a meretricious currency, and if the silver or paper is accepted as sound and desirable, we shall have phantom chasing phantom till the people learn that shadows are shadows, and that bread and comforts are the only realities, acknowledging that money is only a medium of exchange and wages are only a fluctuating equivalent for victuals and raiment.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

A Comment on the Jed Explosion

The time has arrived when, in the interest of humanity, every mining man should take a part in a propaganda devoted to the dissemination of knowledge for the purpose of warding off these ever recurring explosions in the future; and I know of no more effective method of accomplishing this end than to analyze the facts surrounding those that have occurred, and especially the last, that of the Jed mine disaster.

Justification of the State Mine Inspectors

Was this disaster unavoidable? Were not the officials forewarned of the lurking danger? Did not the state mine inspectors fulfill their duties when, shortly previous to the accident, they caused operations to be suspended? The permission granted by the court to reopen the mine, ignoring the order of the mine inspectors which commanded the use of locked safety lamps, was a sad instance of the miscarriage of justice. Such restraints handicap the mine inspectors in the discharge of their duties, and this interference with their prerogative lifted the responsibility from their shoulders and placed it upon the court and the officials of the mine.

Was the Jed mine as uptodate as claimed by the correspondent, in Coal Age of Apr. 6? In that article it was stated: "The work of the rescuing party was balked by falls of slate and many of the bodies were found covered by falls," and again, "The draw slate which is 12 to 18 in. thick is taken down in the main entrances but held up in the rooms and airways by timbering." Is this a good system of mining? Would it not be safer and cheaper to take down this 12 to 18 in. of draw slate, say 12 ft. wide in the rooms and airways, as well as in the main entries? Eventually this draw slate will fall before the time of drawing pillars; consequently it will have to be removed; why not do it in the first place, and save the cost of timber, and timbering, and possibly a life? Is it not possible that some of the victims whose bodies were covered by falls may have escaped the force of the explosion?

The correspondent says further:

"The fan was crippled, it is true, but nevertheless it was kept running." My theory of an uptodate mine generating gas and coal dust in dangerous quantities would call for an emergency fan available for immediate use in case of damage by an explosion or accident from any other cause that might put the fan out of commission.

Some Pertinent Theories

Note again: "Day shift starts at 7 a.m. Explosion occurred at 8:10 a.m.," and there is great significance in this fact. As is well known, it is a custom with miners to gather in small groups the first thing in the morning for conversation before beginning work. The explosion evidently occurred about the time they got into their places and finished drilling holes for the "breaking down shots . . . which are fired at the same time throughout the mine," for it seems that such was the custom, as well as to have the undercutting done during the night, the night shift quitting at 4 in the morning.

It is a question whether or not the dust from the undercutting would be thoroughly settled, before being set in vibration again by this artillery of breaking shots that went off in rapid succession at about 8:10 on this fateful morning. Again: "The fireboss had charge of the night shift." Did he examine the mine between 4 and 7, or did he quit at 4 with his men? The latter being the case, what changes might not have occurred between the hours of 4 and 7?

The statement that the mine foreman and three others were lowered into the mine immediately following the hoisting of the 12 men who escaped, justifies the conclusion that the mine foreman was not on duty early in the morning. Knowing that it was after pay day it was his duty to be at the mine early to see that no man be allowed to enter the mine in an intoxicated condition, or in that nervous state characteristic of a man recovering from the effects of over-indulgence in intoxicants. Permit me to call attention to the fact that the explosion at Harwick in the Pittsburg, Penn., district occurred on Monday, directly after pay day, and I think that laxity on the part of foremen in allowing men to enter the mines before they have recovered from the effect of their pay-day celebrations, has been a potent factor in the various disasters that have occurred in gaseous mines.

M. J. Clemons.
Mine Supt., Murray, Penn.

Effect of Uncontrolled Competition and Need of Price Associations

In view of the growing sentiment among coal operators in the United States to the effect that selling syndicates or equivalent associations are becoming an economic necessity in this country, the following letter from a British correspondent will doubtless interest a number of Coal Age readers.

Opinion is strengthening in the British coal fields that with diminished competition there would be less waste of coal resources; incidentally it is being shown, to some extent at least, how the high coal exports of the country are being maintained. These exports are increasing by leaps and bounds, and D. A. Thomas, the South Wales authority who is closely associated with the Cambrian combine, is quoted to show that the national aspect of the question is of vital importance.

The following quotation is extracted: "We are exporting large quantities of coal at less than cost price; we are, in fact, giving away to the foreigner with insane prodigality our mineral wealth—wealth that is by no means inexhaustible and cannot be replaced."

If Mr. Thomas is right, it is easy to understand how a huge foreign trade may be built up; that is, if giving away can be said to have any relation to trading. The critical state of the situation is further emphasized by Sir William Ramsay's note of alarm before the British association, regarding the possible exhaustion of the coal supply.

G. R. Carter, M. A., of the Department of Economics, University College of Wales, referring to the same condition, says the reckless competition of coal owners, middlemen, etc., in the sale and distribution of coal, especially that intended for export, produces consequences upon the coal industry quite as real and disastrous as those occasioned by wasteful methods of mining or of coal consumption.

To check this loss and waste he favors the formation of price associations between the various coal owners, which might neutralize the increasing tendency of competition to reduce prices to a minimum. In Germany, Austria, Belgium and the United States of America, Mr. Carter says, these combinations for the maintenance of prices have come to be considered well nigh indispensable to the

welfare of the coal trade. The Chenish-Westphalian coal syndicate, probably the best organized and most effective combination in the world, enjoys the fullest favors of the German government. In fact, the State itself is a member of the price associations, owing to the existence of state-owned coal mines. These associations have been found valuable, Mr. Carter adds, as a means of steadying the coal trade, fostering the exports, checking the development of doubtful mining projects, etc.

In the foregoing remarks it is clear Mr. Carter concentrates on the South Wales coal field, because he believes that a scheme for the maintenance of prices is a necessity there owing to the utter dependence of the community in South Wales upon the welfare of the coal industry. The leading points in his argument are:

1. "The unrivaled quality of the coal extracted in South Wales makes it an article of prime necessity under modern conditions; it is indispensable in the world's markets. Both Welsh steam coal and the anthracite of West Wales possess many elements of monopoly value, which give South Wales coal owners enormous advantage over other competitors at home and abroad. It might be asserted that their coal must be obtained at any cost.

2. "Again, the natural location of the coal measures is favorable. The coal field is concentrated in area, the seams are easily accessible, transportation facilities are abundant. The production of a large proportion of the steam coal is in the hands of a comparatively small number of companies whose interests are well ramified."

It is said, however, that the competition of rival producers within this favored area is more serious than that of competitors outside this field, and Mr. Carter assumes it would be more profitable that they should unite their energies in order to obtain the fullest value for their products rather than weaken one another by ruthless undercutting, "all for the advantage of foreign purchasers in most cases."

A pregnant paragraph reads:

"Prices, profits and wages are inseparably and intimately bound up with one another. They all suffer from the effects of unchecked competition. Employers seek to recoup themselves for low prices by shifting the burden of loss onto the miners through a reduction in wages. Any downward tendency—and this is the inevitable tendency of competition—furnishes immediately a source of trouble and conflict in the coal field. When prices are tending downward of themselves the keen competition of sellers only hastens and aggravates their fall. Similarly, the lack of concerted action seriously delays any tendency making for a rise in prices."

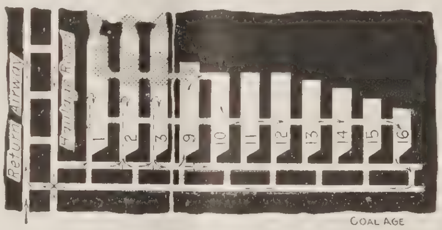
The above discussion is suggestive and may teach some important lessons.

BENJAMIN ADDICKS.

Wigan, England.

A Cave-In Proposition

My attention was called a short time since to a serious proposition in the way of a cave-in at the face of nine rooms driven off from an entry. The cave closed the inside breakthroughs between these rooms and shut off all of the ventilation from the rooms. The roof fell to a great height above the coal so that, in places, there were cavities of several hundred cubic feet in the roof. There were sixteen rooms turned off this entry, the first nine of these being closed, as stated, by the cave at the face. The proposition presented was to properly ventilate these fallen rooms so as to prevent the accumulation of dangerous quantities of gas in them.



SHOWING MANNER OF VENTILATING ROOMS CAVED AT THE FACE, BY BRATTICES

I suggested the plan shown in the accompanying sketch. This was to place a curtain across the entry at the mouth of each room so as to form a brattice extending into the room and which would deflect the air current toward the face. The plan proved successful and kept the rooms free of any dangerous quantities of gas.

JOHN SUTTON,
Fireboss.

West Terre Haute, Ind.

Expansion Bit for Drilling Coal

I wish to draw the attention of readers of COAL AGE to a new kind of drill having an expansion bit that seems to me would be of great advantage in drilling either anthracite or bituminous coal. I would like to see a good discussion of the use of this bit in drilling coal.

The bit is so arranged that it will expand automatically in the hole and is adjustable. By its use a small hole can be drilled to any desired depth and the bit expanded, at any point, so as to drill the remainder of the hole with a larger diameter. It often happens, in drilling a hole with a common bit, that the diameter of the hole grows smaller toward the bottom; and the charge cannot be pushed safely to the end of the bore. This difficulty would certainly be overcome by using an expansion bit such as I have described.

The question I would like to see discussed is, would not better results be obtained all around, in charging and blasting, when the hole is slightly enlarged at the inner end occupied by the charge. Of course, it would be necessary to properly charge the hole; but the pressure on the tamping would be less, and the danger of the shot blowing out its tamping much reduced. It is possible also that the number of holes required would be reduced.

It is well known that miners in anthracite mines commonly drill a 2½-in. hole to a depth of 5 ft. This means a grinding out of about 5×12 (0.7854×2.5^2) = say 300 cu.in. of coal. Now, if an expansion bit could be used to drill a 1½-in. hole and expand this to, say 3½ in., at the lower end of the bore, the area being doubled, the charge would occupy only one-half the length it filled in the 2½-in. hole. If the charge filled 20 in. in length in the first hole, it would only require 10 in. in length in the expanded portion. This would reduce the cuttings for a 5-ft. hole from 300 cu.in. to 188 cu.in., or about 37 per cent.

If this is practical the saving effected is well worth while. At any rate the scheme is worthy of consideration. The concentration of the charge in the end of the hole would prove a greater advantage in a hard-shooting coal than in a soft, friable coal, or a coal that has a tendency to "seam out." Let us hear from some of our experienced miners. Perhaps some have used or are using this bit and can give us the benefit of their experience.

A MINER.

Wilkes-Barre, Penn.

Timbering a Mine Parting

In reply to Noah Burton, Anglin, Ky., COAL AGE, March 23, p. 786, I would say posts between tracks are dangerous. However, Mr. Burton does not mention the width of track or of cars. I will, however, assume the width of cars to be 4½ ft., and a 4-ft. clearance between cars, and 6-in. clearance between car and rib, on each side. Therefore, $4.5 \times 2 = 9$ ft. for cars on both tracks; plus 4 ft. between cars, plus $2 \times 6 = 12$ in. or 1 ft. for clearance on each side = 14 ft. in all, which is the least possible width. Then, allowing 9 in. for each end of the crossbar in a hitch, will require crossbars 15½ ft. long.

It would be best to use 8- or 10-in. I beams, spaced 4½ ft. centers and lagged with either short pieces of rail or 2 in. plank. Mr. Burton does not state the thickness of the seam. I would suggest making a blind parting, with two or more crosscuts open for mules to pass. It will possibly be necessary to drive an air-course to do this, which will, perhaps, be the cheapest in the end, depending on the life of the parting.

DAVID FULTON.

Marion, Ill.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Blownout and Windy Shots, Their Cause, and Precautions to Avoid Them

(a) Explain the difference, if any, between a "blownout" and a "windy" shot; are they both equally dangerous? (b) What are the causes of such shots and will a dusty atmosphere or accumulations of fine dust, at the face, when no gas is present, produce the same effect?

La Salle, Ill. MINE EXAMINER.

(a) A blownout shot is a shot that has blown its tamping instead of breaking the coal. A windy shot is one that expends a considerable portion of its energy on the air, causing a heavy concussion of air due to the large and rapid expansion of the gaseous products. Both are dangerous, but the degree of danger will depend on the condition of the immediate workings with respect to gas, dust and ventilation. A blownout shot develops a greater heat energy and is more dangerous, owing to its intensity, than a simple windy shot, which may do no harm in case the workings are free from gas and dust.

(b) The main causes of blownout shots are: Poorly located shot holes, insufficient undercutting, or holes put in beyond the depth of the undercut, shooting from the solid, insufficient or careless tamping, tamping material not being plastic and incombustible, and consequently not airtight, and the use of an excessive amount of explosives. Except in anthracite mining, shooting from the solid is a dangerous practice under the best of conditions, but it is doubly so in chambers located near a return airway containing inflammable gas or in chambers where a blownout shot may discharge into the gob or into a dusty main-haulage road.

A windy shot is often the result of firing a heavy charge in a dusty place; or a place where the ventilation is poor; or firing two or more shots, in quick succession, in a close or confined heading.

The experiments made at the government testing station at Pittsburg, Penn., have shown that coal dust will explode even if free from gas. Explosions of gas are usually more or less local in character, but the explosion of dust, which is present throughout the mine, may traverse rooms and entries, and even wreck buildings at the entrance of the mine.

When about to drive a shot hole, make a careful examination of the place and judge the nature of the material to be blasted and that of the overlying strata. Keep the hole as cylindrical as possible, so that the cartridge may be easily slipped into position. See that the hole is put down on the line of least resistance. Undercutting for firing in coal should be a little deeper than the shot hole, to avoid the danger of a "tight" shot that may blow the tamping.

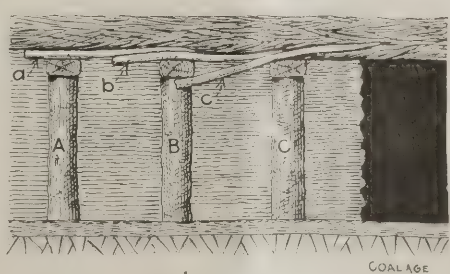
"Forepoling" in Mine Timbering

What is meant by "forepoling" in mine timbering and what is its purpose? Kindly explain the method in detail.

Pocahontas, Va. TIMBERMAN.

The forepoling system of timbering consists in supporting the roof right up to the coal face with provisional wooden or iron bars, driven forward over the collars as the working face advances until there is room for another row of timbers. The available height of the seam is somewhat lowered by this method, and this fact is an important matter in the case of low seams undercut by machine, but with a friable roof this system means additional safety.

The general method of forepoling is shown in the accompanying figure. The spiles or forepoles *a, b* and *c* are driven over the crossbars *ABC*, in their respective turn.



SHOWING METHODS OF FOREPOLING

These spiles are narrow plank, 2x6 in. or 2x8 in., sharpened to a broad, flat edge. Each set of spiles is driven up, at a low angle, over the collar or crossbar of the last set of timbers, close to the face of the heading, and under the next preceding set, as shown at *c*, in the figure. These spiles protect the miner while he is advancing the face far enough to set another timber frame. When this is done, the next set of spiles is driven under the collar of the framing *C* and above that of the new framing just set. When this has been done, the spiles *c* are driven forward to a position corresponding to *a* and *b*.

Advantage in Employment of Shotfirers

What is the advantage of employing shotfirers in coal mining? Is the system in use, anywhere, of firing all the shots in the mines, at once, by means of electricity, from the surface?

Minersville, Penn. MINE FOREMAN.

When shotfirers are employed the shotfiring is all done at night when there are the least number of persons in the mines and the risk which always attends firing can be reduced to a minimum. During the daytime, doors are constantly being opened and closed, all of which affects the ventilation, which in turn affects fires or explosions due to shotfiring. Fresh gas is also being constantly liberated in the daytime, and clouds of dust are continually being raised, all of which increase the dangers of day-shift shotfiring. Night firing, which may be described as an ordinary precaution, eliminates all of these dangers.

In Alabama and Utah, electric firing is done by specially appointed firemen, who enter the mines at night while they are empty, connect up the wires, and then return to the surface, where they make the connection of the circuit, thus insuring blasting in a mine empty of all workmen, so that even if the mine should be badly damaged or even destroyed, no lives can possibly be lost.

Powder in Illinois

How much coal will the average miner produce for every keg of powder used?

Spring Valley, Ill. MINER.

In 1910, the last year for which full statistics are as yet obtainable, the total number of employees at mines was 74,634; the total ouput of the mines was 48,717,853 tons; the number of kegs of powder used for blasting was 1,254,095. In the 11 years since 1899, the output has just about doubled, while the quantity of powder has practically trebled, giving an average production, for this period, of nearly 39 tons of coal per keg of powder used. The production of coal per keg of powder used did fall to 32.28 tons in 1908, which was the lowest point reached. This powder cost the miners at the average rate of $1.75 per keg.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Anthracite Mine Foremen's Examination in Pennsylvania, April, 1912

(Selected Questions)

Precautions in Blasting

Ques.—Having charge of a mine in which locked safety lamps are used, what precautions would you take before firing?

Ans.—Every hole should be inspected before it is charged, to ascertain its depth and direction, the condition of the coal, and to estimate as nearly as possible the weight of charge required for the work. This should be done by a competent miner, whose experience in shooting coal fits him for the work.

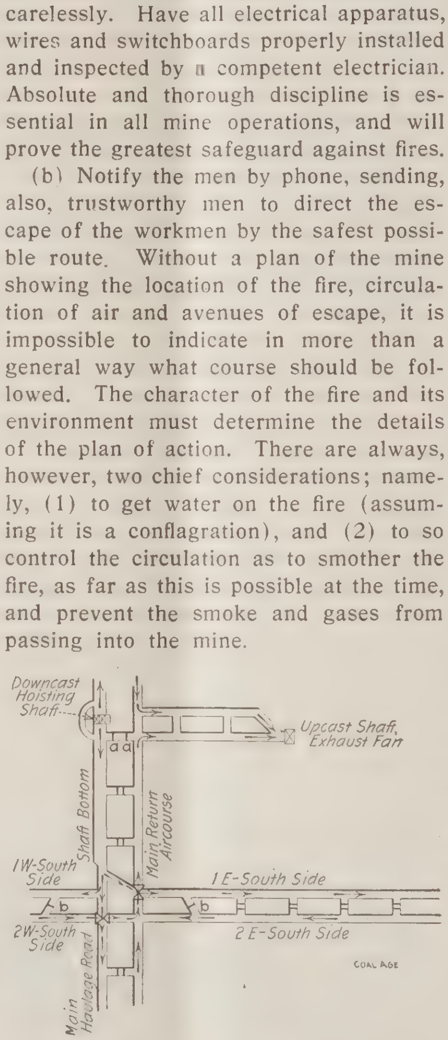
Assuming the hole has been properly inspected, charged and tamped, before it is fired, the place and those adjoining must be carefully examined for gas; care must be taken to see that the usual quantity of air is passing and the place free from undue accumulations of dust. If much dust is present, although anthracite coal, it may be advisable to water the face, roof, floor and sides for a few yards back, to avoid what might prove a windy shot. Fuse should not be used; but all shots should be fired with squibs or by electricity, after giving suitable warning to men working in adjoining places.

Mine Fires, Precautions, Etc.

Ques.—(a) Having been placed in charge of a large mine, what precautions would you take to prevent mine fires? (b) If a fire should occur in the intake of your mine, what would you do?

Ans.—Make and enforce strict regulations in regard to the handling of all combustible material, especially hay, oil and explosives, in and about the mines. Forbid the storage of such materials in or near the shaft, or the carrying of larger quantities into the mine than are required for the day's use. Forbid the use of mixed lights in the mine, and allow no unprotected lamps or torches at the shaft bottom, or in pump rooms, engine rooms or stables. Adopt a system of firing shots in the mine that will reduce to a minimum the chance ignition of a gas feeder being undiscovered; or the occurence of windy or blownout shots, or local gas or dust explosions. Load out all fine coal and slack, and forbid its being thrown back in the waste. Ventilate all abandoned places, voids and falls; examine these regularly for gas; report and remove promptly all dangers. As nearly as practicable, make all air bridges, stables, pump rooms, engine rooms, tool rooms and shanties fireproof; and allow no oily waste thrown around carelessly. Have all electrical apparatus, wires and switchboards properly installed and inspected by a competent electrician. Absolute and thorough discipline is essential in all mine operations, and will prove the greatest safeguard against fires.

(b) Notify the men by phone, sending, also, trustworthy men to direct the escape of the workmen by the safest possible route. Without a plan of the mine showing the location of the fire, circulation of air and avenues of escape, it is impossible to indicate in more than a general way what course should be followed. The character of the fire and its environment must determine the details of the plan of action. There are always, however, two chief considerations; namely, (1) to get water on the fire (assuming it is a conflagration), and (2) to so control the circulation as to smother the fire, as far as this is possible at the time, and prevent the smoke and gases from passing into the mine.



Showing Arrangement of Shaft Bottom

Each case will present a different proposition that must be treated accordingly. The accompanying diagram represents a common arrangement in many mines. Assume, in this case, a fire has gained some headway on the shaft bottom, about 25 yd. from the foot of the shaft, and 50,000 cu.ft. per min. is passing this point and entering the mine. A brief reflection will show that the 250 men working on this side of the mine have but slight chance of escape unless there are cool heads at the bottom of the shaft. Some one says, "Slow down the fan or stop it entirely." In some cases, this would be necessary; especially, if there is no other way of reducing the current passing the fire, which, unless reduced, would soon convert the place into a furnace.

In the present case, the best plan would be to short-circuit a portion of the air, by setting partly open the separation doors close to the shaft. These are the double doors marked *aa* in the figure. To open these doors wide might prove as dangerous and fatal as the full air current, because of the deadly carbon monoxide that would then be formed by the fire, and which is not only extremely poisonous, but increases the explosive condition of the mine air. It is important to control the amount of air passing the fire by the regulation of these doors, so that the air will not fan the blaze and still keep the entry clear outby from the fire.

It would be a fatal mistake to set open either of the doors marked *bb*, on the cross-entries, as this would increase the draft on the fire, burn out the overcasts at the mouths of these entries and absolutely cut off the escape of the men.

The above is about as bad a case as could well occur in so-called safe mining. It shows the importance of providing a number of avenues of escape, as well as separation doors close to the bottom of the shaft, for the better control of the current. The advantage of this method over that of slowing or stopping the fan is that it keeps the escapeways and upcast clearer and safer; and reduces the formation of CO, by the fire, to a minimum, while practically cutting off the draft from fanning the blaze, and providing fresh air for the fire fighters.

Pressure In a Slope Pipe Line

Ques.—A pipe line in a mine slope has an area of 180 sq.in. and is 3000 ft. long; the slope has a grade of 1 in 10 ft. What is the pressure per square inch at the bottom of the pipe when the latter is full of water?

Ans.—If the slope rises 1 ft. vertical height for each 10 ft. measured on the pitch, the total rise is $3000 \div 10 = 300$ ft.; and the static pressure is then

$300 \times 0.434 = 130.2$ *lb. per sq.in.*

This is the pressure when the pump is not working. When the pump is acting there will be an additional pressure, due to the friction of the water flowing through the pipe. This will depend on the size of the pipe and the quantity of water discharged.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Some Remarks on Safety in Mines

By S. J. Phillips*

Education should always precede discipline. It is wrong to discharge or suspend a miner for pushing a light cartridge into a drillhole, if that miner does not know the danger which may result from such an action. When a boy or man knows exactly what he should do and does not do it, he forfeits his right to hold his job, and the best thing that a foreman can do for the man and his family is to put him out of the mine before he kills or injures himself or his fellow workmen. This act is as humane as taking a razor from the hands of a baby. You might say that it is not right to take the bread out of a man's mouth. We all are opposed to doing that, and it would be much easier for the foreman, I admit, to permit the miner to go on a little longer violating the law and the rules of the company for which he worked, but it is because such a lack of discipline is endured for just a little longer, that so many are killed and many more are injured. Let your sympathy exhibit itself in the direction in which it will do the most good. It is better to send a man home to his family without his job than without his life. It is better to see him return before noon than to meet the undertaker at the door.

I go into places quite frequently and find the miner's powder box open. When I question the miner as to the length of his experience in the mine, the answer sometimes is, "ten years." What is the natural conclusion? That a miner who has been disregarding the orders of the assistant foreman, the foreman, the company's inspector, and the State mine inspector for ten years is hardly a fit man to work in the mine. This very act shows a man's mental attitude toward any order which is issued in the interest of safety, and as this is one of the easiest orders to obey, and as he does not obey this, it is evident that he is unlikely to obey any.

I am thoroughly in accord with the order issued by the Delaware, Lackawanna & Western Railroad Co. in all its collieries, relative to shots which have apparently failed to explode. The rule is that: If a squib-fired shot fails to ignite, the miner and his laborer must go home for the rest of the day. Some operators will say that this rule will be sure to lower the tonnage wherever enforced. District No. 1 of the Delaware, Lackawanna & Western Railroad Company, Coal Mining Department, increased its output last year where this rule was in force, and, furthermore, accidents were reduced one-half in the same district and not one of these occurred from a delayed fire. When miners are asked to stay 15 min. before returning to work because a shot has misfired, they are apt to overestimate the time during which they have waited or they deliberately break the rule. This is especially the case where there is little coal ready to load and an empty car on its way to the room. The more stringent regulation obviously prevents the miner from miscalculating or deliberately reducing the time limit.

*Mine inspector, third anthracite inspection district.

Note—Abstract of article read before the First Aid Association of Pennsylvania Coal Co., at Dunmore, Penn.

Loading the Mine Foreman

By Sim Reynolds* and W. H. Reynolds

Whenever a discussion arises as to the fatalities in mines, the suggestion is made that some new burden shall be loaded on the mine foreman. It would seem better to seek immunity from accidents in the rank and file, instead of endeavoring to secure a reform entirely through the efforts of an official, who is already hard pressed and harassed under the many onerous requirements which have been placed upon him.

The fact that he has come up from the ranks, as he almost invariably has, shows that he possesses an energy and ability unusual in his class, but does not imply that he is a wonder-worker, and that there is no limit to the services which he can perform. Quite often this most worried unit in the conglomerate mass of mine workers has to shoulder faults for which other parties are to blame.

Conditions at any given mine may be, and frequently are, adverse by nature, and he may be confronted moreover with problems which are the direct or indirect outgrowth of a long continued faulty method of mining, and yet, despite these severe conditions, the blame is placed on him by the state and by his employers when untoward things happen.

But to lay the blame in the wrong place does not cure it. One wrong added to another wrong never made that wrong right. We must look to other sources beside this for a reduction in the great number of fatalities. We must instil the idea of the supremacy of the law in the minds of other men than the fireboss and mine foreman. This view of the condition of affairs is not new, but it is necessary that it should be instilled in everybody around the mine. At the time of an accident, the hue and cry is always that the mine foreman has neglected his duties, whereas there are probably two to four hundred men who are all vitally interested in the safety of the mine, any one of whom may be the real cause of the accident.

As President Taft recently emphasized on Forbes Field:

> This loss of life (20,000 killed outright and 70,000 injured in the coal mines during the last 20 years) must be brought home to the miner himself. We have certain defects—and one of them is a feeling of security that we are not going to get hurt. We must overcome that notion, and we must take more precautions to save life. This requires discipline, instruction and experience. We must enforce these ideas so that the miners themselves may save themselves by strict attention to the instructions, which must be given in turn by government and state.

Practically every man who is qualified to speak publicly on the matter by virtue of his experience and study of mining conditions, evinces the same belief as to the means which will ultimately have to be employed to bring the human element up to the same efficient standing already gained by the mechanical end of mining. First educate the miner to an understanding of the dangers of his employment; second, exert at all times the strictest possible discipline; third, secure immediate action in such criminal proceedings as arise out of the enforcement of the law.

In his speech at Pittsburg, the President, in my opinion, hit the nail of difficulty more squarely on the head than has been done by any man in or near his eminent position, perhaps touching the "sore spot" more closely than he himself knew when he concluded with the words: "We must stamp out the spirit of carelessness—the happy-go-lucky idea which I fear prevails among American citizens generally," and had it not been for the inherent courtesy of a gentleman toward his auditors of every station in life, the chief magistrate might well have added: "and the mining part of our population in particular."

*Pittsburg-Buffalo Coal Co., Marianna, Penn.

Coal Situation in the Philippines

By Monroe Woolley*

The Philippines have much good coal, yet but little is mined. The large consumption is met by Australian and Japanese imports. There is room for developments in Polillo, Cebu, Mindoro and Mindanao.

Area considered, there is perhaps no country in the world possessing greater or better fields of coal than the Philippine Islands. Moreover, there is no country known to be so rich in coal deposits where so little coal is mined.

During the American occupation, extending now over a decade, many millions of dollars have been spent abroad, chiefly in Japan and Australia, for the island coal supply. A comparatively small amount of fuel for domestic purposes is required in the archipelago for the simple reason that in the tropics fires are needed in the home for cooking purposes only. There are but two or three cities in the whole group of islands where families may buy coal from regular coal yards. One of these is Manila, and there the price is almost prohibitive for the average citizen.

But enormous quantities of coal are nevertheless consumed in the islands annually. The military establishment uses many thousands of tons in operating its numerous ice and condensing plants and in coaling the many steam vessels comprising the inter-island transport fleet. At every garrison an ice and condensing plant is maintained for the comfort of the command, making in all possibly half a hundred such institutions, consuming anywhere from a ton to several tons daily. In addition to the great amount of coal consumed by the inter-island fleet, the huge trans-Pacific transports coal either in Manila or in Japan for the return trip home each month.

Import Coal

Nearly all this great amount, especially for the consumption on land and for the inter-island fleet, has for some years been purchased in Australia. In fact, the contract was so often awarded to Australian companies that an investigation was conducted by the military commander, in Manila, in which one of our diplomatic agents in the land of the kangaroo figured to some extent. One of the Government contractors was quoted as saying that he had the military contract "cinched" so long as Australia wanted it. This remark precipitated the inquiry.

Japan has been lucky most of the time in holding the contract to coal the trans-Pacific vessels for the return journey to 'Frisco, the Mitsui Company, in Nagasaki, performing this service.

Besides all these channels for consumption there is the big demand made by the civil authorities. The civil government owns an ice and cold storage plant in Manila, which is probably as large as any in the world. It consumes enormous amounts of coal daily. Then, too, the civil government maintains a coast guard fleet equal in size to the military's transport fleet, which also has to be coaled regularly. Much of the navy's coal, destined to be used by the Asiatic and Philippine squadrons, and by the navy yards in the Philippines, is supplied from Asiatic mines.

The Batan Coal Area

From all this it would appear that the government should make haste to develop the fields in the islands, but so far big coal furnishing contracts are still going to Australia and Japan. Soon after American occupation of the islands, the military authorities staked out coal claims on the western half of Batan Island, in the Gulf of Albay, Southern Luzon, and the President set aside the land by executive order as a military reservation. Meantime, some Americans resident in that part of the archipelago, saw the advantage of staking out claims on the eastern half of Batan, the entire island being covered with coal.

The government lost no time, owing to the crying need for a home-produced coal, in developing its claims, sending an engineer officer and a detachment of men down to experiment. Many tons were taken out and trial tests were made on government vessels plying between the gulf and Manila. The coal at that early date was found to be equal to and sometimes superior to the Japanese product for steaming purposes. Scientific tests of the fuel were made in the laboratories of the bureau of science, at Manila and gave encouraging results.

However, some two or three years later operations were discontinued, largely on account of a lack of funds for experimental purposes. The government claims then remained closed for some two or three years, when an energetic, military official in Manila finally secured additional funds by act of congress, and prepared to reopen the mines on a larger scale.

Batan Coal Makes Good Showing

The officer who had charge of the work during the first attempt was ordered back from Washington to resume operations, and brought with him modern apparatus and a large corps of expert miners from the United States. The work had barely begun, however, when friction arose between the civilian mining expert and the military officials, ending in the discharge of the expert. Following this, other officers were detailed in charge of the work, which went on enthusiastically for some months. The Manila press heralded almost daily the success of the project, and all the Philippines were joyful at the prospects of an adequate fuel supply. Finally a cargo of Batan coal from the government mines was placed aboard the trans-Pacific transport Dix, the largest vessel in the military service, for a trial test in steaming to the home port in Seattle. It is not known what the official report of this test had to say of the product, but shortly afterward the Batan government claims were again closed, and have since so remained. The engine room employees of the Dix, as made known through the Seattle papers, were favorably impressed with the coal, the ship entering port on schedule time.

In the meantime the pioneers owning the claims on the eastern half of Batan, while handicapped at times for capital, have been mining coal steadily, having formed a stock company, the shares of which are increasing in price. This company has been for some time shipping coal to Manila for the local markets and is supplying quite a number of inter-island commercial vessels with coal for steaming purposes. Only a short time ago the flourishing condition of the company was attested when it purchased for $50,000, the Steamer Yuengsang, which was formerly in the China-Philippine trade. This ship is used by the company in delivering its product throughout the islands.

Other Coal Deposits

Polillo Island, much larger than Batan and which lies to the northward of the Government claims, is said to be rich in coal. A number of Americans have claims here, but so far as known little development work has as yet been undertaken. Perhaps lack of capital prevents, perhaps there is some other reason.

There are one or two small mines in the vicinity of the flourishing port of Cebu, but the output is inconsiderable. It is also believed that the large islands of Mindoro and Mindanao, both rich in all manner of mineral deposits, are also rich in coal, and some private parties are endeavoring to locate mines.

*Fort Casey, Island County, Washington.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The new bill, prepared by Judge Knapp, of the Commerce Court, and Commissioner Charles P. Neill, of the Bureau of Labor, to take the place of the Lee bill, for extending the application of the Erdman Act to coal-mining disputes, has just been placed in the hands of the subcommittee of the House interstate commerce committee. The terms of this proposed bill have not heretofore been made known, but the measure is proving of very considerable interest. Salient features of the proposed measure are as follows:

The provisions of this act shall apply to any railroad corporation engaged in interstate commerce and to its employees, and to any person, firm, or corporation engaged in the mining of coal which enters into interstate commerce, and to their employees.

Whenever a controversy concerning wages, hours of labor, or other conditions of employment shall arise between employer and employees subject to this act, interrupting or threatening to interrupt the business of said employer, to the serious detriment of the public interest, either party to such controversy may apply to the commission of media- and conciliation created by this act and invoke its services for the purpose of bringing about an amicable adjustment of the controversy; and upon the request of either party the said commission shall, with all practicable expedition, put itself in communication with the parties to such controversy and shall use its best efforts, by mediation and conciliation, to bring them to an agreement.

Whenever a controversy shall arise between employer and employees subject to this act, which cannot be settled through mediation and conciliation in the manner provided in the preceding section, such controversy may be submitted to the arbitration of a board of three or of five persons, as the parties to the controversy may elect, which board may be chosen in the following manner: The employer or employers and the labor organization or organizations, parties, respectively, to the agreement to arbitrate, shall each name one arbitrator. The two arbitrators thus chosen shall name the one or the three arbitrators, according, as the agreement to arbitrate provides for a board of three or five, but in the event of their failure to name the three arbitrators required, days after their first meeting or to name the thre arbitrators required, when the agreement provided for a board of five, within ten days after their first meeting, the third arbitrator or the three arbitrators, or such of the three as have not been named within the time herein prescribed, shall be named by the commission of mediation and conciliation.

It is doubtful whether any report on this subject will be rendered at the current session of Congress, but those who have been supporting the bill are still expressing a determination to press its adoption.

Suspension of Duties on Coal

Senator Watson, of West Virginia, himself a large coal operator, has offered the following amendment to the pending metal schedule in the Senate, it being his view that the provision would serve to meet an emergency like that which existed at the time of the coal strike in 1902, when Congress finally suspended the duties on coal for a year.

The President is hereby authorized, in any case of emergency, to suspend the collection of customs duties on any article included for taxation in the tariff law in effect on the day the President issues his proclamation suspending the collection of duty on any article, so that such article may be imported free of duty for not exceeding the period of one year. When the President decides to suspend the collection of duties on any article, he shall issue his proclamation to that effect. Such suspension of the collection of customs duties for the period named by the President in his proclamation shall take effect on the day following the issuing of said proclamation, and shall continue for the period named.

Alabama

Birmingham—If the coal production of Alabama for the remainder of the year holds up to the pace set during the first four months, the coal output for 1912 will break all previous records and will come close to being 19 or 20 million tons. According to the chief mine inspector, the output for the first four months of the year is far ahead of 1910, the banner year in the history of the state, when the production exceeded 16,000,000 tons.

The Tennessee Coal, Iron & R.R. Co. is blowing in the third battery of 70 Koppers ovens at its new byproduct coking plant, at Corey, Ala., and is abandoning its bee-hive ovens at Pratt City and Pratt No. 1 shaft. As the new byproduct ovens get up to capacity and into smooth running order, the bee-hive ovens, at Pratt Nos. 3, 4 and 5, will be dropped out of commission, leaving only those at Johns in blast. These last will be displaced also, as soon as the fourth and last battery of Koppers ovens at Corey is finished, during the next few months.

Colorado

Steamboat Springs—It is announced that the Moffat Coal Co. will at once start work on opening up its anthracite coal holdings. The entire 1000 acres, controlled by the company, are to be thoroughly prospected and sinking started.

Illinois

Benld—One man was fatally injured and four others received serious wounds in a revolver battle between two mine crews, near here, May 10. Half of the men were employed in mine No. 2 of the Superior Coal Co., which has three pits at Benld; the other half composed the crew of mine No. 3. The Benld local had been informed by state officials of the union that the men might return to work pending a referendum vote, and No. 1 and No. 3 crews, whose members reside at Gillespie, a mile and a half north of Benld, voted to go to work. Crew No. 2, composed of Benld men, voted to stay out. When crew No. 3 was on its way to work it was met by crew No. 2, with orders to turn back. Both sides drew revolvers and started firing into the air, but as the situation grew more serious, the No. 3 crew fired a volley at their opponents, hitting the five men. Both crews then returned to their homes.

Springfield—The plant of the Spaulding coal mine, north of Riverton, near here, was partially destroyed by fire, May 7. The top works were set on fire, it is said, by sparks from a railroad locomotive. The mine was to have resumed operations the day following, after being shut down for some time. Nine men were at work, preparing for the resumption of operations. They escaped through the Riverton Mine No. 1, which is connected with the Spaulding mine. The Illinois National Bank, of this city, owns the mine. The loss is about $50,000.

The referendum vote on the new wage contract, taken by the Illinois miners, May 7, favored its acceptance by a majority of over 13,000.

Peoria—The mine of the Wolschlag Coöperative Coal Co., south of Bartonville, has been taken over by Messrs. Ditewig and McElwee, who already own and operate, near Farmington, two of the largest mines in Peoria County. The Wolschlag property is located near the lines of the Peoria Ry. Terminal Co., and will also be on the lines of the Chicago & North Western, when its new branch to the south is completed. The

capacity of the mine will at once be increased to 1500 tons per day, and it is reported that the entire output has been sold for a period of two years.

Chicago—Increases in freight rates on soft coal from Illinois mines to destinations in Kansas and Nebraska have been suspended by the Interstate Commerce Commission from May 11 to Nov. 11. The advances, amounting to approximately 12 per cent., are now under investigation by the commission.

Indiana

Terre Haute—After modifying their demands to the operators, eliminating many of the requests included in the first report of the scale committee, the delegates to the convention of district No. 11, United Mine Workers, voted unanimously to adopt the report of the policy committee, which is practically a declaration of a strike in the Indiana bituminous coal field. The report of the committee contains provisions for a strike benefit to the men who are in actual need. The mine workers instructed the district officers to attempt to sign up the independent operators in the Indiana bituminous field, said to number about 25 per cent. of the operators in Indiana.

It was decided at a meeting of the coal operators, May 8, to obtain coal from other states and supply it to their customers at Indiana prices, pending the outcome of the trouble with the miners. The operators say that they can buy coal in Kentucky and West Virginia at prices which will enable them to deliver it to customers without loss to themselves. This coal is mined by nonunion men. No men will be imported to work in the mines here, it is said, and, therefore, no violence is expected. It has been the contention of the operators that when the Cleveland agreement was signed at Indianapolis, it was virtually promised that the men would return to work pending negotiations on the details of the state contract.

Sullivan—Following the purchase by the Chicago and Eastern Illinois R.R. of 16 coal mines in Indiana and Illinois, including a tract of 3000 acres in Sullivan County, Ind., the announcement is made that a mine is to be sunk at once on a tract lying a half mile east of Paxton. This is to be done by the J. Wooley Coal Co. of Evansville, to which a part of the 3000 acres purchased by the C. & E. I. has already been leased. Work on the sinking of the new shaft will be begun at once, and development is promised of a field heretofore untried, but said to be rich with coal. The tract was sold by the West Jackson Hill Coal Mining Co. and this company still owns 4000 acres in the Paxton field.

Bicknell—The Monon Railroad is preparing to extend its line from Wallace Station to Bicknell. The company has recently purchased 6300 acres of coal lands south of the Little Giant mine, between Linton and Bicknell, and the line will extend through this land. The positive assurance of this extension has renewed activity all along the proposed line, and doubtless new mines will be sunk and mining operations increased as soon as the strike situation is relieved.

Kentucky

Louisville—District No. 23 of the United Mine Workers, comprising the employees of the union mines of western Kentucky, has voted to return to work pending the settlement of slight differences over the wage scale, which will be arbitrated. The vote was 1850 to 425 in favor of resuming work, and the mines have started up again.

The Harlan Coal Mining Co., of Louisville, which is to open three mines on the extension of the Louisville & Nashville R.R. to Harlan County, has let contracts for all of the equipment required, and this will be delivered in the immediate future, as the company plans to start operations at once. By the time the company is ready to mine coal, the railroad extension will have been completed to its plant. The proposed output is to be 2000 tons a day.

Madisonville—A French syndicate is reported to have purchased 1000 acres of coal lands in Hopkins County, near Madisonville. Negotiations are pending for 4000 acres additional. The property is off the railroad, but an extension of the Kentucky Midland R.R. may be built to reach it if mining operations are begun.

Pikeville—The Pond Creek Coal Co. is actively engaged in driving entries, building houses and preparing in general for the development of its coal properties. The company will have an outlet through the new Williamson & Pond River R.R., a Norfolk & Western line, which is to be built from Williamson, W. Va., up Pond Creek to the holdings of the company.

Missouri

Kansas City—The subcommittees of operators and miners of the Southwestern field, after a two-weeks conference at which they failed to reach an agreement, reconvened here, May 8, to resume negotiations for a 2-year contract.

Ohio

Zanesville—The majority of the coal mines in this vicinity are again in operation. A meeting was held in Cambridge, May 9, to adjust details of the contract for the Cambridge district and a similar meeting for the Crooksville district will be held here later this month.

The Cambridge Coal Co. has constructed a manway at its workings east of Byesville on what is known as the narrows. This is 12x14 ft. in section and about 80 ft. deep. A winding stairway affords a ready means of egress in case of fire or other accidents in the mines.

Crooksville—Three miners were entombed in Keystone Mine No. 1 for several hours, May 6, as the result of a cave-in. One was rescued with difficulty and his injuries seemed likely to prove fatal. The other two were only slightly injured.

St. Clairsville—One of the largest damage suits in the history of the local court was put on record, May 6, when William Fulton entered suit against the Youghiogheny & Ohio Coal Co., asking $65,000 damages for injuries which he received in the mine of the defendant and which injuries he alleges were due to the negligence of the company.

Massillon—The conference between miners and operators of subdistrict No. 3, district No. 6, United Mine Workers, reached an agreement, May 4, whereby a slight increase of wages was granted to engineers and bucketmen, engaged in sinking shafts, and the wages of other workmen were fixed in accordance with the Cleveland wage-scale agreement. The operators advanced the cost of coal to miners from $1.90 to $2.

Oregon

Portland—That Oregon, some day not so very distant, will mine coal on a large scale is indicated by the activity of men interested in coal properties in various parts of the state. It is reported that large coal deposits in eastern Oregon will be opened up as soon as arrangements can be made for transporting the coal, and as it would require only about 50 miles of railroad extension to do this, it is held that it will not be long before development work is under way. The coal is said to be of good quality.

Pennsylvania

Bituminous

Washington—E. T. Kurtz, receiver of the Washington County Coal Co., announced, May 7, that he had sold the company's property to Samuel Hollis, of Pittsburg. The price paid was $300,000. All real estate, a railroad line and an operating mine are included.

James S. Campbell, of Mt. Pleasant township, on May 8, sold to Virgil McDowell, of Midway, said to represent the Wabash Coal Co., a tract of 335 acres of coal land. The land, which adjoins 800 acres owned by the coal company and lies along the line of the Wabash railroad, was sold at $100 an acre. It is bordered on one side by the property of the Wabash Coal Co. and on the other side by holdings of the Pittsburg Coal Co. It is understood that the acreage of the Wabash company will soon be developed and a spur run from the Atlas mines into this new territory.

An important coal deal was closed here, May 4, when notices of acceptance were served, whereby H. L. Duncan, of Pittsburg, representing a syndicate of Pittsburg capitalists, took over more than 5000 acres of coal land, located in Washington County, the average option price being $115 an acre. The tract, comprising the Pittsburg seam of coal, lies in Cross Creek, Jefferson and Smith townships, extending northwestward from Cross Creek village, almost to Dinsmore and Hanlin on the Panhandle railroad. The coal block is unusually accessible to railroads, having the Wabash along the southern border and extending on the north to the Pennsylvania lines.

Clearfield—Tellers have completed the count of votes on the ratification of the new wage contract for the bituminous miners of district No. 2, United Mine Workers, and find that 22,325 were for acceptance, and 5245 for rejection.

Indiana—The Buffalo, Rochester & Pittsburg Coal & Iron Co. has started work on another operation in this county, about two miles from Jacksonville, where it is expected coal will be taken out before the coming winter. The tipple will have a capacity of several thousand tons per day.

Within the past couple of weeks contractors and others interested have gone over the plans for the extension of the railroad from above Idamar to what is commonly known as the Lowry coal, three miles east of Marion Center, and the indications are that the road will be built in the near future.

Pittsburg—The Interstate Commerce Commission has set May 16 for the hearing of arguments in the petition of John W. Boileau and coal operators of the Pittsburg district who ask for a hearing in their case against the Pittsburg & Lake Erie R.R. and other carriers. The petitioners, after a hard fight, won a reduction of 10c. a ton on the coal rate of 88c. from the Pittsburg field to Ashtabula Harbor. The action of certain railroads in reducing rates from competing fields, it is asserted, has nullified the commission's order so far as the Pittsburg operators are concerned.

Anthracite

Scranton—Riotous demonstrations have been taking place recently in nearly all sections of the anthracite field. Following the trouble at the Dickson shaft of the Delaware & Hudson Co., on May 7, a similar demonstration took place at the Leggetts Creek and Von Storch collieries in North Scranton on May 9. The Cayuga breaker of the D. L. & W. Co. was the scene of another riot in the morning of May 10 when a crowd of several hundred men, women and boys assembled to keep men from going to work. The police were attacked and fired on the mob, wounding several men. A number of arrests were made. At Olyphant, on May 11, a conflict took place between state police and a crowd of rioters who had assembled near the No. 1 breaker of the D. & H. Co. A 14-year old boy, on the outskirts of the fray, was shot and it was thought would die.

Wilkes-Barre—Angered at the number of men employed doing repair work at the collieries in this region, small armies of idle men attacked a number of the workers May 9. At the Nottingham Colliery, at Plymouth, a crowd of 500 men and boys menaced the workmen and compelled them to return to their homes. Repairmen, pumpmen, firemen and engineers were held up at the Delaware Colliery, at Hudson. At a washery in Luzerne borough, the men at work were driven from the place by a crowd of 400 men, women and boys, who used sticks and stones. Hundreds of idle mine workers have left here recently for the West Virginia bituminous region, although officials of the United Mine Workers have tried to persuade them not to go.

The tridistrict convention of anthracite mine workers met here May 14 with 407 delegates in attendance. The foreign element proved to be in a majority and indications pointed to heated discussion.

Pottsville—In a clash between a detail of seven state police and foreign mine workers at Minersville on May 8, three men were shot, two fatally, and a woman injured. The police were escorting Superintendent George W. Keiser and several repairmen to the Pine Hill colliery. Attacks on men going to work at the mines have been general throughout the lower end of the anthracite field and several attempts have been made to dynamite railroad tracks and trains. The companies have suspended all work except that absolutely necessary to keep the mines in order.

Hazleton—Local unions on May 10 adopted resolutions asking that all repair work at the mines be discontinued but agreeing to permit engineers, firemen and pump runners to remain on duty.

Washington

Seattle—Paul Bockmier, of Palouse, Wash., has found a 6-ft. seam of coal within six miles of that town. A tunnel has been driven 85 ft. into the bluff along the Palouse River, and when in a distance of 50 ft., exceptionally good samples were taken out. The work of prospecting is being done by some individual members of the Palouse Coal & Oil Co. The surface croppings are of poor quality, but the coal evidently becomes better at a slight depth and is believed to be a good fuel.

Word was received here recently from the Mare Island navy yard that the cruiser "Maryland," which will arrive about May 15 for repairs, will be used to make further tests of the Pacific Coast coals. She will load with Western coal for a cruise to Alaska.

West Virginia

Welch—The Jed Coal & Coke Co., with a mine near here at which an explosion occurred recently, killing 81 men, has been placed in the hands of A. H. Storrs as receiver. This action of the court was taken at the request of Mr. Storrs, who was recently elected president of the company, and was opposed by William Leckie, a stockholder and formerly general manager. The company is capitalized at $600,000 and has never paid a dividend, the earnings having been used in the development of the property. Most of the stock is held by people in Pennsylvania.

Holden—The United States Coal & Oil Co. is opening up a large amount of new territory in this state and in Kentucky.

Charleston—The West Virginia-Pittsburg Coal Co., which has operations in the Cross Creek district of Brooke County, in the northern panhandle, has increased its authorized capital from $10,000 to $1,500,000.

Nine thousand miners in the Kanawha district, who had been idle since the first of April, returned to work, May 7, following a settlement of the wage-scale dispute. The men will receive an advance in wages equal to half of that provided for by the Cleveland joint conference. Miners in the Paint Creek section still remain on strike.

About a score of the mines in the Kanawha district have not yet resumed operations since the agreement of a week or more ago. The operators who refused to sign claim they have been operating their mines at a loss for several years, and that to pay the increase would only add that much more to the loss. In consequence the mines have been closed indefinitely.

The old Nuttallburg Coal Co.'s property, recently purchased by W. E. Deegans, of Fayette County, under a decree of the federal court, is to be operated under the name of the Nuttallburg Smokeless Fuel Co., just chartered by Mr. Deegans and others. The new company is capitalized at $125,000.

Canada

British Columbia—The Corbin Coal & Coke Co., Ltd., which is operating a mine in Crows Nest Pass, has filed amended articles of incorporation, increasing its capital from $2,000,000 to $10,000,000. It is understood that the increase of capital is due to the fact that the company is securing possession of large additional areas of coal land. D. C. Corbin, of Spokane, is the principal stockholder.

Personals

J. M. Fitzgerald, president of the Davis Coal & Coke Co., recently made a trip of inspection to the company's mines, at Thomas, W. Va.

C. F. Brenn, chief engineer for the coal-mining operations of the Chicago, Milwaukee & Puget Sound Ry., recently returned from a month's business trip to Montana.

Henry M. Payne has become associated with Stephen T. Williams & Staff, of New York, and will leave the latter part of this month for the Yukon and Klondike gold fields, returning late in the summer.

Harry Thomas has been appointed general superintendent of the O'Gara Coal Co.'s properties, in Illinois, Indiana, Ohio and West Virginia, with headquarters at Harrisburg, Ill. Edward Gent and D. B. McGehee have been appointed assistants to the general superintendent.

Edgar Kudlich, formerly general superintendent for Coxe Brothers & Co., Inc., and recently division engineer for the Lehigh Valley Coal Co., at Hazleton, Penn., has resigned from the Lehigh Valley company to accept a similar position with the Lehigh Coal & Navigation Co., at Lansford, Penn.

George C. Atkinson has been elected president of the St. Bernard Mining Co., of Warlington, Ky., succeeding the late John B. Atkinson, who died about six months ago. Frank D. Rash has been chosen vice-president and general manager, and Dan M. Evans, secretary and treasurer of the company.

The senior and junior students in the department of mining engineering of the University of Illinois, recently visited the Illinois Steel Co.'s plant, at Joliet, the mines, zinc works and cement plants in the La Salle district of Illinois, and a number of manufacturing plants in Chicago, where mining machinery is made, also the accounting offices of a number of the larger mining companies, having headquarters in Chicago.

The following changes have been made in the coal-mines division of the Tennessee Coal, Iron & R.R. Co., Birmingham, Ala., effective May 1. C. G. Owen, acting chief engineer, has been appointed chief engineer. W. H. Sterling, superintendent of bee-hive ovens, has been appointed superintendent of Pratt No. 12 mine, with headquarters at Docena, Ala., succeeding H. McKean Conner, resigned. L. V. Harvell, until recently division engineer of the Blue Creek division, has been appointed assistant superintendent of that division, with headquarters at Johns, Ala., succeeding John A. Jordan. George W. Postell, until a few months ago division engineer of Pratt No. 2 division, has been reinstated in that position, succeeding John A. Ridgney, detailed on special work.

Obituary

Joseph E. Ball, for a number of years a sales agent of the Delaware, Lackawanna & Western Coal Co., at Buffalo, N. Y., died recently at his home in that city. Mr. Ball was 61 years of age and well known in connection with the Lake trade.

Frank J. Bergs, vice-president and general manager of the Berry-Bergs Coal Co., of St. Louis, was killed recently, when an automobile, which he was driving, was struck by a Missouri Pacific train. Mr. Bergs was 46 years of age and one of the most prominent and popular coal men west of the Mississippi River.

Construction News

Harlan, Ky.—The Wilhoit Coal Co. is building a power plant and will install electric coal-cutting machines.

Marion, Ill.—The West Virginia Coal Co. is planning to build here a large coal storage and rescreening plant.

Washington, Penn.—The Pittsburg-Buffalo Co. has announced that it will install 500 additional coke ovens at its Marianna plant.

Superior, Wis.—The Pittsburg Coal Co. has announced that $750,000 has been appropriated to be used in making extensive improvements to its local dock.

Brownsville, Penn.—The Lilly Coal & Coke Co. has started construction work on its new plant at West Brownsville, to cost $1,000,000. A steel tipple will be erected.

Herrin, Ill.—It is reported that the Chicago-Herrin Coal Co. will make improvements to its surface plant and will erect storage pockets and screens for loading on two railroads.

Lansford, Penn.—The Lehigh Coal & Navigation Co. has decided to erect a large number of houses for the employees of its new colliery at Hauto, Penn., now under construction.

Cumberland Gap. Tenn.—The Eastern Kentucky Land Co. contemplates the development of coal property near here and will be in the market for machinery. Address Lewis Apperson, Mt. Sterling, Ky.

Red Ash, Ky.—The Proctor Coal Co., which will develop 6000 acres of coal land to a daily capacity of 2000 tons, has not yet fixed a date for opening machinery bids. Address Philip Francis, superintendent.

Indianna, Penn.—The Buffalo, Rochester & Pittsburg Coal & Iron Co. has started work on a new operation at Jacksonville. The Heyl & Patterson Co., Pittsburg, is reported to have the contract for a large new tipple.

Bay City, Mich.—The Central Coal Mining Co. has completed plans for building a large coal-handling dock on waterfront property recently purchased. Facilities will be installed for coaling vessels and receiving coal by water.

St. Paul, Minn.—The C. G. Hartin Coal Co. has purchased a large property on Dale St. and will build a coal-storage yard of 25,000 tons capacity. Elevators and rescreening plant will be installed. Immediate outlay on improvements to be $40,000.

Publications Received

INDUSTRIAL EDUCATION. The twenty-fifth annual report of the Commissioner of Labor. 822 pp., 6x9¼ in., cloth. Government Printing Office, Washington.

REVIEW OF LABOR LEGISLATION OF 1911. Bulletin No. 97 of the Bureau of Labor. By Lindley D. Clark. 622 pp., 6x9¼ in. Government Printing Office, Washington.

MINING CONDITIONS UNDER THE CITY OF SCRANTON, PENN. By William Griffith and Eli. T. Conner. Bulletin No. 25, Bureau of Mines. 90 pp., 6x9 in., illus., and case of 29 maps.

This bulletin is a publication of the report recently made by Messrs. Conner and Griffiths to the city of Scranton.

TESTS OF COLUMNS: AN INVESTIGATION OF THE VALUE OF CONCRETE AS REINFORCEMENT FOR STRUCTURAL STEEL COLUMNS. By Arthur N. Talbot and Arthur R. Lord. Bulletin No. 56, Engineering Experiment Station, University of Illinois, 25c. 44 pages, 6x9 in., 1 pl., illustrated.

This bulletin gives an account of a series of tests to determine the strength of a structural steel column of considerable strength having a filling of concrete. The tests show that this type of column, if properly made, is a reliable and efficient structural member, and that nearly all the strength of both steel and concrete is developed. The tests also show that up to the point of failure of the column, the fireproofing shell of concrete adheres tightly to the remainder of the column.

Trade Catalogs

Taylor Iron & Steel Co. High Bridge, N. J. Bulletin No. 114. "Tisco" Manganese Steel Crusher and Pulverizer Parts. 4 pp., 6x9 in., illus.

John Davis & Son (Derby), Ltd., Baltimore, Md. Leaflet 20 FB. Selection of Mining Instruments, a catalog of safety lamps, anemometers and various scientific instruments for use in mining work. 6 pp., 6x9¾ in., illus.

Electric Service Supplies Co., New York. Series of four pamphlets. The Bond with the "Shot-Over" Sleeve—its Manufacture, Copper, Service and Compressor, descriptive of protected rail bonds. 5x7 in., illus.

Hyatt Roller Bearing Co., Newark, N. J. Booklet. Twelve Progressive Mine Car Wheel Makers. 16 pp., 3⅜x6¼ in., illus. Twelve makes of mine car wheels, to which Hyatt roller bearings have been applied, are illustrated and described.

Industrial Notes

The Roberts & Schaefer Co., Chicago, Ill., announces that on account of the increase in the company's business during the past year it has decided to move into more commodius quarters, and after May 11 will be located in its new offices on the top floor of the McCormick Building, Chicago.

Walter B. Snow, publicity engineer, 170 Summer St., Boston, has increased his organization by the addition of Mr. Charles Mulligan, late of the editorial staff of the Brooklyn "Standard Union," and for a considerable period associated with the publicity department of the Western Electric Co.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

A more general resumption at the soft-coal mines, with a consequent increase in production, has resulted in another relapse in the bituminous market. The supplies accumulated in anticipation of the strike are still in evidence, and the trade has fully demonstrated its inability to absorb even a normal tonnage. Forced sales of demurrage coal are reported at some of the large distributing centers and quotations have fallen off generally in all parts of the country.

In anthracite the situation continues tight and supplies short; premiums are being offered on every hand and the market is in prime condition for a panic. Hard-coal shipments for April amounted to only 266,625 tons as compared with 6,596,687 tons for the month previous, and indications are that unless an agreement is effected in the meantime, the movement for the current month will show a still further decline. The shortage is most pronounced in the Northwest and it is probable that the season's shipments will not be sufficient to meet requirements as stocks are down to an unusually low point and this market, at the best, is only an overflow for the surplus tonnages.

Mining in the Pittsburg district is steadily increasing due largely to the Lake loading which is fairly heavy. Preparations are being made in Ohio at both the mines and on the railroads for the largest production on record. In West Virginia the movement has been quite free to tidewater but not as heavy as last month, while in the South prices are steady and the outlook good. Some contracting is being done in the Middle West but otherwise the trade is dull.

Boston, Mass.

There is little change in the Eastern market. Soft coal is certainly dull, and low prices are heard where cargoes are forced on buyers. There have been several instances of "sacrifice sales" during the past fortnight, and there is small encouragement in the outlook.

The Pennsylvania shippers are especially active in the pursuit of business on the low freights from Philadelphia, and sales from that direction and on Georges Creek are much heavier than on the West Virginia coals. At the Hampton Roads piers there is plenty of coal, although off-shore tonnage is still taking the largest proportion of it.

The anxiety over anthracite is again on the increase. Opinion here is about equally divided as to whether there will be a settlement at Wilkes-Barre, May 14, or a long strike. Meanwhile there are almost no hard-coal arrivals. Receipts are confined to odd lots of stock coal in egg and chestnut. Premiums are again heard, and conditions seem ripe for another "flurry."

Wholesale quotations are about as follows:

Clearfields, f.o.b. mines	$1.10@1.40
Clearfields, f.o.b. Philadelphia	2.35@2.60
Pocahontas, New River, f.o.b. Hampton Roads	2.70@2.80

New York

The anthracite trade in New York is practically at a standstill as no shipments are coming in and no sales being recorded. No great inconvenience has yet been reported but supplies are steadily disappearing and consumers are decidedly worried over the outlook. The large wholesalers are apportioning their remaining stocks among regular customers, and these represent the last remaining source of supply. There are more inquiries from buyers, particularly in the steam sizes for which there is quite an active demand.

Heavy tonnages of bituminous are arriving and this branch has suffered a further decline. There is little or no demand in the spot market, the movement being almost entirely on contract. The shortage of anthracite has had no effect on the soft-coal trade as yet. Prices on the lower grades have eased off still further, sales being reported during the week at as low as $2.40 f.o.b.; the higher grades, however, are holding steady, $3.05.

In anthracite, broken is about out of the market entirely, while the other sizes are selling at: Egg and stove $6; pea $5; buckwheat $3.25@3.50; rice $3@3.25; barley $2.25. The operating companies, however, continue to quote their regular winter circular as follows:

Broken	$4.50
Egg and stove	5.00
Chestnut	5.25
Pea	3.25
Buckwheat	2.75
Rice	2.25
Barley	1.75

Philadelphia, Penn.

The situation in this vicinity, while not in any way serious yet, is fast approaching that condition. The stocks of coal that various manufacturing establishments accumulated are slowly but surely disappearing, and while it is a fact that there is plenty of soft coal to take its place, at the same time any unusual call for this grade of fuel is bound to be followed by a substantial increase in price. Of course, this refers particularly to the steam sizes. What little stocks the operators had of these sizes are now quite low, and it will only be question of a few weeks at the most, when the situation will become decidedly uncomfortable.

As far as the domestic sizes are concerned, the supply now on hand is probably sufficient to cover all demands, which are light during the summer months. The findings at the meeting held last Tuesday will in a large measure dictate what disposition will be made of these stocks of domestic sizes. A refusal of the convention to abide by the terms of the settlement reached by the committees will more than likely result in a long strike, and a scramble among the householders for what coal they can get will undoubtedly follow, as was the case in 1902.

If mining is resumed by the first of June, it is more than likely that a reduction of prices will be made, as it is not felt that there will be any great demand for coal if the circular that was current through the winter, is still maintained. To create a market, the companies will have to reduce prices, as the apathetic condition of the market demands it.

Pittsburg, Penn.

Bituminous—Mining is increasing slightly in the district, but chiefly on account of heavier shipments in the Lake trade. Local demand is still extremely small, and operators probably have a better idea of the heavy stocks accumulated in anticipation of a long suspension than they had at the time they hastily made a settlement, on the eve of the expiration of the old agreement. Lake shipments are now fairly heavy, and a record year in Lake trade for the district is expected. It is not thought this will be due, however, to the reductions in rates the railroads made after the Interstate Commerce Commission's order to reduce the Pittsburg-Lake rate from 88 to 78c. per ton. Hardly enough had been done in the coal market to establish prices, and those first announced may still be quoted as follows: Mine-run and nut, $1.22½; ¾-in., $1.32½; 1¼-in., $1.47½; slack, 87½c., per ton at mine.

Connellsville Coke—Operators are asking higher prices for contract furnace coke for second-half shipment than was expected, the general asking price developed being $2.50, when consumers had questioned whether they would take an interest in a $2.25 quotation. No important business has yet been closed, but there are negotiations which will likely lead to results shortly. A small contract was recently made at $2.35, for the six months.

Sales of about 15,000 tons of prompt and May furnace coke have been made in the past 10 days, chiefly at $2.40, though a portion brought $2.45. We quote: Prompt furnace, $2.40@2.50; contract furnace (nominal), $2.40@2.50; prompt foundry, $2.75; contract foundry, $2.75@2.85.

The *Courier* reports production in the Connellsville and lower Connellsville region, in the week ending May 4, at 401,544 tons, an increase of 50 tons, and shipments at 4345 cars to Pittsburg, 6282 cars to points West and 1302 cars to points East, a total of 11,929 cars, or an increase of 47.

Baltimore, Md.

The continuation of the strike of the laborers and coal trimmers at the railroad piers in Baltimore had a detrimental effect on local market conditions during the past week. Prices dropped considerably, and many of the operators had the greatest difficulty in getting rid of the product in this city at even the lowest prices which have prevailed in the Baltimore market for months.

No coal has been handled at the Port Covington yards of the Western Maryland Railway Co., where hundreds of cars are waiting to be unloaded. Not a laborer would touch it, and the market would have been benefited just as much if it had not been shipped in. The situation is cleared up now, however, and loading has been resumed at approximately the normal rate.

At the Curtis Bay piers, of the Baltimore & Ohio, some coal was moved during the week, although the movement was retarded on account of a shortage of men. Among coal men it is believed that the worst is over, and that normal conditions at the railroad piers in Baltimore will prevail again soon.

There was a considerable movement by rail during the week, but practically all under contract. Very little spot business was reported. It developed a few days ago that the Uruguayan government had requested several coal operators to submit bids on a coal contract, the fuel to be used by the navy of that country. Should the companies here be successful, it is likely that Uruguay will be a large purchaser in this market in the very near future.

Buffalo, N. Y.

The bituminous trade is still very quiet and promises to remain so for a while, as the consumers who stocked up in March are still mostly well supplied. There was some expectation that the failure of the anthracite miners to go to work would immediately stiffen the bituminous prices, but the production is too large for that. It is estimated that the production is fully 40 per cent. more than consumption, and though quite a large part of the mines are either idle now or running part time, there is enough surplus to keep prices down.

A fairly good feature of the trade is the making of the annual contracts, for it was thought that the basis was hardly good enough for anything but transient sales. Some sellers are getting a better profit than last year. The trade generally goes on much as before, the new basis of reckoning not tending to help prices as a rule.

Quotations of bituminous remain nominally as before, $2.57½ for Pittsburg three-quarter, $2.47½ for mine-run and $2.25 for slack. Coke is again quiet at $4.75 for best Connellsville foundry. A mistake was made in putting coke prices too high.

Anthracite is plenty enough for local consumption, but there is none for the Lake and the Western rail-line trade. It is now believed to be impossible to produce enough to meet the demand from the upper-lake district, even if mining should begin at once.

The bituminous miners in the Allegheny Valley are very quiet, as there is not nearly enough work for them. Many have left the region and the same conditions are said to prevail in the South and West.

Cleveland, Ohio

There has been very little change in the situation in the past week. The demand for coal has not increased, as there still seems to be considerable on hand, which was obtained prior to the strike scare, and the manufacturers are not inclined to purchase at any price at the present time, owing to their being still well supplied.

Considerable coal has come in during the past week for the Lake trade, and slack seems to be a drug on the market. Quotations for slack are nominally $1.55 for No. 8, $1.45 for No. 6 and $1.65 for Pittsburg.

The general business in the steam trade does not look very encouraging up to the present time. There is, however, a feeling that there will be a large demand for the Lake trade; in fact it is generally believed this season will see the biggest Lake business that has been done for years.

Columbus, Ohio

Coal loading for the Lake trade has assumed considerable proportions during the past week. The greatest activity is in eastern Ohio, but a number of mines in the Hocking Valley are now busy. The Northwest docks are urging shipment during the suspension in the anthracite field, and for this reason a much larger tonnage will be moved than is usually the case with the first month of navigation. Lake demurrage rules go into effect the middle of the present month, and producers will be allowed only seven days after that date to release cars now loaded and awaiting bottoms.

Officials of the Hocking Valley Ry., which is affiliated with the Chesapeake & Ohio for West Virginia shipments, as well as being the chief outlet for the central Ohio territory, are preparing for the largest movement in the history of the road. They have announced that no Sunday excursions will be run this summer, as they will need that day for cleaning up and keeping the lines open.

Outside of the Lake trade, the market is very dull. Dealers are tardy about placing orders for stocking, and in this respect the present season is at least a month behind that of 1911. Salesmen report that most of the steam consumers have stocks held over from storage and cannot be interested. Tonnage on contracts has been cut to the minimum by railroads, public service plants and other large steam users.

Altogether there is a dearth of business that is keeping mines down to a day or two a week, where they are not idle altogether. This condition is looked upon as being temporary and one that will produce a stiff market within a very short time.

Prices remain practically unchanged, except for fine coal, which has dropped 10c. a ton during the past week. The prevailing figure on nut, pea and slack is 65c. As Lake production increases, this will go much lower, unless there is a concerted movement to hold it back from the market by track storage.

Hampton Roads, Va.

There has been little change in the market conditions at Hampton Roads during the past week. Coal is moving quite freely to tidewater ports although not in as great a volume as it did during the earlier part of the month. Prices are holding up well in spite of the approach of the summer season.

An especially noteworthy feature at Hampton Roads during last week was the 24-hour performance at the Virginian Ry. piers. The dumping over the Virginian piers on Monday last reached the enormous figure of 26,391 tons, or 551 cars of coal. Of these 303 cars were dumped during the day and 248 during

the night. While this entire tonnage was dumped within the 24-hour day, the actual dumping time was only 20 hours.

In the coal trade here the Virginian Ry. has been much congratulated on what is considered a wonderful performance, which goes well toward indicating the great future of Norfolk as a coal center.

Charleston, W. Va.

Although about one-half of the miners in the Kanawha district were out during the month of April, it proved to be the biggest month in shipments in the history of the district, which indicates what the mines could do if they were not handicapped by a shortage of cars and motive power. Between 8000 and 9000 miners were out in the Kanawha field during the month or for at least three of the four weeks.

The tonnage of the district for April, as shown by the Chesapeake & Ohio reports, was 973,730; that of the New River district was 739,100 tons, and the Kentucky district 151,390 tons. The tonnage for the entire Chesapeake & Ohio system in West Virginia for April was 1,864,220 tons, an increase of 356,130 tons over the month of March, when all the mines were in operation, but during which time there was a shortage of cars. This illustrates the conditions that the operators along the Chesapeake & Ohio have had to contend with.

Memphis, Tenn.

The wholesale situation so far as west Kentucky steam coal is concerned has been in pretty fair shape, as to price; the Henderson division of the L. & N. R.R. being a nonunion field, is the only western Kentucky coal that has been offered on the market for the past 40 days. However, this situation will change now, as the miners and operators have adjusted all their differences and the union field will go back to work immediately. This will have a tendency to cheapen the price of all grades of coal from this territory.

Prices now in effect are:

Mine-run	$0.80@0.90
No. 1 lump	1.25
No. 1 nut	1.10@1.25

The smaller screenings are very scarce and range from 40@80c. Alabama coal is unusually stiff in price for this season, as the bulk of the high-grade coals are sold up to Oct. 1. In the big veins domestic orders are in excess of the contracts for steam coal and consequently the Alabama situation is stiff at the present time.

The east Tennessee mines, which include the Jellico and Straight Creek seams, are getting better prices this season than last. Present quotations range from $1.65@2 for Block coal as against $1.50@1.80 last year. There is practically no coal in storage, either steam or domestic, throughout the Southern territory, and this will have a tendency to make good prices for the operator from now until winter.

Birmingham, Ala.

The coal market is maintaining a steady level in prices with satisfactory outlook. An improvement in the demand has been noted in textiles and railroads. Furnaces are not increasing their consumption as yet but the indications are that they will about the middle of the year. The market has been affected to some extent by the high waters on the Mississippi River and this is also offered as an explanation of the car shortage.

The commercial coke market is satisfactory. The policy of maintaining a fair level of prices in spite of the fluctuations in the Virginias has, it is believed, accrued to the benefit of the Alabama coke producers.

Some of the leading coal operators of the Birmingham district are investigating the possibilities of getting into the Cuban and South American markets, by reason of the coal shortage in England following the strike. Several shipments have been made and encouraging reports are being received from the consumers, indicating a willingness to continue. Alabama coal can be placed in the West Indies and South America at a saving to the consumer. The Alabama product, however, is so strikingly different from the Wales coal that it is no easy matter to introduce it.

Aside from the increased demand in some lines and the slight car shortage during the week, other factors entering into the market conditions are a labor shortage in some quarters and heavy rains causing some mine troubles.

Chicago

There will be no big improvement in the Chicago coal market until the beginning of September, according to observers of conditions here.

Small steam users and a few railroads, seeking to replenish their storage piles, create about the only demand which exists now. So far as Western coal is concerned, it may be said that domestic sells at $1.50 and steam at $1.25, at the mines. There is practically no demand for any kind of domestic coal. The supply of screenings is small and the price is correspondingly high. Screenings, mine-run and steam lump are selling around $2.10@2.25, f.o.b. Chicago. There has been little change in the smokeless-coal market, there being little or no demand for the product. It is generally believed that anthracite coal will not be available for the Western trade until late in the summer. The coke trade, generally, is dull.

Coke—Prices asked for coke are: Connellsville and Wise County, $4.75; byproduct, egg and stove, $4.55; byproduct, nut, $4.55; gas-house, $4.75.

Prevailing prices at Chicago are:

Sullivan County	
Domestic lump	$2.37
Egg	2.12
Steam lump	2.12
Screenings	2.12
Springfield	
Domestic lump	$2.32
Steam lump	2.07
Mine-run	2.07
Screenings	2.07
Clinton	
Domestic lump	$2.27
Steam lump	2.02
Mine-run	2.02
Screenings	2.02
Pocahontas and New River	
Mine-run	$3.15
Lump and egg	3.30@3.55

St. Louis, Mo.

There is practically no market in St. Louis for bituminous coal of any kind. The mines in the Standard field are gradually resuming work, but they are forcing the greater part of their tonnage on the railroad companies. Screenings are moving freest and are sold only with a proportionate amount of lump.

Carterville and Franklin County mines are gradually resuming, but the same condition prevails in that coal as with the Standard, with the exception that such as is moving, is going into the country.

There is nothing to indicate that the market will improve any in the very near future, but, on the other hand, it may gradually get worse as a greater tonnage is forced upon it. There is a limited amount of smokeless moving in, and the same applies to gas-house and byproduct coke.

The prevailing prices are:

Williamson and Franklin County	
6-in. lump and 3x6 egg	$1.30@1.50
Nut	1.30@1.50
Screenings	1.50@1.10
Mine-run	1.05@1.15
Standard	
6-in. lump	$1.15
3x6 egg	1.10
2-in. lump	1.00@1.05
Screenings	0.95@1.00

Minneapolis—St. Paul

With the exception of making contracts on bituminous, business in this territory is extremely dull. There is hardly any domestic trade, and all the larger steam users are well stocked up, and will not be needing new supplies for another month or six weeks. Some Chicago jobbers ordered coal shipped all along the line, between here and Chicago, for speculative purposes, and when the market broke on the announcement of the strike settlement, they found it very hard to sell, and most of it has reached this end of the line. Their efforts to dispose of this coal has had a tendency to break prices on the steam grades. Soft-coal prices are very weak and price cutting is going on to a great extent.

The Illinois mines are not doing much and it is thought that they will withhold

mining until there is more of a market. The Illinois representatives here seem to have no prices to work on.

The anthracite proposition is almost at a standstill, and the expected new scale of prices did not, of course, arrive, owing to the further disagreement with the miners in that field. There is very little anthracite coal of any size to be had, and consumers will not buy their winter's supply until later in the summer, unless some inducement is made in the way of prices.

Portland, Ore.

The demand has been light for several weeks, owing to the mild weather, and there is every reason to believe that the call for coal now will come only from manufacturing interests. It is expected that storage prices will soon go into effect. There has been no change in prices here since last fall.

Receipts are naturally light here at this time of the year and it will be fall before any shipments will begin to arrive from Australia. Last year the Australian importations were light, but as the demand was light, too, dealers here are pretty well supplied.

Production and Transportation Statistics

Anthracite Shipments

Total shipments of coal in April were 266,625 tons as compared with 5,804,915 in April, 1911, and 6,569,687 in March, 1912. The shipments in April were 5,538,290 tons less than in that month of last year. Practically no coal whatever was mined in April, which accounts for this showing. The shipment by the different companies in April this year and last, were as follows, in long tons:

Company	1912	1911	Dec.
Phila. & Reading...	31,324	1,174,837	1,143,513
Lehigh Valley......	4,840	1,049,164	1,044,324
Cent. R. R. N. J...	58	777,438	177,380
Del. Lack. & West..	112,858	756,019	643,161
Del. & Hudson.....	......	538,026	538,026
Pennsylvania.......	49,687	635,330	585,643
Erie..............	67,798	681,524	613,736
Ont. & Western....	60	192,567	192,507
Total...........	266,625	5,804,915	5,538,290

The Virginian Ry.

Total coal shipments over the Virginian Ry. for the month of March, 1912, amounted to 303,159 tons. No coke was shipped during this period.

The Consolidation Coal Co.

The tonnage of the Consolidation Coal Co. was exceptionally large for the month of April. The total output for the month was 950,000 tons, or an increase of about 300,000 tons as compared with the corresponding month of last year. The Consolidation is now rushing work on its Kentucky railroad, which taps a large coal area in that state, and the line will probably be completed some time in June.

Imports

The total imports of bituminous coal into the United States, for March, 1912, were 120,355 tons, as compared with 148,751 tons in the same month last year. Imports of coke for March of this year were 7418 tons as compared with 14,290 tons for the same month last year. No anthracite was imported during March.

Exports

The exports of anthracite during March of the current year amounted to 277,283 tons as compared with 136,723 tons in March of last year. Bituminous exports for March of this year, exclusive of bunker or fuel coal laden on vessels in the foreign trade, were 973,096 tons as compared with 721,181 tons for the same month last year. Bunker or fuel coal laden on vessels in the foreign trade during March of this year amounted to 671,053 tons, as compartd with 574,409 tons during the same month last year. Coke exports fell off during March of this year to 70,393 tons, as compared with 76,866 tons for the same month last year.

Baltimore & Ohio R.R. Co.

The coal and coke shipments over the lines of the B. & O. R.R. for the month of March, 1912, and for the same month of the previous year, were as follows:

	1911	1912
Coal................	2,027,245	3,173,168
Coke................	371.219	384,094
Total.............	2,398,464	3,557.262

Pennsylvania Railroad

Statement of coal and coke carried on P. R.R. Co.'s line east of Pittsburg and Erie, for the month of March and first three months of 1912, in short tons:

	March	3 Months
Anthracite............	1,140,976	3,288,737
Bituminous............	4,501,653	12,169,935
Coke..................	1,147,602	3,111,786
Total................	6,790,241	18,570,458

Foreign Markets

Toronto, Canada

Owing to the British coal strike, the Nova Scotia mines have greatly increased their output for the first quarter of the current year and extended their export business considerably. Should the production be maintained at the same rate throughout the season, the total output for the year will exceed 7,000,000 tons.

The markets of South America have, for the first time, been available for Nova Scotia coal. The Nova Scotia Steel & Coal Co. has so far shipped about 30,000 tons to Montevideo and Buenos Ayres, and the Dominion Coal Co. has also made some consignments to the same markets, as well as to the West Indies. Much coal has also been sent by the Cape Breton companies to European ports, including one cargo to London. The steamer "Tokomaru," of the Shaw Savill & Albion line, recently sailed from North Sidney with a cargo of coal for Capetown, South Africa, and had sufficient fuel to last her for a trip to New Zealand. Canadian exports for the current year will probably show a good increase.

Financial Notes

Assets of the International Coal & Coke Co. at the close of the year 1911 were: Coal lands, $3,116,118.90; plant buildings, horses, etc., $640,426.43; warehouse stock, $39,256.37; current accounts receivable, $90,616.69; stock of coal and coke on hand, $2582.25; unexpired insurance, $1269.28; timber rights, $4304.82; total, $3,894,563.34.

The Pittsburgh Coal Co. strengthened its financial position during the past year by purchase and cancelation of $8,600,000 first mortgage bonds at 110 and interest. It was enabled to do this as a result of sale of about 7000 acres of measured coal to H. C. Frick Coke Co. for an aggregate consideration of not less than $10,000,000.

The securities and cash set apart in the coal loans sinking fund of the Lehigh Coal & Navigation Co. now amount to $1,031,131. The fund has now reached such proportions that with the accretions due to the investment of its annual income at 4% it will in 40 years equal the value at which the coal lands are carried on the books of the company and under the circumstances the board is of the opinion that appropriations for the fund direct from the income are no longer desirable.

In the foreclosure sale proceedings brought by the Bankers' Trust Co. of New York as trustee under the mortgage securing the $200,000 prior lien 5% bonds which matured July 1, 1911, it is held that the Wheeling & Lake Erie Railroad Co. is obliged to pay off and discharge the sale. The protective committee for the $634,500 first mortgage 4% bonds opposed the suit on the ground that the railroad company, which owned and controlled the coal company, should pay the latter's debt.

Jamison Coal & Coke Co., of Pittsburg, Penn., has issued $5,000,000 first mortgage 5% sinking fund gold bonds dated Apr. 1, 1912, and due May 1, 1931, redeemable at any date at 105 and interest. The company has been in successful operation since 1892, and owns in Greenburg Basin, West Moreland County, Penn., 5350 acres of high-grade steam and coking coal, 1800 acres of surface, six mining plants, 1400 coke ovens, miners' houses, railroad sidings, etc. Property valued at $9,000,000 on which the bond will be a first lien.

The United States Smelting, Refining & Mining Co. has organized the Utah Co. of Maine for the purpose of acquiring a number of large coal properties in Utah. All the stock of the Utah Co. will be held the Smelting Co. and the new properties will be paid for by an issue of notes of the Utah Co. guaranteed by the Smelting Co. and secured by the pledge of large interests in the Castle Valley Coal Co., the Black Hawk Coal Co. and Consolidated Fuel Co., and also by the capital stock of the 80-mile railroad, which is to be built to Spanish Fork in order to give these properties direct connection with the Union Pacific System.

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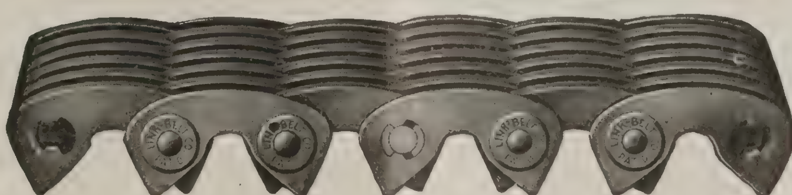

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Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 33.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, MAY 25, 1912

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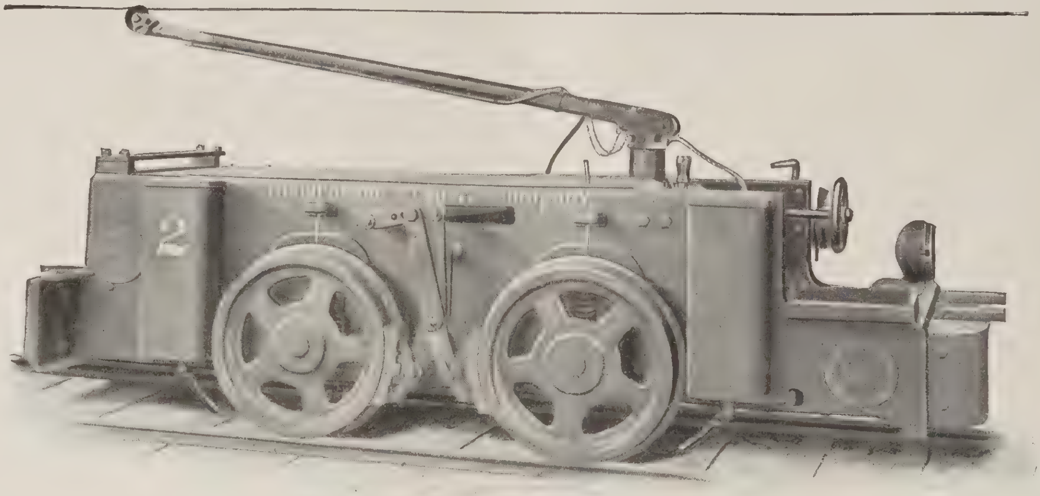

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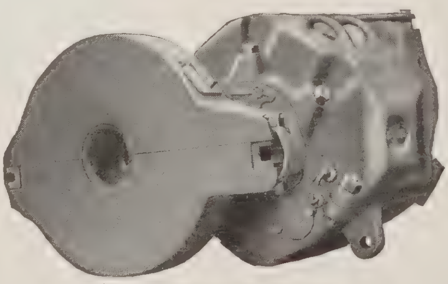

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COAL AGE

Vol. 1 NEW YORK, MAY 25, 1912 No. 33

Some time since an interesting discussion was started among COAL AGE readers by a reference in these columns to a disputed question on the correct method of sealing off a mine fire.

The echoes of that discussion are still heard and give such strong evidence of its practical value to mining men that we are prompted to suggest another question of mining practice concerning which opinions vary.

A while ago an editorial reference in COAL AGE (Jan. 13) instanced a mine superintendent who "erected an exhaust fan at the upcast to assist the blowing fan at the top of the downcast shaft" and later ordered it removed when he found that "the fan last erected would not draw in connection with the fan already forcing the air through the mine."

This statement gave rise to an animated discussion between two mine superintendents in Illinois, one of whom was using the well known "booster" fan, which he claimed, very properly, was performing the work for which it was designed.

The other questioned the efficacy of the "booster" and produced in support of his argument the editorial in COAL AGE, to which we have already referred.

The first man naturally tossed the argument to the winds and declared with much emphasis that he did not care what anyone said to the contrary; "With the 'booster' running, the men could work; but without it, not a man could stay at his place long enough to complete his day's work."

Here were *facts* against *theory*; and, as usual in such cases, the theory was misunderstood and misapplied. Both men were right and both were wrong. Why? Because they each failed to understand and properly apply a plain statement.

The question we submit for discussion by our readers is the following: Is it possible to run a so-called "booster" fan to assist in ventilating mine workings where the circulation produced by another fan, either blowing or exhausting, is deficient?

Without prejudice to the discussion, which we invite, but in order to concentrate the arguments of all who take part, we would suggest that there are two propositions that should be considered:

1. The conditions in the mine may be such that both fans are working on what are practically two distinct circulations.

2. One of the fans may be run at a speed that is capable of generating a greater velocity in the air than that induced by the other fan.

To state these two conditions more clearly:

(a) Suppose a blower fan is forcing 20,000 cu.ft. of air into a mine; but owing to leaky stoppings, brattices and doors, one or more of the innermost sections of the mine are practically without air. The air in the intake of these sections is "dead." A small "booster" is installed at this point and does the work, drawing the air from the other current and passing it through the inner sections.

Again (b), suppose the second fan is erected at the return end or opening, to work as an exhaust fan on the main current, or tandem to the first. Is this arrangement feasible and will it give results? In other words, can two fans be run tandem, the one forcing and the other exhausting on the same direct current?

Let us have a full and free discussion of this practical question.

The Roslyn, Washington, Coal Field

By Joseph Daniels*

This is the first of two articles describing one of the most important of the Pacific Coast coal fields. It discusses the geology and the various methods of development in use, including shafts, slopes and rock tunnels; also a number of difficult and novel rope haulage systems. The second instalment dealing with the methods of mining will appear in an early issue.

*College of Mines, University of Washington, Seattle, Wash.

The Roslyn coal field, of Washington, is situated in the west-central part of the state, in Kittitas County, about 100 miles southeast of Seattle. Its area is about 30 square miles and it lies just east of the Cascade Range in the borderland between the range and the Columbia plain. As a coal field it is isolated and seems to form no part of any other coal district of the state.

The Yakima River, just south of the district, is the most important stream in the drainage system. It is joined by the Cle Elum River at a point a few miles west of the town of Cle Elum. The general course of these streams is southeast. The Northern Pacific and the Chicago, Milwaukee & Puget Sound railroads follow the general course of the Yakima River in crossing this part of the state. Cle Elum is the station for the Roslyn field on the main line of both roads. Only the Northern Pacific taps the district now in operation. This it does by the Roslyn branch line, which runs six miles from Cle Elum to Lakedale, near Cle Elum Lake. Roslyn, in the center of the mining district, gives the field its name.

The field covers the valleys of the Yakima and Cle Elum Rivers, and is bounded by hills on both the north and south sides. The branch railroad, at Cle Elum, has an elevation of 1911 ft., at Roslyn 2222 ft., and continues to rise until it attains an elevation of about 2500 ft., which is at the end of the line. The hills on the north side, back of Cle Elum, have a maximum elevation of about 3300 ft., and those back of Roslyn, 3800 ft. They are composed of the sandstone of the Roslyn formation and rise gradually from the general level of the valley. Ravines along these hills expose the coal along irregular lines of outcrop. On the south side of the main valley, a ridge of basalt, andesite, and metamorphis schist rises abruptly in a pronounced range of hills 2500 ft. above the general level. A number of gravel terraces which occur between the flanks of the hills on both sides of the river cover the coal so that no outcrops are found in the southern part of the field.

Two Views of the Roslyn Fuel Co.'s Beekman Slope, Which Was Driven Out from the Inside

Geology

The rocks of the Roslyn field are made up of sedimentary measures, deposited in a lake or lagoon during the Eocene epoch of the Tertiary period, and of igneous flows which separated periods of gentle uplift occurring between the successive stages of the sedimentation of the Eocene in this area.[1] [2] The sedimentary measures consist of sandstones, shales, and coal beds, having an estimated total thickness in the Roslyn formation of 3500 ft. The Roslyn formation is partly concealed by the Yakima basalt of Miocene age, under which it dips, and it overlies the Teanaway basalt, which also is of the Eocene epoch. The upper portion of the Roslyn only is of economic importance as it alone contains the known and workable coal seams.

The greater part of the Roslyn formation is made up of massive yellow sandstone. The shale beds vary from fine grained to sandy and no subdivision of the beds has been attempted. Several seams of coal have been found, but at the present time only one, the Roslyn, is of great importance. A new mine has recently been opened on an overlying bed, the so called "Big Dirty," and prospecting is being carried on in the underlying seams. Sufficient information is not yet available to correlate these openings.[3] [4]

The strata of the Roslyn formation in this field lie in the general form of a syncline, the axis of which has a pitch to the southeast. The present workings are all on the northeast side of the field; the measures here have a southwest dip which varies from 10 to 30 deg., but which flattens out as the basin of the synclinal is approached. At the east end of the field the workings end abruptly without indicating any structural change; at the west end, as the workings approach the point where the pitching synclinal axis intersects the surface, the

[1]Mount Stuart Folio, No. 106. Geol. Atlas, U. S. Geological Survey, 1904.
[2]Snoqualmie Folio, No. 139. Geol. Atlas, U. S., U. S. Geological Survey, 1906.
[3]Washington Geological Survey, Annual Report 1901, Vol. I, 1902.
[4]Washington Geological Survey, Annual Report 1902, Vol. II, 1903.

levels swing around at an angle of over 90 deg. This seems to indicate that the Roslyn bed has an extreme length of about 7½ miles in a northwest and southeast direction.

The Coal

The most important seam, the Roslyn, is a hard and compact bituminous steam coal. The thickness varies with the locality from 4 ft. to 4 ft. 9 in., with a general average of 4 ft. 3 in. The coal thins down to 2 ft. or less in the "troubled" or "faulted" areas, while in other places it will increase to twice or three times the normal thickness, but the average may be taken at 4 ft. 3 inches.

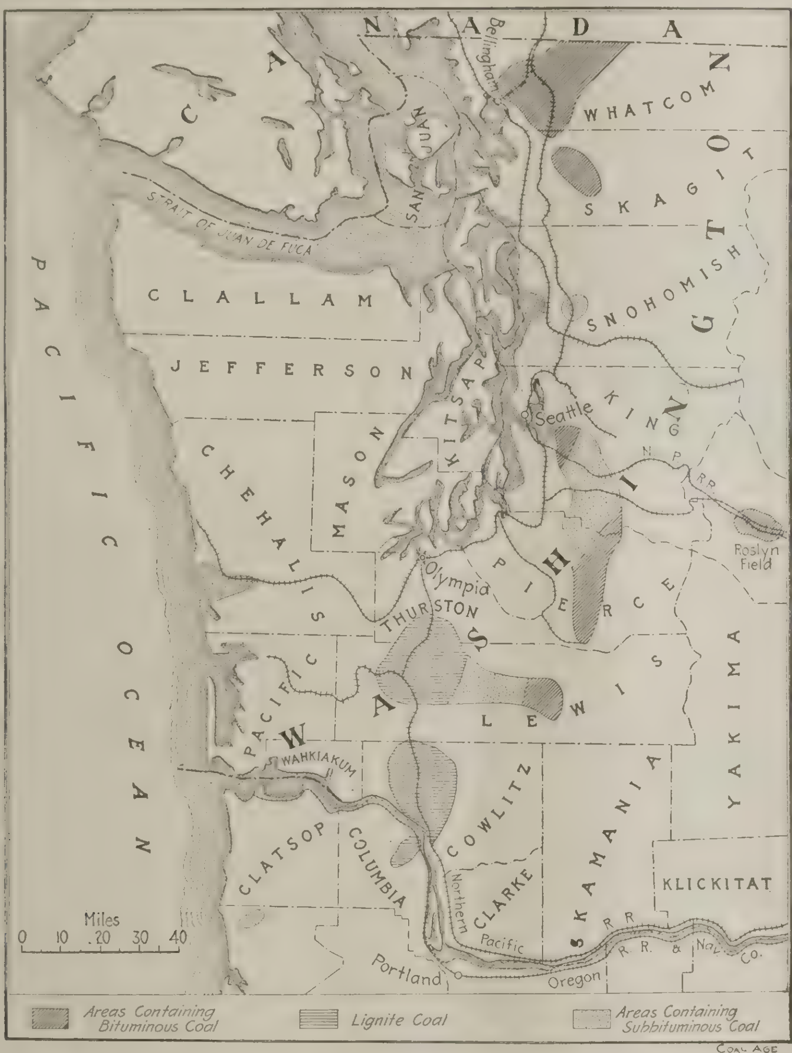
The following may be taken as an average section of the coal:

Roof, sandstone.
Cap rock, shale (variable thickness).

	Inches
Coal	29
Shale	1
Coal	4
Shale	½
Coal	20
Total	4 ft. 6½ in.

Bottom, firm, sandy shale.

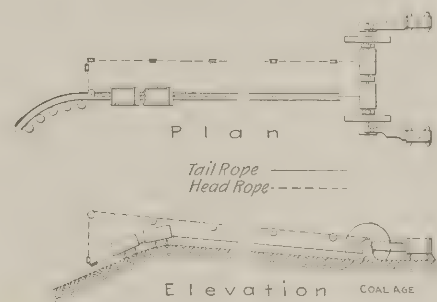
The coal changes in character from one part of the field to the other. At the southeastern, or Cle Elum end, the coal is banded and laminated, resembling bony; at the northwestern end it is denser and breaks with a cubical fracture. The ash in the coal from Cle Elum is greater, the heating value lower and the coking quality less marked than in the coal from the other end of the field. Some of these differences may be explained by the change in the structure of the coal basin as it approaches the western uptilt of the synclinal axis. This change was caused by the increased dynamic action which occurred toward the hills of the Cascade Range.



Map Showing Coal Fields of Western Washington

Moisture in this coal is low. The ash is higher than it would be if the thin shale, clay bands and partings were removed either in mining or in subsequent preparation. The amount of sulphur is small. The accompanying representative analyses taken from a series of 60 samples obtained at Cle Elum, Roslyn, and Beekman, the western end of the field, will give a good idea of the composition.[5]

The domestic market for Roslyn coal is mainly in the eastern part of the state of Washington. Transportation rates over the steep grades of the Cascades to the Puget Sound markets are high, and furthermore, the coal is in competition with the mines of the western part of the state. At the present time, the greater part of the output, about 85 per cent., is used for steaming purposes by the railroads. The marketed coal is used in gas making and for domestic purposes; none is used directly for coke making.



Haulage System at the Dip Mine

Production Statistics

The greater part of the coal lands represented by the Roslyn field are owned and operated by the Northwestern Improvement Co., a corporation affiliated with the Northern Pacific R.R. Part of these lands include the original grant of each odd section for 20 miles on each side of the right-of-way of the road; the rest have been secured by purchase. Three or four independent companies operate small mines. The field was first opened up in 1886 and in December of that year, coal was dumped over the tipple of No. 2 mine. Production, therefore, may be said to have begun in 1887, and during

[5] "Coals of the State of Washington," Bulletin 474, U. S. Geological Survey, 1911.

Characteristic Proximate and Ultimate Analyses of the Roslyn Coals

Mine	Air Drying Loss	Form of Analyses	Proximate: Moisture	Volatile Matter	Fixed Carb'n	Ash	Sulphur	Ultimate: H	C	N	O	B.t.u.
Cle Elum No. 1....	3.4	As received**	7.9	34.6	44.8	12.68	0.43	5.76	62.84	1.31	16.98	11,410
		Air dried*	4.7	35.8	46.4	13.13	0.44	5.57	65.05	1.36	14.45	11,820
Roslyn No. 4.......	1.8	As received	3.7	34.3	48.6	13.40	0.36	5.43	67.57	1.28	11.96	12,250
		Air dried	1.9	35.0	49.5	13.65	0.37	5.33	68.81	1.30	10.54	12,480
Beekman..........	1.8	As received	3.3	34.1	50.5	12.15	0.35	5.61	70.67	1.65	9.57	12,910
		Air dried	1.5	34.7	51.4	12.37	0.36	5.51	71.97	1.68	8.11	13,150

*Analyses made on air-dried sample. **Calculated from air-dried sample.

the three years, 1887 to 1889 inclusive, 230,548 short tons were produced in Kittitas County. In 1891 the production amounted to 331,444 tons; in 1900, 867,-204, and in 1910, 1,667,453 tons were produced, which is the banner production for the county.[6] The production for the calendar year of 1911 was 1,254,845 tons, a slight decrease over 1910.

The entire production of the state of Washington in the years 1860-1910, according to the figures of the U. S. Geological Survey,[7] was 53,647,802 short tons. In the period 1887-1910, the production was 51,084,344 short tons. In the latter span of years, the Roslyn field furnished 18,229,610 tons of this output—very nearly 30 per cent. of the whole.

An estimate, recently made by the State of Washington Geological Survey places the original coal content of the Roslyn bed at 71,877,840 tons, covering an area of 9661 acres. Of this content, 65,353,600 tons are estimated as "known workable" and 16,-524,240 as "probable" coal. The percentage of recovery in the old workings was taken as 70 per cent. and, from calculations made on this basis, it is believed that the future recoverable coal in the Roslyn bed is 34,054,691 tons.

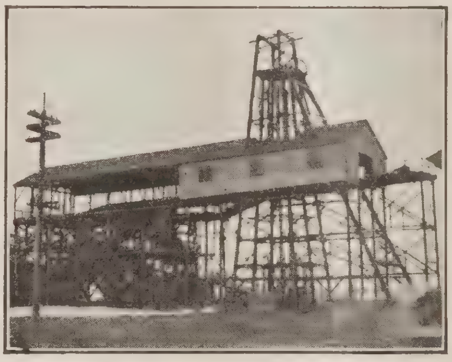
Different Methods of Working

The surface topography of the Roslyn field and the position of the coal with relation to the main surface features have been responsible for considerable variation in the methods of opening and working. The outcrop of the Roslyn bed is found on the north side of the valley, along the hills, at an elevation varying from 2000 ft. at Cle Elum to a maximum of 3700 ft. back of Roslyn. From that point it follows the irregular line of the general topography which roughly resembles a bow and reaches the Beekman mine where the elevation of the bed is 2200 ft. The coal is also exposed in the ravines which cut the hills at frequent intervals.

The general slope of the surface corresponds with the angle of dip of the coal, so that the seams dip to the southwest and yet have a fairly uniform cover of from 100 to 200 ft., up to the point represented by the toe of the hills, where the depth of cover begins to increase rapidly and finally reaches a maximum of about 1000 ft. in the synclinal basin. Since no outcrops occur on the south flank, the only data in regard to the seams must be obtained from bore-holes. The coal can be opened by drifts from the ravines, by slopes from the outcrops, by rock tunnels to the coal at points below the outcrop, and by vertical shafts and slopes. All of these methods are in use.

Two shafts, the Cle Elum No. 1, 250 ft. deep, at one end of the field, and the Roslyn No. 4, 625 ft. deep, near the center of the field, have been sunk to the coal, each reaching the seam at approximately the same elevation. From the shaft bottoms, slopes have been driven in the coal. Numerous air shafts have been sunk throughout the field but in no case are they used for other than ventilating purposes. Of the true slope mines, that is, slopes which hoist coal to the outcrop, only two in the whole field, Beekman No. 1 on the Roslyn Bed

View of the Cle Elum Mines



The No. 4 Shaft, at Roslyn

and Beekman No. 2 on the Big Dirty, will be noted. Slope mines which are tapped by rock tunnels are more frequent. Among these are Roslyn Nos. 3, 5 and 7, and the Patrick-McKay Nos. 1 and 2. In a number of these, the slopes have been extended to the outcrop. The drift mines are mainly the "hill workings" along the ravines. Cle Elum No. 2, No. 3 Extension, Roslyn No. 6, No. 2 East Side, and some small operations represent this type. The other mines, Cle Elum No. 2, Roslyn No. 1 and No. 2 Dip, are worked by slopes connected with drift openings.

Haulage System

The whole problem of surface and underground transportation is so intimately connected with the topography and method of opening the beds that it should be considered at this point, previous to the discussion of the methods of working. From the main openings to the seam, levels are driven in the coal at intervals of 350 to 400 ft. and usually on an ascending grade of 1 per cent. in favor of the loads. In the case of drift openings, the same method is followed. Landings or gathering stations are provided at the entrance of each level, and trips are made up or distributed from this point either by mule or electric power. General Electric, Westinghouse and Jeffrey motors operating on 500 volts, direct current, are usually employed.

In the slope and shaft mines, rope haulage, operated by steam or electricity, is the general method of handling the trips. In the slope mines, opened by a tunnel to the coal, the hoisting engine is located in some cases at the top of the slope above the tunnel on the surface, and drops the cars directly to the rock tunnel where they are picked up by an electric locomotive and taken to the tipple. In another arrangement, the hoisting engine is below the intersection of tunnel and slope and the rope is taken from the drum to a bull wheel inside the mine and from there down the slope. In this case, the trip is dropped right down to the tipple by the drum. The bull wheel may be so placed that this arrangement will permit full cars to be taken up the slope or dropped down from the "hill" or rise workings above the tunnel.

At the Dip Mine the trip is taken into a drift, as a rope entry, on a rising grade, then dropped down the slope. The empty trip is taken in on a head rope passing over sheaves and a bull wheel to the knuckle, and carries a tail rope connected with the second drum of the hoisting engine. At the knuckle, the head rope is disconnected, and the trip dropped down the slope by the tail rope. The accompanying sketch illustrates the method.

Another arrangement was used at the Roslyn shaft. The rope was carried from the surface down a 10-in. bore-hole, 500 ft. deep, and the trips pulled up the haulage slope to a point above the shaft bottom and then dropped back to the shaft and hoisted on double-decked cages. Finally, the simplest method of all includes engine haulage on the main slope to the outcrop, and the dropping the cars from the knuckle down to the tipple. In the drift mines the full cars are dropped to the tipple below and the empties raised by gravity or engine planes. Some of these planes are considerably over a mile in length. In every case, the tipple is below the mine opening.

The usual weight of rail on the levels is 16 lb., and on the slopes, 30 to 40 lb. The gage of track is 30 or 36 in., and the weight and capacity of mine cars vary. An average weight of an empty car is 1500 lb. and its capacity 2500 lb.; from 10 to 16 cars make up a trip.

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[6] For a detailed statement of production during the 1911 fiscal year see Coal Age, Vol. 1, page 415.

[7] "Production of Coal in 1910." Advance chapter Mineral Resources of United States.

The New Buck Mountain Colliery

By E. L. Cole

Following the article in Coal Age of May 18, which dealt with the Buck Mountain breaker, details of the belt-loading and car-handling systems are here considered. The boiler, engine, and miscellaneous equipment of the colliery described.

In the article describing the Lehigh Valley Coal Co.'s new Buck Mountain breaker, which appeared in the preceding issue of Coal Age, it was stated that the methods of loading and handling transportation cars were features of particular novelty and interest. As previously explained, coal of all sizes is carried from the storage pockets and loaded into cars by means of a belt conveyor, with adjustable boom end. This conveyor installation consists of a 36-in. Webster rubber belt, running on Robins troughing and return idlers. It is driven at a speed of 200 ft. per min. by a Lycoming high-speed engine, through belt and gear transmission.

One Man Does the Loading

A layout of the loading arrangement is shown in the sketch, Fig. 1, the entire operation being controlled by one man. The belt is started or stopped by means of a hand lever and a friction clutch on the engine drive. A steam cylinder and piston raises and lowers the boom end of the conveyor as desired. This mechanism is controlled by a four-way valve, conveniently located in front of the operator. A similar steam cylinder with controlling valve opens and closes the pocket gates, by means of seven distinct sets of connecting levers and shafts, which run to the different storage bins and are thrown in and out of connection with the operating mechanism by means of jaw clutches and suitable hand levers. The gates of any particular set of pockets may be operated by simply throwing into mesh the corresponding clutch and admitting steam to the cylinder.

Coal is discharged from the end of the belt into an adjustable chute, which leads it to the cars. Removable screen plates are provided in the bottom of this chute, in order to remove any fine coal which may have resulted from breakage in the pockets. This fine material, together with a certain amount of dirt, which adheres to the belt and tends to travel back with it on the return run, is collected in a hopper beneath the loading head and carried away by a small scraper line, which returns it to the breaker.

Automatic Belt-loading Device

An interesting detail of the installation is the use of small counter-balanced lips on the ends of the chutes, which carry coal to the belt. A sectional view of one of these lip chutes is shown in the sketch, Fig. 2. It is automatic in its operation, inasmuch as the weight of the descending coal causes it to drop into the position shown in the figure; but as soon as the flow of coal has ceased, it is drawn up out of the way by the counterweight. These lips are installed to secure an even loading of the belt, a matter which is essential to its satisfactory operation. Since the conveyor is loaded at a number of different points along its length, a stationary construction extending down close to the face of the belt would not be permissible.

Handling Cars by Cable Haulage

Handling cars to and from the breaker by other means than gravity is a decided innovation in the anthracite field. At Buck Mountain, as stated in a previous article, a continuous cable haulage is employed. The endless rope of this system runs up and down between the tracks of both empty and loaded yards, being so arranged with respect to any particular line of track that the rope travels up one side and down on the other. The rope is carried on gum-wood rollers, and guided, where necessary, by cast-iron side sheaves, complete changes of direction being made around sheaves of large diameter. At the end of its run, the cable passes beneath the tracks and returns on the opposite side. The rope is driven by a Litchfield haulage engine of the type shown in Fig. 5. This is located near the breaker at approximately the center of the system. A heavy counterweight, which operates in a tower just outside of the haulage-engine house, is provided, to insure the necessary tension of the rope.

Cars are attached to the rope by means of a Morgan cable grip and a length of chain, which is hooked by the attendant to some convenient part of the car. The

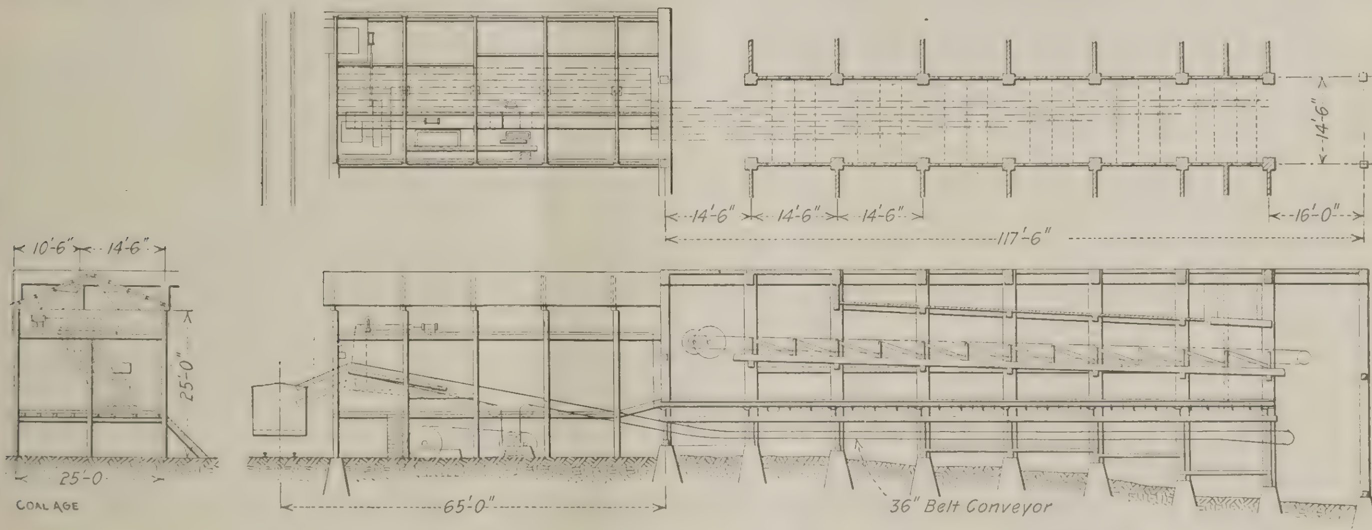

Fig. 1. Arrangement of Storage Pockets and Belt Conveyor for Loading Cars

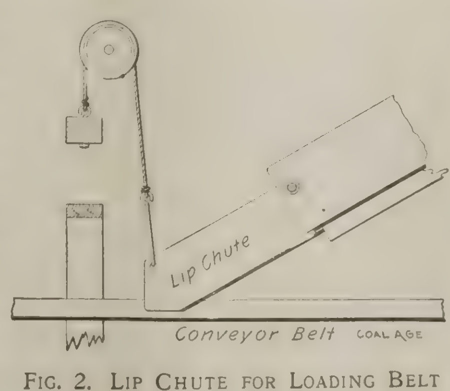

Fig. 2. Lip Chute for Loading Belt

grip, as shown in Fig. 6, is controlled by a hand lever, and it will be noted that to release its hold on the rope it is only necessary for the operator to halt, thus throwing the lever back by retaining his hold on it.

Boiler-plant Equipment

The boiler house at Buck Mountain is located about 100 ft. to the north and west of the breaker. It is a concrete building with steel roof trusses and corrugated iron roofing. One end is closed with a wooden frame and sheathing, to facilitate an extension of the plant when required by future developments. A monitor, extending nearly the full length of the building, is equipped with two lines of pivoted window sash, providing ventilation and some additional light.

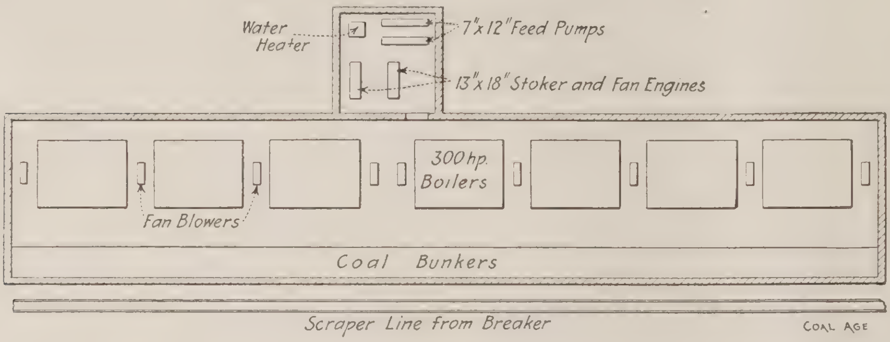

Fig. 3. Sketch Plan Showing Layout of Boiler House

This building houses an installation of seven 300-hp. batteries of Sterling boilers, making a total rated capacity of 21,000 hp. The boilers are equipped with Coxe traveling grates and Sturtevant forced-draft fans. The general plan of the plant is indicated in the sketch, Fig. 5, and a sectional elevation is shown in 3, and a sectional elevation is shown in Fig. 4.
the breaker, by a scraper line, which is driven by an 11x16-in. Atlas engine. This conveyor dsicharges into bunkers within the boiler room, or may be used to accumulate a reserve storage pile just outside of the building. From the overhead bunkers the coal is fed automatically to the Coxe grates. These are driven by belt connection to a line-shaft running the full length of the building, in front of the boilers. Four-cone pulleys are provided for regulating the speed of the grates in accordance with the demand for steam. The whole system is driven by belt connection to a 13x18-in. Atlas engine, located in the pump room, near the center of the building.

Forced-draft Fans for Each Setting

Forced draft for the boilers is provided by No. 7 Sturtevant fans, which are located in the alleyways between the settings, each fan supplying two boilers. These blowers are supported on steel beams at a height of 8 ft. above the floor level, and are driven by belt connection to a line shaft running the full length of the building behind the boilers. This arrangement provides considerable flexibility in the matter of air supply and leaves the passageways between boilers unobstructed. The fan line shafting is driven by a 13x18 Atlas engine in the pump room, this being a duplicate of the engine which operates the traveling grates.

Steam is taken from the boilers by the usual U-bends, to a header line, which runs overhead above the alleyway at the rear of the settings. The boiler-room steam lines are all of steel pipe with recessed-lap-joint flanges. This plant was installed to supersede the separate equipments located at the old Buck Mountain and Vulcan collieries, as well as to supply the needs of the local surface operations. Both of the above mentioned plants have now been dismantled and steam is supplied to these two operations by 8-in. lines, proceeding east and west from the new installation.

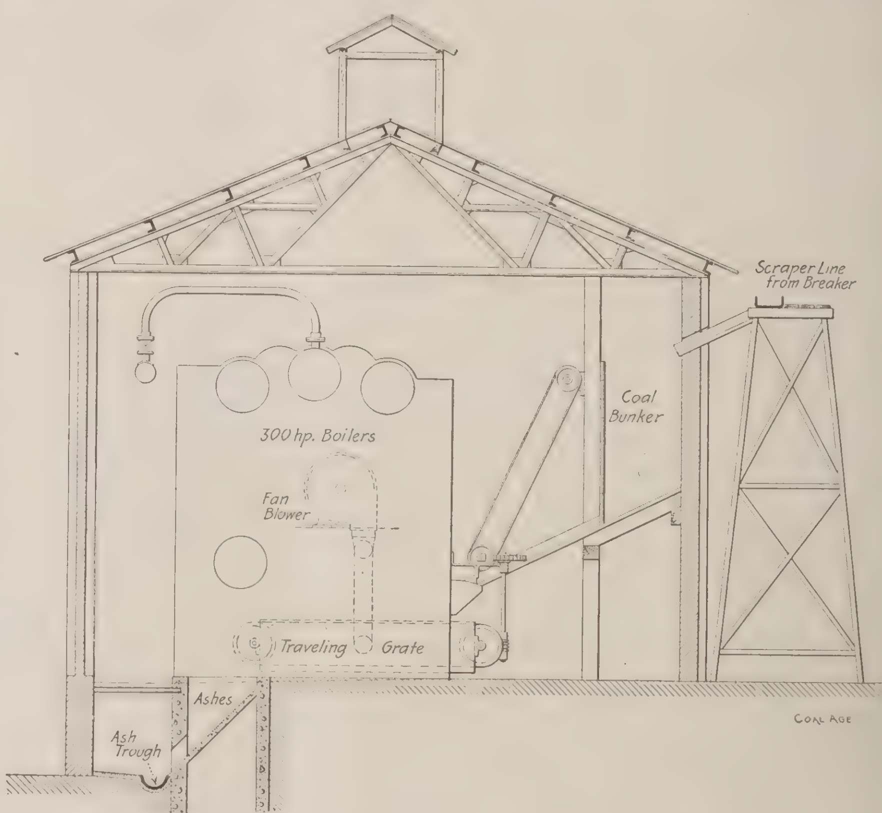

Fig. 4. Sectional Elevation of Boiler House

Ashes Removed by Flushing

The Coxe grates discharge into concrete ash pits, formed below the floor level at the rear of the boiler foundations. From these hoppers the ashes run to a line of half-round terracotta trough in the ashway at the rear of the building, and are washed out by water from the screens and jigs in the breaker. This water first enters a storage tank at the west end of the boiler house and is drawn from there as required.

Feed water is obtained from three wells, 750 ft. deep, one being of 3-in. and two of 4-in. diameter bore. These have a capacity of approximately 500 gal. per min. The water is forced by compressed air into a group of Caldwell tanks at the top of the bore holes, and flows thence by gravity to two 25,000 gal. steel storage tanks located near the breaker. The boilers are supplied by means of two 7x12 in. Scranton feed pumps, which draw their supply through a Cochrane feed-water heater. This latter raises the temperature of the feed water up to 210 deg. F. and is supplied with exhaust steam from the adjacent breaker engines and boiler house auxiliaries.

The plant is operated by three shifts of four men each, and one foreman, who is on duty during the day and acts in the capacity of machinist and repairman.

A Model Engine House

The breaker engine house is located directly to the rear of the breaker and is separated from that structure by a space

of 37 ft. It is a building 70 ft. long, 40 ft. wide and 18 ft. high, of concrete construction, with steel roof trusses and purins and corrugated iron roofing. The metal roofing is lined on the under side with asbestos sheeting, held in place by wire netting. This is done to prevent the sweating action of an unprotected metal roof. The building, as a whole, represents a radical departure and great improvement in the design of engine houses in this field. There is provided throughout not only ample working space but an abundance of light and adequate ventilation. All piping is carried beneath the floor, in concrete ducts or runways. These are covered in some cases by removable floor slabs of concrete, and in other instances by cast-iron plates, depending on the frequency with which the underlying pipes will probably require attention.

An equipment of four engines is housed in this building. These all operate at 150 lb. steam pressure. An 18 and 26 x 30-in. tandem-compound Vulcan Iron Works Corliss engine, running at 100 r.p.m., drives the greater part of the breaker machinery through a 24-in. belt drive to a line shaft located in the upper and rear part of the structure. This belt, in its passage from the engine house to the breaker, is protected by a housing of corrugated iron on a specially designed steel frame work.

The jigs are driven by a 12 and 16 x 24-in. tandem compound Corliss engine running at 125 r.p.m., and power is transmitted to the jig-line shafts by 1½-in. manila rope drives. A 16x30-in. simple engine drives the Gates crusher and refuse conveyor line, and mine cars are lifted from the ground to the head of the breaker by a pair of 16x30-in. second motion hoisting engines. The self-dumping cages operating in this tower hoist are remarkable for the simplicity and strength of their construction.

Locomotive House and Carpenter Shop

In addition to the portions of the colliery which have already been considered, the locomotive and compressor house, blacksmith and carpenter shop, and the fan installation are particularly worthy of further note. In the first mentioned building are installed three compressors: one Chicago Pneumatic, one Ingersoll-Rand and one Norwalk Iron Works three-stage machine. The last named furnishes power for two Porter locomotives, which are used for haulage in the mines. The front portion of this same building is fitted up for the accommodation of the two steam locomotives which are used for hauling mine cars on the surface, and the construction of the repair pits for these engines is a feature of particular interest. The tracks are supported on pillars, and the entire space within the limits of the foundation walls is left open, so that mechanics, when working on repairs, are not confined by a narrow pit, and are afforded plenty of daylight to aid them in their work.

The carpenter and blacksmith shop is thoroughly equipped for handling all necessary repair work at the colliery. As to form of construction, it is uniform with the other colliery buildings. The smith shop is located in one corner of the structure, and is separated from the wood-working and machine tools by a substantial partition of tile and cement. A track for mine cars and a repair pit run longitudinally through the building. A drill press, pipe-threading machine, bolt cutter, lathe and circle saw are installed, and all are driven by a 12x16 Atlas engine.

A 20-ft. diameter Guibal-type fan is installed at Buck Mountain, and is driven by a 20x36-in. Vulcan engine. In the fan house also, is located a 12½-kw. Ridgeway 110-volt generator for furnishing light to the colliery operations. This is driven at 900 r.p.m. from the fan-engine shaft by means of a Link-Belt chain. The colliery grounds are lighted by 250-volt tungsten lamps, mounted on 30-ft. poles.

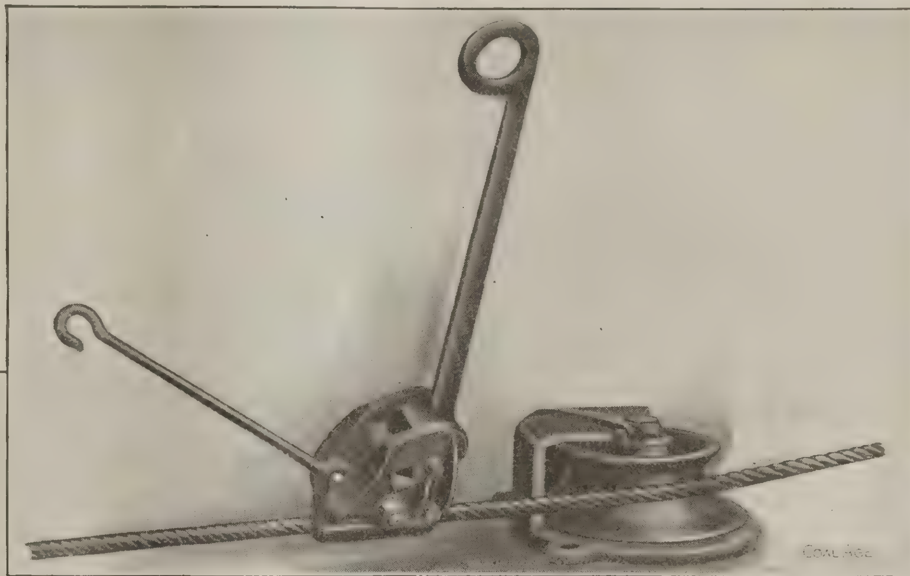

Fig. 6. Grip for Attaching Cars to Cable

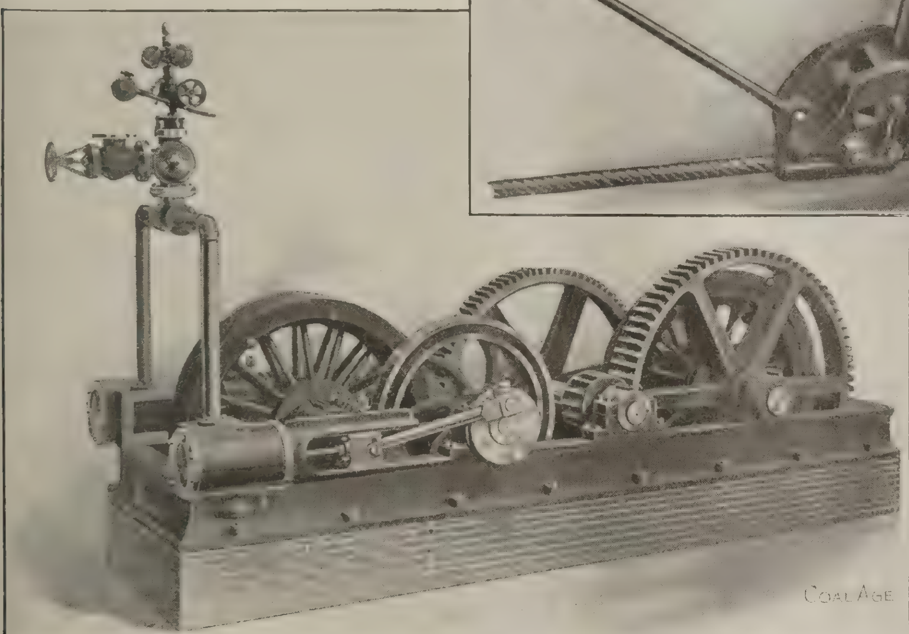

Fig. 5. Endless-rope Haulage Engine for Car-handling System

Time-saving Arrangement of Buildings

All the various buildings, foreman's and shipper's office, storeroom, oil house, shop, etc., are closely and carefully grouped around the breaker, in order to minimize the loss of time by employees in passing from one to the other of these buildings, and the foreman's office is so situated that he may command a view of practically the entire operation.

According to E. W. Parker, because of invention of grates and furnaces adapted to the use of small sizes of anthracite coal (and also because of the higher prices of the prepared sizes), the percentage of waste in anthracite coal has been reduced to a minimum. Buckwheat, rice, barley and even culm are now important steam fuels, particularly in hotels, apartment houses and large office buildings in the cities of the East, where smoke ordinances are in force.

Colliery Boiler Room Practice

By F. R. Wadleigh*

The average colliery boiler room is usually the most neglected part of the surface equipment, and there are often heavy and unnecessary losses in fuel consumption. Some of the more common mistakes and the resulting losses are noted here, together with remedies for the same, and a number of valuable suggestions on boiler room practice in general.

This article refers more especially to the average coal-mine plant. There are many large operations, having central power plants for several mines, equipped with all modern appliances and obtaining results equal to those yielded at any large power plant or station, and a discussion of these will not be attempted.

An experience of some years around coal mines has convinced me that the poorest equipped, worst handled, and least cared for place about the average 200- to 1000-ton capacity mine is the boiler plant. This seems rather strange when it is remembered that the entire working of the mine is absolutely dependent upon the work done by the boilers; yet the reasons for the neglect of economical methods of using coal are not far to seek—lack of knowledge, lack of incentive and the cheapness of fuel. At no other class of power plants will there be found such abuse of coal, such poor firing and such badly kept up plants.

The General Lack of Knowledge

Efforts on the part of the management to use uptodate and economical methods and appliances are rare. Daily, weekly, or monthly inspections are almost always concerned with the mine, the tipple, and the labor; possibly the engine room is looked into, but the boiler room seldom if ever, or if visited at all, not enough time is spent in it to get any true idea of the working conditions there. Such being the case, it is not surprising that the average mine superintendent pays so little attention to the condition of his steam plant, or to economical methods of operation, and there is little incentive to study combustion questions and the economical handling of the power plant.

There is a lamentable lack of knowledge among mine superintendents and mine bosses as to the proper methods of firing and the conditions under which coal should be used. It is true that nearly all of the mine-foremen examination papers contain questions on combustion and boilers, but these are more or less perfunctory and may easily be learned for the time being, their practical use and importance not being sufficiently emphasized. As long as sufficient steam is kept up to run the plant and no breakdown occurs, the boiler room is let alone to run itself and as little money as possible is spent on it.

That these methods are conducive of much loss will hardly be disputed. In the boiler room, the load, draft, coal, the condition of the fires and boilers, in fact, almost every item, is of a variable nature and lack of knowledge or stupidity will surely lead to excessive consumption of coal and, at some time, a heavy expenditure for repairs or damages.

The mine superintendent should familiarize himself with the principles of combustion, the results that can be obtained with the coal he is mining and the proper use of everything connected with the boiler plant, together with the conditions which will give the best results in economy of fuel and efficiency of working; he should have the requisite knowledge to formulate and put in force proper instructions for firing, cleaning boilers, and the general operation of the steam plant.

Some Typical Colliery Boilers

Cheapness of fuel is probably the principal reason why more attention is not paid to the boiler room and its equipment and operation. But, obviously, the simple fact that coal is cheap is no valid excuse for lack of efficiency in the power plant and saving in the amount of coal used means increased output for commercial purposes, lower mining cost, less depreciation and lower cost of repairs. In fact, the actual cost of the coal used should be made lower by burning the lowest grade made or by using the bone or refuse thrown out at the tipple, either of which may be made available by proper instruction and the use of suitable appliances.

As concrete examples of bad conditions actually observed at different mine power plants, the following will be of some interest:

Due to change of ownership an examination was made of the four water-tube boilers at a certain mine and over 200 tubes had to be removed, most of them badly burnt and all of them stopped up more or less. As a result, the coal consumption was cut down, after new flues had been put in, over 25 per cent.

Lack of steam to run the tipple caused an examination of the furnaces and fires and it was found that the fires had not been thoroughly cleaned for a long time, the back half of the grates being entirely cut off by a solid mass of clinkers 6 in. thick. The bridge-wall was covered with ashes and clinkers to within 2 in. of the tubes and all the brick baffles gone.

Fires 20 to 24 in. thick, the fireman slicing the fire about every half hour and putting on 18 to 20 shovelsful of coal at each firing.

On three boilers used, steam gage showed 120 to 125 lb. pressure on two, while on the third the gage showed 200 lb. where it remained until boiler was allowed to cool down and fires were drawn. No one around the plant could remember when the gages had been tested.

Dampers rusted open and could not be closed, gage cocks would not open, boiler fronts showed cracks ¼ in. wide, ashpits full of ashes to within 6 in. of grates. Boiler settings were also badly cracked.

The above are a few instances of conditions actually seen at colliery plants in this country. Instead of such conditions obtaining, and they are not at all unusual, the boiler room should be a show place where visitors could see for themselves what good results can be secured from the coal and how it should be handled. As a means of enabling the mine superintendent to have such conditions in the boiler rooms under his charge, the following notes and suggestions are given.

Boiler Equipment

Good results can be obtained from any kind of boiler, but the old idea that any kind would do for colliery work is fast disappearing. It is becoming recognized that the best is not too good and that it is economy to have only the best, just as much as at any stationary power plant. Whatever type of boiler may be used, ample heating surface should be provided, so that the inferior product of the mine can be used, if it is thought advisable to do so.

At large mines or where there is a central plant supplying power to a number of mines, it is undoubtedly a good policy to put in automatic stokers, as has been done at a number of large collieries in this country. At the average mine, however, the use of stokers is hardly advisable. There would be no saving in labor and almost as good results may be obtained by the use of shaking grates, close inspection, good firing, and by keeping the boilers, furnace walls, arches and baffles in good condition.

The use of shaking grates is strongly recommended, as with them it may be

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possible to burn the refuse or rejected coal from the mines. They will also give better results, if properly handled, with either slack or run-of-mine coal, than will stationary grates, besides making the work of the fireman easier, and giving a better supply and distribution of air to the fires, eliminating much of the trouble of cleaning fires and consequent loss of heat. Whatever kind of grates is in use, attention must be given to the following, neglect of which will nullify the work of the best grates:

Stationary Grates—Keep the air spaces open, and have the grates fit properly; be careful, in using the slice-bar, not to damage the grates, and do not allow badly warped bars to remain in the furnace and waste fuel.

Shaking Grates—After shaking, always be sure that grates are moved back into level position; otherwise they may be partly burned or broken and will waste fuel. As to frequency of shaking, that will depend on the kind of coal used, but do not allow too long a time to elapse between shakings; otherwise clinkers may accumulate and nullify the good effect of the grates. The object of these is to keep the fire clean of excessive ash and not to allow clinkers to form in large pieces.

The Fireman

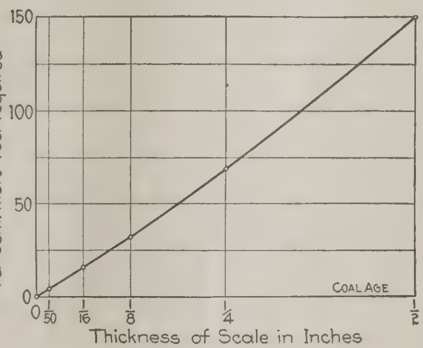
The fireman is the most important part of the boiler plant. It is said by reliable authorities that: "Economy of boiler management is dependent on the skillful handling of the fuel. The fireman can save more to the plant than anyone else," and "To handle a boiler and furnace properly requires expert knowledge and considerable experience and ability. The fireman is, in many respects, the most important man about the plant."

The four main factors affecting fuel consumption are the fuel, air, furnace design and the fireman, and the latter is undoubtedly the most important. Without skill and intelligence on his part no good results may be expected from any grade of fuel or with the best designed boilers and furnaces, as his carelessness or ignorance may nullify such expectations. It should not be a difficult matter for the colliery superintendent to find two or three men of the necessary intelligence and strength whom he can train to take an interest in the work. Especially is this true if he gives some incentive, such as having a decent clean plant to work in and suitable equipment, properly kept up.

Experience has shown that it is much better to use a green man, familiar with the coal and the mine and to train him up properly. Better results will be obtained in this way than by picking up some fireman out of a job whose experience quite often is shown only in his ability to shovel in coal and keep the pump running. Too much stress cannot be laid upon the importance of selecting good firemen, as upon their work depends, in a measure, the whole working of the mine. It will not be necessary to pay more than the prevailing rate of wages if sufficient attention is given to the issuing and carrying out of instructions and to stopping leaks of all kinds and keeping the plant in good repair and equipped with the necessary and right facilities for working.

The Fuel

The question as to what fuel is the most economical for use at the mines should be given careful consideration, but, as a rule, the coal to be used should be that which is the cheapest, providing it will keep up steam. This can only be determined by actual experiment at the particular plant in question, as a fuel that may be entirely suitable at one mine, will not be the best at another.



Fuel Loss Due to Scale

Bone and other impurities thrown out at the tipple often have considerable fuel value, and with sufficient grate surface, and suitable grates, may be used to advantage, provided the cost of conveying it to the boiler room is not prohibitive. Where the impurities consist principally of bone or bony coal, it will usually pay to use the refuse, but where there is a large amount of slate, fire clay or pyrites, its use is not practicable. When it can be arranged, a conveyor line may be run from the picking table, or from a point alongside of the railroad cars, and all refuse, except slate and pyrites balls, thrown into this and taken to the boiler room. Or the refuse may be crushed first and then conveyed to the boiler room. The use of such refuse may often be made possible by putting a steam-jet system under the grates.

Coke Braise, which usually amounts to 1½ to 2% of the coke made, can be used very successfully under boilers with forced draft and suitable grates. In England and Germany it is quite largely used at power plants other than those at the mines.

Slack is probably the best all-around fuel for use under boilers at mines, either by itself or mixed with the bone or refuse obtained from the tipple. It has been found a good plan to screen out the fine slack and dust at the tipple, say everything that will go through a ½-in. screen and convey this to the boiler room. This method will improve the run-of-mine coal, especially where the coal is soft and friable and the screenings will give good results under the boilers.

Run-of-mine, one of the principal merchantable products of the mine, should not be used under the boilers when it is possible to avoid it. If local conditions make it necessary, then such conditions should be changed. There is no sense in using coal that can be sold for $1.10 per ton when coal that brings 75c. can be used equally as well.

The colliery boiler plant is an excellent place to test coal from time to time (as when new seams or new territory is being developed), to ascertain if there is any change in quality of the coal. These need not be elaborate evaporative tests, although such would be better, but merely burning tests, weighing the coal and refuse, and separating the clinkers and ashes to determine whether the coal is clinkering more or less than usual.

Firing

The following suggestions on the best method of firing will be found helpful and embody the best practice in hand-firing at the ordinary stationary boiler plant:

1. Fire evenly and regularly, putting on approximately the same amount of coal each time and with the same interval between firings.

2. Keep fires in such condition that a moderate amount of coal (two to five shovels full) will be sufficient at each firing, and place the coal where needed, only.

3. Keep the fire clean and bright all over, except when using the coking method, where the fresh charge is banked at the door and the fire kept bright back of the bank.

4. Break up large lumps to the size of a man's fist and have the coal as uniform in size as possible.

5. Regulate the draft and air supply to suit the working conditions.

6. Keep the fire free from holes, especially along the sides and back of the furnace.

7. Watch closely the condition of the fire and the steam pressure as they are dependent on each other. If the pressure varies, some change in the fire caused the variation.

8. Keep the steam pressure even and without variation.

9. Carry water in the boiler at a uniform and regular height.

10. Do not level or stir the fire unless absolutely necessary.

11. Find the thickness of fire necessary to prevent smoke and keep up steam and do not allow this to vary.

12. Keep flues and heating surfaces clean.

13. Do not allow leakage of air into the furnace or combustion chamber.

14. Do not allow ashes or clinkers to accumulate on the walls or in the combustion chamber.

15. Clean fires when necessary, but do not allow them to run too long; deficiency of air through the grates means incomplete combustion, loss of efficiency and increased smoke.

16. If the furnace has more than one door or there is more than one furnace to be handled, fire in alternate doors and it is better to put coal on alternate parts of the fire reached by each door. This is the so called "ribbon" method of firing, the coal being put on in alternate strips across the full length of the grate, as shown in the accompanying sketch, *A*, *B*, *C*, and *D* representing that portion of the grates served by one door and 1, 2 and 3, the firing strips across the grates. Firing should be done across *A*1, *A*3; *B*2; *C*1, *C*3; *D*2; then back *D*1, *D*3; *C*2; *B*1, *B*3; *A*2.

This method gives more even temperatures in the furnace, affords a better chance of mixing the gases from the fresh coal with the incandescent gases and heated air from the bright fire, thus preventing smoke, and giving a more even steam pressure, systematic stoking and less contraction and expansion of the boiler plates and flues.

Boiler Records and Inspection

To systematize the work in the power plant and to enable the superintendent to keep track daily of what is being done, records should be kept of the day's work, which should include:

Amount of coal used, estimated or weighed.

Average steam pressure. Every plant of any size should be equipped with a recording steam gage.

Amount of ashes and clinkers removed. These should either be weighed or records kept of the number of loads, as this gives a valuable check on the quality of the coal.

Temperature of the feed water. Hourly observations.

Condition of boilers.

Condition of grates.

Date of boiler cleaning.

Time flues were blown.

Condition of boiler pumps.

The fact that records are kept and followed up is of itself an incentive to the engineer, fireman, and master mechanic to improve their work. It has often been found, too, that an investigation into the cause of poor records has led to either the discovery of a leak, need of important repairs or a revision in methods, none of which might have been discovered without the use of such daily records.

In addition to having daily records, the mine superintendent should, as a matter of course, make a daily inspection of the boiler room, not only to satisfy himself as to the condition of the plant and its handling, but also to show the firemen that interest is being taken in their work and its importance recognized.

Every uptodate colliery boiler-plant should have at least the following equipment:

Feed water heaters. Their value is obvious.

Pumps. Boiler pumps should always be in duplicate or injectors furnished.

Feed water regulators. These save their value in fuel economy, safety, pump repairs and the fireman's time.

Damper regulators. These are important fuel savers and regulate the air supply according to the demand for steam.

Water Supply

The water supply should be closely investigated, as upon this point depends the proper and economical operation of the whole plant. The different sources of supply should be located and a careful comparison of the cost from each source made up. An analysis should then be made of the different waters to determine their value for boiler use, and whether they are corrosive or likely to deposit scale or sediment.

If the latter is liable to occur, steps should be taken to determine how to best neutralize these deposits, and whether it would be advisable to install a water softening plant or resort simply to boiler cleaning compounds. No boiler compound should be used except that specially made for or adapted to the particular impurities in the water under consideration. A compound that will suffice for one kind of water may quite possibly be of no use whatever for another.

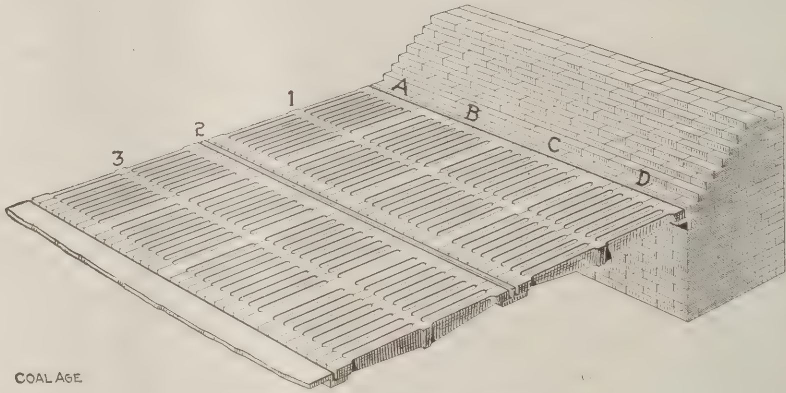
Gage cocks should be kept open and used several times daily. The glass on the water gages should be kept clean and water and steam connections blown out several times daily, especially through the water valve, which is the most liable to become stopped up.

Scale Accumulations

Whatever type of boiler is used, it is absolutely necessary that they should be kept clean inside and out. This may seem obvious and hardly necessary to repeat, but an examination of many colliery plants will soon prove that it is often badly neglected.

If a fire-tube boiler is used, the flues should be cleaned out with a blower once a day at least and the same applies to the outside of the tubes in a water-tube boiler. The frequency of cleaning the inside of fire-tube boilers and inside the mud-drums and tubes of a water-tube boiler, can only be determined by actual experiment or analysis of the water, but by no possibility should boilers be allowed to run longer than the regular time without cleaning.

The accompanying profile shows the enormous losses of fuel resulting from accumulations of scale in boiler tubes, as shown by actual tests made by the Lagonda Manufacturing Co. on a boiler with 2-in. tubes and working under 90 lb. steam pressure. These losses vary greatly according to the character of the deposit, and the results here given are close to the maximum on record with the worst kind of scale.



Sketch of a Boiler Firebox

Operation

The following points should be watched to insure good results and minimum losses:

Boiler settings and walls, fronts and cleaning doors, should be kept in order and all cracks and leaks promptly stopped up. Furnace walls should be kept free from clinkers; baffles and bridge walls in good condition and no accumulation of ashes or clinkers allowed.

Leaks should be stopped at once in all piping and steam pipes should be covered to avoid condensation and loss of heat.

Boilers should be blown out once a day, preferably in the morning.

Safety valves should be tried every morning, to see that they work properly.

Steam gages should be tested once every three months, and they should be kept clean, and placed where they can be easily seen.

The advantages of good draft are apparent. No accumulation of ashes or soot should be permitted that would in any way interfere with the draft, and the breeching and stack connection should be kept tight and clean.

All ash pits should be water-tight and water should be kept in them at all times. They should be thoroughly cleaned out whenever the fires are cleaned and oftener, if necessary.

The necessary tools to properly handle the boilers should be provided and these should be hung up on the walls when not in use.

List of tools: Shovel, rake, two-pronged hook, slice bar, coal pick, T-leveler (made of pipe and used only for leveling top of fire) and a long-handled scraper, for raking ashes out of pit.

General Notes

Coal should be placed in the boiler room within easy reach of fireman, and a hard, level floor should be provided, preferably concrete or vitrified brick. The superintendent should insist on the boiler room being kept clean and no accumulations of scrap, ashes, water, etc., allowed. A water hose and connection to the boiler feed should be provided for wetting ashes and for general cleaning.

The boiler room should be made as light and be as well ventilated as possible, and should have a toilet and wash basin with running water. Experience has proved that these general improvements and facilities pay, as they assist in getting better results and make it easier to get and keep good men.

In the examinations for the position of mine foreman, more attention should be given to power-plant questions and more knowledge required from the candidates since the use and making of power is one of the important questions in mine operation. It is among the mine foremen that we must look largely for our mine superintendents and managers, and the better educated they are on all mining questions, the greater will be their efficiency.

An Improved Mine Rescue Apparatus

Special Correspondence

Oxygen tanks must needs be cumbrous and heavy in order to resist the pressure of their contents. When the oxygen is held in chemical combination, the weight can be considerably reduced. A compound of oxygen and sodium hydrate, which liberates oxygen when water is dropped on it, is used in this apparatus.

The development of self-contained breathing apparatus for mine rescue work has extended over many years. However, the point has been reached but recently where the apparatus could be considered as of any practical value to the mining industry. This is due largely to the fact that a breathing contrivance to be efficient has practically to parallel the functions of the human organism; whereas the body receives oxygen creating car-

Side View of Servus Mine Rescue Apparatus, Showing Mask

bon dioxide, the apparatus must deliver oxygen and absorb the CO_2.

Four qualifications, therefore, are absolutely essential: (1) The volume of oxygen must be ample to meet every requirement, the actual need of the lungs ranging from 0.2 liter to 2.0 liters per minute according to the amount of labor performed by the operator. (2) The absorption of CO_2 must be relatively complete, the volume of this gas thrown off being about equal to the volume of oxygen absorbed, the exact ratio being 9:10. The presence of over 5 per cent. of this gas in the inspired air causes discomfort, and a great percentage utterly unfits the operator for any actual service. (3) The inspired air must be cool and contain the proper amount of moisture necessary to keep the mouth and nasal passages from becoming dry. (4) The apparatus must be light in weight and so suspended on the body as to cause the least discomfort and allow the operator free use of both arms.

Development of Breathing Apparatus

The early types consisted of a helmet and large flexible bag. In the latter was placed a package of flax or cotton waste saturated with a solution of caustic potash. The bag was then inflated with oxygen, and for a short period, the apparatus was of some slight value. The next step was the addition of oxygen in steel cylinders, which was released into the bag either by means of a regular locked feed, or at the will of the operator. This method was fairly satisfactory, but the renewing of the generator meant inevitable delay at critical times when human life was a matter of moments.

The next advance was the production of a sealed regenerator, the capacity of which would be constant for a given period and through which the air was drawn by an injector. This method has proved fairly efficient, but because of the excessive weight of the apparatus, which is due largely to the oxygen cylinders, and because the whole construction and

Apparatus As Seen from Rear, Showine Cooler and Breathing Bag

method of operation are so complicated, it is conceded that this plan still leaves much to be desired. The new device known as the Servus Oxygen Mine Rescue Apparatus, manufactured by the Servus Rescue Equipment Co., of Newark, N. J., has been designed to overcome these objectionable features. In this type

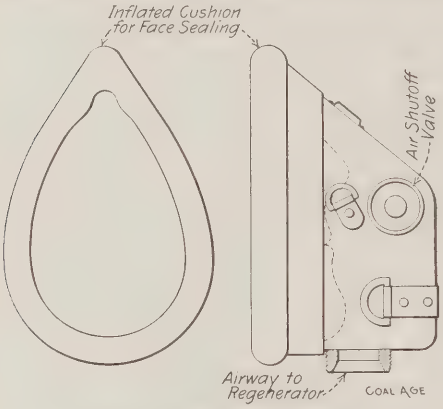
a chemical combination of oxygen with sodium hydrate is utilized, the compound being of such a character that it instantly liberates oxygen gas 100 per cent. pure on the addition of water, exactly as acetylene is released from calcium carbide.

The Source of Oxygen

This chemical, known as Oxodon, is fused into convenient cakes, five of which are used per hour, liberating 130 liters of oxygen and leaving a residue of one kilogram of sodium hydrate, which is used simultaneously for taking up the CO_2, which it accomplishes perfectly. The chemical is placed in a heavy rubber bag and the air passed over it, this bag being also used to receive the air exhaled by the wearer.

Water contained in a cylinder above the bag, is used jointly for generating oxygen and for cooling purposes, principally the latter, the air having to pass over the water when inhaled. A valve controls the starting and stopping of the water drip, but its actual regulation is accomplished by a set adjustment so that the proper flow is assured at all times.

The weight of the one-hour type, completely charged, is but 18½ lb. and of the



Side View of Mask

two-hour type is but 22 lb., the difference in weight resulting principally from the greater amount of water carried for cooling purposes in the latter type.

The lightest action of the lungs provides the necessary motive power to insure perfect and complete circulation, which is directly controlled by two check valves of the mica disk type operating in reverse directions. The exhaled air, after leaving the mask, travels through a noncollapsible tube over the left shoulder down through the cooler into the bag, where the CO_2 is absorbed and the air is replenished with a supply of oygen. After leaving the chemical, the air is passed through a series of tubes surrounded by water which removes the heat caused by chemical action and condenses the excess moisture. The air then passes through the second tube over the right shoulder into the lungs.

The Mouth-and-Nose Mask

It is generally conceded that a helmet which entirely encircles the face, is hot, liable to leakage, and depends for safety wholly upon a rubber pad or an inflated air cushion. Moreover, the wearer is restricted in motion and in vision. The mouth piece, while permitting free motion of the head, is insanitary, prohibits conversation, affords no protection to the nose, and necessitates mouth breathing, with the resultant dryness of the throat so familiar to wearers of this type of apparatus.

A mouth-and-nose mask has been long recognized as ideal, but until recently has been considered unavailable because of

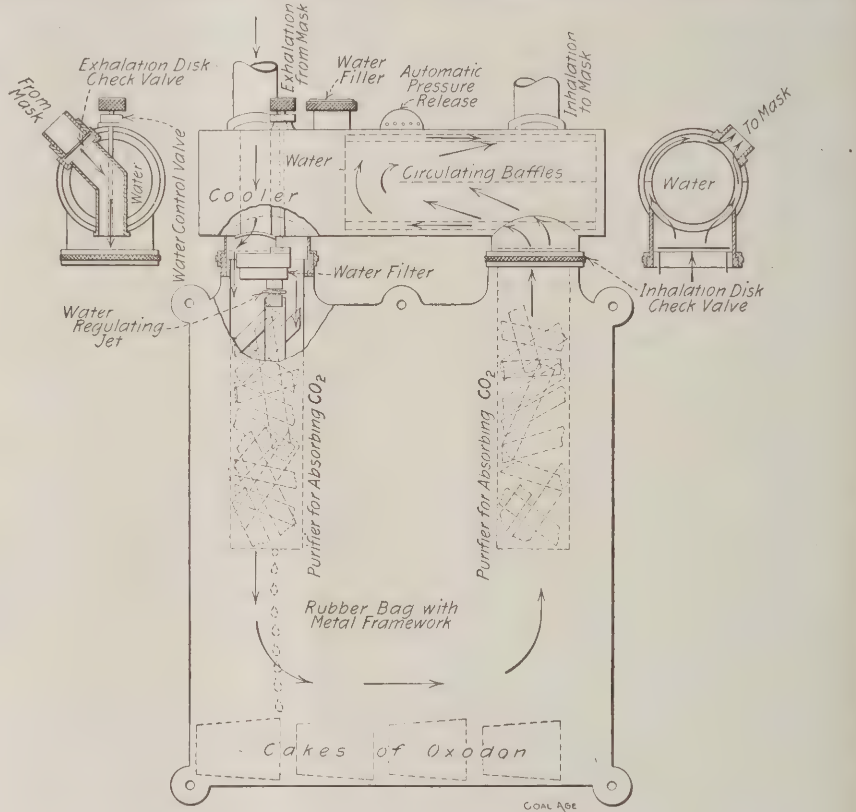


Diagram Showing Mode of Action of Breathing Bag and Cooler

the inability to secure and seal it properly to the face without undue and uncomfortable pressure. The Servus apparatus is equipped with a mask which encircles the nose, mouth and chin and which is retained in position by a special piano wire spring strap, affording a uniform tension at all times without any discomfort to the wearer.

In all other types, face sealing is accomplished by inflating the rubber cushion, and serious difficulty has been encountered from inherent inequalities in the rubber, which permit air bladders to form and burst under pressure, rendering the apparatus instantly unavailable. The wire spring strap provides that a perfect seal can be made between the Servus mask and the face. But to give further assurance, the rubber cushion is inflated by discontinuous pressure on a rubber bulb. A check valve between bulb and cushion provides for the retention of all air thus pumped into the latter. Both air and water are used to make the seal. When no longer in service, the end of the bulb is pressed and the excess pressure in the cushion is released into the bulb. When the mask has been strapped on, ready for use, the bulb is pressed, and the operator forces the air and water into the sealing cushion, the bulb remaining collapsed while the device is in service. This water at the time of manufacture, is made slightly alkaline and thus acts as a preservative to the rubber.

Availability in Service

The rubber bag, which serves both for a regenerator and as a breathing bag, is covered with asbestos and mohair canvas and protected by a substantial metal frame work, so that the operator, when crawling through narrow spaces, cannot readily force out the reserve air, or puncture the bag. In suspending the Servus apparatus, the knapsack idea has been followed, the weight being high up on the shoulders and the pull being directly downward, leaving the chest entirely free from straps.

No costly supply of regenerators and spare parts is necessary. Oxodon, cold water and sodium hydrate are the only requisites for the immediate operation of the apparatus. Oxodon will keep indefinitely without deterioration when sealed in the special containers in which it is supplied. Its action on rubber is specifically preservative.

The Servus apparatus is made in four types: No. 1 is the two-hour type and is designed for heavy labor such as would be required in mines. Weight 22 lb. No. 2 is the same as No. 1, except that it has less cooling surface and slightly smaller

bags. Weight 17½ lb. No. 3 is intended for one-half hour's work only and is of markedly different design. It is placed entirely in front of the wearer and being without check valves, the air travels through two small tubes into the bag and back through the same tubes. This latter apparatus is designed more for fire-department work or for inspection work in mines. No. 4 is a compact, light, emergency mine rescue apparatus, designed for use in smoke or gas, where the rescuers can penetrate to a body of imprisoned men. Each man can carry from one to ten apparatus, and by their aid can enable the endangered persons to travel to a safe place.

They are also designed for permanent storage at strategic points in the mine, where they may be instantly available in the event of a fire or an explosion. The apparatus just described marks an important step forward toward the perfection of rescue apparatus. The positive action of the oxodon, the light weight of the apparatus, its freedom from cumbersome bulk, its simplicity and comfort to the wearer, are some of its advantages. Because of its simplicity, and the fact that it is manufactured wholly in the United States, its cost is not prohibitive and its delivery is not subject to delays.

A New Type of Rivetless Chain

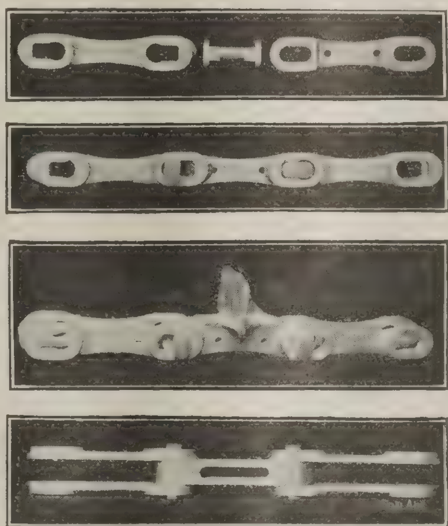
Nearly everyone who has had much to do with elevating and conveying machinery around coal-mining plants, or elsewhere under similar conditions of service, has at one time or another come to the conclusion that no conveying chain on the market was quite right, and has forthwith set out to devise one that would be perfect. The results have been varied, but most frequently disappointing, and of the many forms suggested only a comparativeiv few of proven worth have survived in extensive use.

One demand, however, has always been particularly insistent, and this is for a rivetless chain, one that can be detached and put together without the use of tools and without involving the delays to operation, consequent upon the necessity of cutting out and riveting up a number of pins in case of breakdowns. Several successful chains of this type have been in use for some time, but a new rivetless chain which promises to still further supplant a number of forms of riveted chain, now generally in use, has been patented recently by Joseph L. Lee, general superintendent of the Cross Engineering Co., Carbondale, Penn.

This chain, as shown in the accompanying illustrations, is rugged and simple in construction and is intended primarily for heavy elevating and conveying work. There is but one style of pin and two styles of link—the inside and outside links. The illustrations are almost self-explanatory, but it may be well to quote from the claims made for this new product by its inventor and manufacturers.

The chain is interchangeable in all parts. The parts are easily and quickly detachable, and each section can be detached in less than a minute. The links can be released or removed by a horizontal movement equal to the diameter of the pin, that is, a movement of 1⅛ in. for the 9-in. pitch chain, thus doing away with the necessity of adjusting the take ups when links or pins require renewal.

The chain will operate over either a sprocket wheel or a traction wheel, and is interchangeable with certain other types of rivetless chains. It has a wearing surface on both links and pins which is equivalent to that of the standard riveted eye-bar chain, generally known as the "Scranton" type. The pins of the



New Rivetless Chain and Chain Parts

new chain are reversible, so that after becoming worn on one side, they can be turned through 180 deg. to present an unworn surface for 100 per cent. additional wear and, at the same time, will tend to restore the chain to its original pitch.

A special feature of this chain which is claimed to be a distinct advantage over any other type, is the lip shown on the outside links. Thus, when the chain is in working position, whether passing over a sprocket or traction wheel, the slotted space in the center links, back of the pin, is entirely closed. This feature prevents dirt or gritty material from coming in contact with the wearing surfaces, and, if desired, the recess or pocket may be filled with any solid lubricant, such as graphite or hard grease.

The chain links, being solid, have a distinct advantage over the web or open type of links as there is no compression at any point on either link or pin to cause the chain to part or the attachments to stick, and it is not necessary to remove the attachments in order to disconnect the links or pins. The two center links form a pocket for the insertion of the several forms of attachments required. On the other hand, these links may be reversed and placed back to back for use with side attachments. The links are to be drop forged from 0.30 to 0.40 per cent. carbon steel and broached to assemble with an accurate pitch, and the pins are to be drop forged also, and machine finished. The whole is to be assembled to length in the shop to insure free working of chain parts.

There is just one infallible test for an elevating and conveying chain and that is service under the conditions for which it was designed; but it may be said of this new comer in the field that it has every appearance of being thoroughly reliable, practical, and serviceable and capable of living up to all that is claimed for it. The Cross Engineering company is preparing to manufacture this chain in 4-, 6- and 9-in. pitches and a number of mechanical men in the anthracite coal region are of the opinion that it will find a broad field of application.

On Spanish Needles

Publishing houses are often in receipt of strange and weird communications, but we think the ultimate refinement has now been attained in a recent letter to the *Engineering & Mining Journal*, regarding which it says:

It's hard to keep a good fake down. Out of Darkest Arkansas comes an inquiry for a good, reliable "Spanish needle" for locating gold and silver. It's no use spoiling a thing in the telling, so we offer it in the original orthography and typographical style of the Arkansas hinterland:

April 3+4, 12—To the "Engineering and Mining Journal": I Will now Drop you a few lines to see Wheather or not you all handle eny Spanash Needles en your line of Goods iff you Doe Please Send me your Price list. on them and your Best Turms and I Want one that a man Can Depend on. I Want one that will loe cate Silver or Gold and iff your house Don't handle the Goods Would you Bee able to Give me the name of some furm that Does. Well I Will Remain as ever yours truly ——— ——— By By hoping to here from Soone and a Good Reply.

We chronicled, in the "Journal" of Feb. 4, 1911, the interference of the postal authorities with the Stauffers' thriving mail-order business in "goldometers," "electrometers," and "Spanish needles." We have not since heard of any new school giving "short courses" in gold finding.

This Week's Front Cover

The underground flashlight shown on the front cover of our issue this week is a view taken at the face of a room in one of the mines of the Lumaghi Coal Co., Collinsville, Ill. The coal is of medium hardness and is from 7 to 8 ft. in height. The seam is practically flat. The compressed-air pick machine, or puncher, shown in the cut, was manufactured by the Sullivan Machinery Co.

The puncher is engaged in making a wedge-shaped undercut to a depth of about 5½ ft. The cut is 18 in. high in front and tapers to 3 or 4 in. at the back of the mining. This style of undercut causes the coal to roll nicely when it is broken down, and frequently brings better lumps than when the undercut is made with a chain machine.

The Anthracite Miners' Convention

Special Correspondence

Anthracite miners, in convention at Wilkes-Barre, May 18 accepted the tentative agreement reached some time ago by a subcommittee of miners and operators, and have returned to work. Two separate accounts of the convention, from different points of view, are here presented.

The tri-district convention of anthracite mine workers, in session at Wilkes-Barre, Penn., voted on Saturday, May 18, to accept the tentative agreement entered into by the subcommittee of operators and miners in New York on Apr. 25, and peace is now insured in the anthracite region during the next four years. The vote stood 323 to 64 in favor of acceptance.

President John P. White, and those who were associated with him in arranging the terms of the tentative agreement, stated emphatically and impressively during the course of deliberations that they had secured the best terms possible, and that strike or no strike, further concessions were not to be obtained from the operators. President White's public revelations of the actual condition of the union and its finances were merely an official affirmation of facts known to the operators, to the miners who took an intelligent interest in the affairs of the union, and to every person in the anthracite region, who had gone to the trouble to investigate the situation.

Opposition to the acceptance of the agreement, emanated chiefly from representatives of the foreign miners in the lower districts of the anthracite field. These men knew as well as the more conservative and conciliatory officials, the exact condition of the union and the impossibility of winning a strike if a strike was declared. Moreover, they knew that if the strike was lost, the union would not survive. Yet for several days they fought ratification of the agreement, without having any rational principle to defend or any definite policy to pursue.

Their notion of an adjustment seemed to be that the coal companies were in a position to accede to any raise in the rate of wages, that they might demand, because the operators had it in their power to raise the price of coal indefinitely. Perhaps one of the most valuable results of the convention is that it has brought home to the foreign mine workers a more just perception of the purposes of a union, and the fact that public opinion counts for something in the adjustment of a disagreement between capital and labor, which affects the common welfare on an extensive scale. The disappointment of these men was great, and their personal distress was apparent when in some way they at last came to realize the logic of the situation and that a strike would have been disastrous for them as well as for the union.

The newspaper reports sent out from Wilkes-Barre, during the convention, failed to give a fair or accurate impression of what was there taking place. Newspapers, published in the anthracite region, were conscientiously anxious to minimize the importance of any exhibition of strike feeling that developed during the proceedings, while the representatives of New York and other outside newspapers, were anxious to accentuate the more sensational episodes, making it appear that a strike was imminent. As a matter of fact, from the beginning to the end of the convention, there was not the slightest danger of the tentative agreement being rejected.

All doubt on this score was set at rest by President White's speech. It was not so much what he said regarding the numerical and financial strength of the union, as his strong and emphatic exposition of the merits of the agreement and the results of rejecting it, that in the end caused it to be accepted. John P. White seems to be an exceptionally able man. He dominated the convention, and in my opinion, while in no sense an idealist, he is a better leader than John Mitchell. There is not about him the slightest suggestion of playing to the gallery.

Opposition to the Agreement

Andrew Matti, a district vice-president and leader of the Italian miners, conducted the opposition on the ratification of the agreement. Mr. Matti was rather noisy in an oratorical way, during the first few days of the deliberations, speaking often and to little point. Andrew Ryscavage, another district vice-president and leader of the Polish delegates, was also, at the opening of the convention, a determined opponent of the acceptance of the agreement. Toward the close of the proceedings, however, both he and Matti were eager to bring their followers to accept its terms. In my opinion, and I have attended a number of miners' conventions, at least three-fourths of the delegates to the convention, were determined to accept the tentative agreement at any cost.

Neither the operators nor the miners had anticipated that the general committee of miners would repudiate the work of their subcommittee. A great majority of the miners were indignant at the folly of this action, and it is certain that such an incident will never occur again, if the mine workers of the anthracite region can prevent it. It is now admitted that the committee acted not only illogically, but from the standpoint of the union, illegally in that it had no authority to reject the tentative agreement before its submission to the tri-district convention. This committee delegated its power to a subcommittee and in doing so, its executive responsibility began and ended.

After the convention had ratified the agreement, I asked a very intelligent miner of my acquaintance to give his opinion of the result. "We have secured a raise in our wages of 5 per cent.," he answered after a pause, "and that is all." I pointed out to him that there was a series of other provisions in the agreement that seemed to be of the utmost importance to the miner. He replied that theoretically these concessions were all right, but that a strong union was necessary to secure the full effect, or indeed any benefit, from these provisions and he feared that instead of the union becoming stronger numerically or financially during the next four years, it was in danger of disappearing altogether. In regard to the matter of a checkweighman, he continued, let us take as an example a mine employing 1000 men and boys where the union local numbers perhaps 120 or 130 members. How long do you think these union men will be inclined, or able, to pay the salary of a checkweighman, who is working for the men who do not contribute toward his wages, as well as for them?

There was great rejoicing among all classes in the anthracite region when this convention had come to an end. The mines are in excellent condition, nearly all of them having been thoroughly overhauled and made ready to begin operation as soon as the suspension was called off.

Another Account of the Miners' Convention

The anthracite miners, convinced that the offer of the operators was the best contract they could secure, have decided to return to work and for the next four years will labor under the best conditions they have ever had.

The keen disappointment, which the men felt over what looked to them like very slight concessions, was removed at their convention here. When they settled down to a serious consideration of the proposition, they came to look upon it in a different light and were convinced that the coal operators had gone a long way toward conceding to them, some of the really big demands they had made.

Delegates began to assemble in Wilkes-

Barre on Monday, May 13, and it was plain from their expressions of opinion that many of them had determined to reject the tentative agreement and repudiate their leaders. National President John P. White came here with the sentiment of the men largely against him and with ugly rumors afloat, but he and other leaders were prepared to lead the men into an impassionate consideration of the whole matter.

To bring the question home to the miners, it was necessary for President White to bare secrets of the organization and present the case in its most forcible aspect. In his address on Thursday, by a presentation of plain, undeniable facts he showed the men the folly of their hasty conclusions and the dangers ahead if the convention decided to reject his advice and vote to strike.

President White first discussed the terms of the agreement. He took it up clause by clause and in a most able manner showed the men what each concession meant. It was an easy matter for him to show that the sliding scale was an uncertain factor, and that while it had been the means of securing them some extra money, as a business proposition it was not nearly as safe as a flat advance of 10 per cent. He discussed the awards and concessions, covering every point over which the miners argued and showed that out of 170,000 men in the anthracite field, there were less than 30,000 men in the union. He presented figures which showed that in recent years, the union's ranks had been thinned to 21,000 men and that after many organizers had spent months in the field, there were, at the end of March, less than 30,000 members.

Finances of Miners' Union

From a financial standpoint, President White explained that the organization was in no shape for battle. He presented a statement showing that from 1902 down to last year the balance on hand had decreased from one and one-half million to about \$250,000. He did not say just how much money the national treasury contained at this time, but made it plain that there was not enough money on hand to justify even the thought of a strike.

President White explained that the men of the anthracite region had so far forgotten their union that in the past two years it had been necessary for the national organization to pay back in per capita taxes and loans over \$40,000, to keep the three districts' offices open. He referred to the fact that the anthracite men owed the national organization the sum of \$750,000, which had been loaned during the struggle of 1902, and that there was no means at hand of paying this money back. He declared that if the men did not accept his advice and adopt the agreement, they knew just what they faced and any mistakes made would have to be borne by the men and not by the leaders. He put the situation squarely up to the men and declared that they must decide.

Before his address, there were enough delegates in the convention, opposed to the agreement, to defeat the proposition. When he had finished, sentiment began to change at once. Many of the instructed delegates went back to their local unions to present the situation to them and returned with orders to stand by White and the leaders. From this time on, the result was not in doubt. The men had been convinced.

The leaders were not content to let the proposition go to a vote at once. Other officials were called upon to make explanation of the concessions and tell the men what they faced. National statistician William Green made a splendid address and national board member Frank Farrington and the three district presidents all pleaded with the men to be governed by reason and accept what the companies had offered.

The opposition began to lose its hold, and by Friday afternoon there remained only a few instructed delegates who were willing to vote against the agreement. These delegates declared they would have to vote against the proposition even after they had been convinced that it was the best they could get.

By Saturday all doubt as to the result of the convention was removed. The leaders discovered some anxiety among the men to get back home and suddenly called for a vote. So certain were they that the agreement would be accepted that a standing vote was called for. Those in favor of the agreement numbered 323, while the opposition could muster only 64 votes. The convention came to a close after deciding that repairmen were to go back to work Monday May 20 and the miners on the Wednesday following

The Coal Unloading Terminal at Sewalls Point

By Floyd W. Parsons

It is estimated that the anthracite field originally contained 19½ billion tons of coal. Of this total deposit we have mined approximately 2¼ billion tons, and for each ton marketed another ton of coal has either been wasted or left in the ground. It is evident, therefore, that upward of 15 billion tons of anthracite remain unmined, and that a long period of industrial activity may be looked forward to by those engaged in mining hard coal.

This great deposit of anthracite in Pennsylvania has furnished the chief source of income for nine important railroads. Mining as an industry in northeastern Pennsylvania has caused the building of many large towns and several great cities. If all this has been brought about by the exploitation of a great and valuable coal deposit, history will repeat itself in other states where similar natural resources are found.

Showing Operation of Car Dumper at Sewalls Point. Contents of Railroad Car are Being Poured into the Pier Car

As compared with the immense deposit of anthracite, we have only to remember that more than 20 billion tons of coal lie tributary to any one of several great railroads in southern West Virginia. The Virginian Railway, for instance, must eventually carry such a tremendous tonnage to tidewater, and it is interesting to know the provisions that have been made at the seaboard for handling this great amount of bulky freight.

The coal-unloading terminal of the Virginian Railway is shown in the accompanying photographs. This pier is located at Sewalls Point, seven miles down the main stream of the Elizabeth River from Norfolk, Va. The equipment here installed is one of the largest and best

plants of its kind in the world. The total cost of the installation was more than $2,000,000. Its operation has immensely increased the importance of Norfolk as a coaling station, and Hampton Roads is now the largest coaling port of North America.

The maximum unloading capacity of the Sewalls Point pier is equal to that of all other coal terminals in the vicinity of Hampton Roads combined. Every labor-saving device worth including has been installed, thereby reducing by several hours the time required to load a vessel with either bunker or cargo coal. As a result of the advantageous location of the pier, so close to the main channel of Hampton Roads, the Virginia Pilots Association now brings vessels up at night, as well as by day, so that the pier runs on a 24-hour schedule. It is electrically lighted for the night work. At the back of the terminal is a large receiving yard of 185 cars capacity. The pier is 1045 ft. long and is built entirely of steel on large concrete foundations. Its average height is about 75 ft., above water level.

General View of Sewalls Point Coal Unloading Terminal. Pier Car Is Shown at Top of Incline Approach

The maximum capacity of the pier is more than 15,000 tons per day of 10 hours, or 4½ million tons per year of 300 working days. There are four berths on each side, so that eight vessels, not exceeding 200 ft. overall, can be accommodated. The machinery of the pier enables the handling of a railroad car every two minutes, or not less than 1500 tons an hour. This is done by means of a number of hopper-bottomed, electrically operated shuttle cars—called conveyor or pier cars—each of which receives an entire railway carload of coal at a time, carries it out on the pier, and unloads it through movable chutes into the vessel.

Operation

Upon the arrival of a vessel to take a consignment, the switching engine pulls out from the yard tracks the proper number of cars and places them in the barney yard adjacent to the pier. From this point the cars are emptied and removed one at a time in rapid succession by the unloading equipment.

Each car is run by gravity to the foot of an inclined approach to the car-dumping plant, where it is engaged by an electrically operated barney hoist and pulled to the upper level of the car dumper. After being emptied by the car dumper (which operation is shown in the accompanying illustration), the car stands, until kicked off by the next succeeding car and is then allowed to run down an incline to the empty yard. The operation of the car dumper is to pick up the railroad car bodily from its position on the upper track and turn it completely upside down, so as to pour its contents down over a deflecting apron into a steel pier car of 60 tons capacity, which has meanwhile been brought into position on the lower track of the car-dumping plant. The empty railroad car is then returned to its normal position, ready to be kicked off by the next following loaded transportation car.

The railroad car's load of coal having been deposited in the pier car, the latter is allowed to run by gravity to the platform of a railroad scale, for weighing its load. This scale is automatic and records the net weight directly, and the car immediately passes by gravity to a point where it is engaged by an electrically operated barney hoist and pulled up a 25 per cent. incline leading onto the pier proper. On the pier, the car continues by gravity to the desired point over the vessel being loaded—air-brakes and air-operated dumping door in the hopper bottom enabling the car to be spotted and unloaded quickly through adjustable chutes. The empty pier car then proceeds by gravity and its own motors shoreward, back to the receiving position for its next load.

There are ten pier cars, and each one is fully equipped with the necessary electrical, pneumatic and mechanical apparatus. The bottom of the car is made up of four large circular undercut doors, operated either in unison or independently from a central shaft running the entire length of the car, and controlled from the operator's platform. Opening all the doors frees the entire bottom of the car so that coal cannot become wedged or jammed—a feature of superiority to ordinary hopper cars, which become clogged by freezing in winter and thereby delay unloading.

The use of the self-dumping conveyor cars with electric motors, air-brakes and pneumatic bottom doors eliminates the running of the railroad cars onto the pier, and the time and expense involved in poking clogged coal through the hopper bottoms.

A Timber Puller

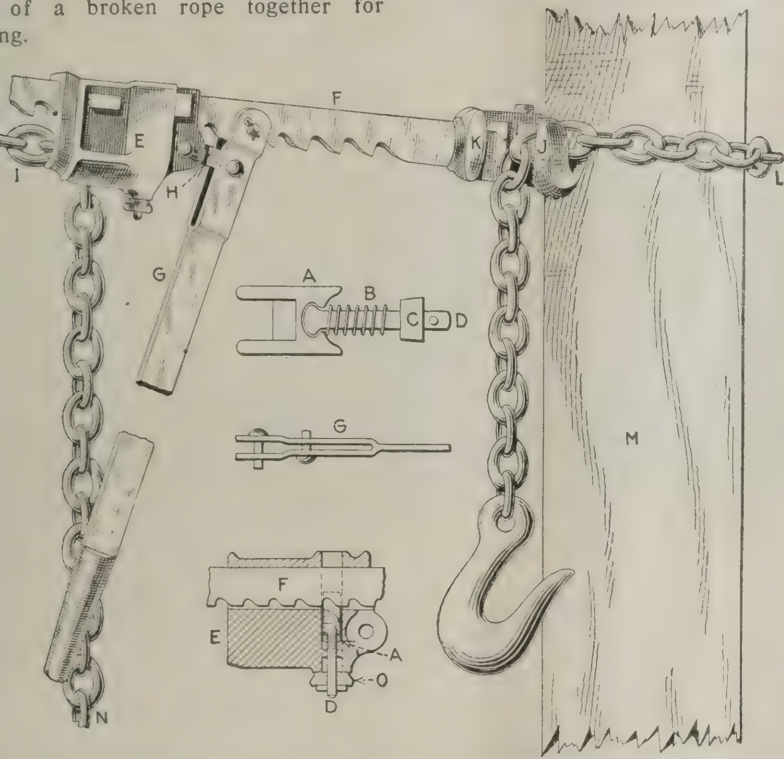
The operation of removing timbers is attended with no little danger. Even when the post is first set, the roof is often none too safe and the operation of driving it into place frequently makes the roof weaker both because of the upward lift of the prop and because of the jarring which accompanies the work. After a prop has stood for some time, the action of the air, the stresses resulting from shot-firing and the general roof strain weaken still further the material which the prop was erected to sustain and it cannot be safely drawn by the use of a sledge because the timberman must stand where the loosened rock cannot fail to fall if the roof is incapable of self support. Yet timber must be withdrawn and a fall obtained if other timbers are not to be burdened more than is safe and desirable.

Safe Timber Pulling

The "Sylat" timber puller furnishes the timberman with a means of withdrawing posts without leaving a place of safety. It will not only dislodge the timber but will drag it toward the operator. Moreover as a steady pull is exerted there is no strain on the roof such as is set up by the hammer blows of a sledge. This simple machine has been used extensively in the coal mines of England and Wales and has been adopted in the United States by some of the larger corporations. Being so simple, the puller

has the advantage of lightness and availability. It can be used in thin and heavily pitching seams as well as in those which are thick and level.

As may be imagined, it will not only pull timbers, but it has beer used for moving heavy mining machines from one cut to another. It has aided in the placing of heavy machinery such as boilers, pumps, hoists, etc., both under ground and above. Where cars have been derailed it has been used to replace or to extricate them. For this reason it is a handy tool to have on hand on a plane where derailments are serious and frequent. Loaded cars are frequently moved with its aid and it can be used with advantage for bringing the loose ends of a broken rope together for splicing.



STYLE OF SAFETY TIMBER PULLER LARGELY USED IN EUROPE

THE "SYLAT" TIMBER PULLER

The "Sylat" timber puller consists of a toothed bar, or rack *F*, about 3 ft. long, having at one end swivel attachment *K*, and a chain block *J* to which a chain *L* (about 3 ft. long) is attached, this chain terminating in a hook. This chain is attached to the anchor post *M*. Sliding on the rack is a block *E*, carrying a ratchet lever and pawl by means of which the block is worked along the rod through the manipulation of a long steel handle or lever *G*. There is another chain *N*, about 15 ft. long, with a hook, which can be attached to the sliding block *E* at any point on the chain by slipping a link into a recess in the side of the block as shown at *I*. This chain is affixed to the post which it is desired to remove.

The pitch of the rack is slightly over 1 in. The length of the lever is such that the pull induced in the chain is thirty-two times the force applied to the lever handle. This pull is sufficient to start and move any timber. When the pawl or catchbolt *A* passes a rack tooth, it is forced in place by a spring *B*; and the lever *G* is then released and moved back one tooth for another pull. It is impossible for the block to lose its grip and spring back. Yet it can be easily and quickly released when desired by moving the lever *G* forward as if to make another stroke. This causes the pawl *A* to ride a rack tooth. While thus released the spindle *D* can be raised by lifting on the cross-bar *C* and placing it crosswise of the recess as shown at *O*.

The device throughout is made of the best grade of materials, with a view to withstanding the hard, knock-about service and frequent neglect or abuse to which almost any mine appliance is subjected. It is extremely simple, has nothing to get out of order or adjustment and can be operated by anyone in the most restricted places.

Western Kentucky Strike Situation

The culmination of the conferences at Louisville, Ky., between the operators in the western Kentucky coal mining district, and the miners, came when the former submitted their "very best proposition." This was taken up several weeks ago at the joint convention of the miners and operators which reassembled at Central City. Pending a settlement of some slight differences, the miners voted for a resumption of work, the ballot being 1850 for and 425 against.

The scale as asked by the miners, and as offered by the operators, is as follows:

	Asked by miners.	Offered by operators.
	Per ton	Per ton
Screened pick-mined coal	$0.925	$0.925
Mine-run pick-mined coal	0.5725	0.5735
	Per yd.	Per yd.
Yardage in pick entries.	1.40	1.40
In wide pick entries....	1.04	1.04
	Per room	Per room
Turning rooms in pick mines	4.18	4.20
Loading in machine mines		
	Per ton	Per ton
On screen-coal basis....	0.4648	0.4625
On mine-run basis......	0.2916	0.2867
Chain machine runners on screen-coal basis..	0.0691	0.0687
Chain machine helpers on screen-coal basis..	0.0617	0.0613
Chain machine runners on mine-run basis....	0.0435	0.0427
Chain machine helpers on mine-run basis....	0.0387	0.0379
Punch machine runners on screen-coal basis..	0.1328	0.1379
Punch machine helpers on screen-coal basis..	0.0839	0.0835
	Per day	Per day
Track layers..........	2.45	2.46
Track layers' helpers...	2.23	2.24
Bottom cagers..........	2.23	2.24
Drivers gathering with one mule............	2.23	2.24
Drivers gathering with two mules	2.43	2.44
Drivers gathering with more than two mules.	2.43	2.44
Riders	2.23	2.24
Water haulers..........	2.23	2.24
Timbermen	2.45	2.46
Pipemen	2.36	2.38
All other inside day labor	2.23	2.24
The minimum outside scale	1.79	1.80
Trappers	0.75	0.76

Michigan Coal Mining

The report of the inspector of coal mines for the State of Michigan states that there were 33 mines in operation during 1908. The average number of employees was 3087, working on an average of 7.8 hr. per day and 20.2 days per month. The total production of coal for the year was 1,839,927 tons. On this basis, 596 tons of coal are secured per year per man employed, or a little under 2.5 tons per day of 7.8 working hours. The oil consumption was reported at 33,966 gal., which is equal to about 11 gal. per man per year, or 0.045 gal. per day. The total amount of powder used was 73,857 kegs, or one keg for every 24.9 tons of coal mined. The average wage was $3.02 per man, and the average cost of mining, $1.67 per ton of coal produced.

As Tate indicated some years ago, when the roof has been continually chipping off over a long period, the top will at last come to rest, forming an arch of parabolic section. When this arch has once formed, it will be more durable and stronger than an artificial arch, or a road that is strongly and expensively timbered, providing there is no subsidence of the supporting pillars. After such an arch has been formed and the removal of the coal is still continued, the parabolic lines may extend upward indefinitely.

The International Red Cross Conference at Washington, D. C.

By M. J. Shields*

The Red Cross Societies of many nations held a conference at Washington, to compare methods of saving lives, and in connection with that convention on May 11 at 2 p.m. held a "first aid" competition and exhibition meet.

The first and leading event was a contest in first aid, in which no less than forty-five teams took part, representing seven different classes of Red Cross first aid work; to wit, the hospital corps of the United States Army, the police departments of the District of Columbia and of the City of Philadelphia, the fire department of that city, the women's first-aid detachment, the miners' first-aid teams, the boy scouts and the field corps of the American Red Cross.

The competition was not general, but teams of each group of first-aid workers competed against other teams in the same group and had separate judges. Those apportioned to adjudge the miners' work were Major Chas. R. Reynolds, Major Matthew A. De Laney and Captain Howard H. Baily of the Medical Corps of the United States Army. I desire to speak in terms of the highest praise of the work of the miners' teams, which received the unstinted praise of the spectators.

Three problems were presented to each team, and in all there were eighteen army and navy officers to render judgment on the work performed. The H. C. Frick Coke Co., the Pennsylvania Coal Co., the Price Pancoast Coal Co., and the Illinois State Mining Department each had a competing team, while the Delaware, Lackawanna and Western Railroad Coal Mining Department showed its enthusiastic interest in life saving by entering no less than three teams.

The following were the winners among the miners: First prize, H. C. Frick Coke Co., a silver loving cup; second prize, Delaware, Lackawanna and Western Railroad Coal Mining Department; third prize, Price-Pancoast Coal Co. Among the mining men present were: J. A. Holmes, H. M. Wilson, Geo. S. Rice, H. H. Stoek, W. A. May, C. E. Tobey, F. H. Coughlin and Drs. Roundtree, Carraway and Head.

A section of a mine was represented, and at 4 p.m. three typical mining accidents were illustrated, a fall of roof, the ignition of a feeder of gas with a naked light, and a fire in a mine. This latter was extinguished by helmet men under the direction of J. W. Paul. The rescue and first-aid work in connection with these demonstrations was illustrated by the Pennsylvania Coal Co.

Other interesting items were an exhibit of the loading of a hospital ship at sea, and an exhibition drill by the Illinois Field Corps of the American Red Cross. The meet was under the charge of Major Chas. Lynch, Medical Corps of the United States Army. Major Lynch and myself desire to thank all those who aided us in making the meet so successful.

*Manager, First Aid Department, American Red Cross.

Miners Ready for Action at International Red Cross Meet, Washington, D. C.

Fuel Movement during First Quarter of 1912

An unusual increase in the volume of coal traffic has been reported during the first three months of the present calendar year, according to a publication just issued by the Bureau of Statistics, of the Department of Commerce and Labor.

Eastern Movement

The shipment of anthracite coal from the Eastern producing territory, as reported to the bureau during the three months of January, February and March, 1912, 18,209,351 long tons, exceeded the shipments during any three months' period in the past decade. Over 25 per cent. of the total shipped, namely, 4,738,476 long tons, was handled in and around New York City for shipment to New York proper and other Atlantic ports. Coastwise shipments of anthracite from Philadelphia during this period totaled 539,855 long tons, while shipments reported from Baltimore were 62,117 long tons.

The bituminous-coal movement in the East during the first quarter of the present year, as reported by eleven leading roads, amounted to 36,818,505 short tons, as compared with 29,019,174 short tons during the first quarter of 1911, 31,773,043 short tons during the same period in 1910, and 23,701,359 short tons in 1909.

The coastwise shipments from the five principal Atlantic seaports amounted to 6,563,411 long tons during the first quarter of 1912, as compared with 6,480,418 long tons during the same period in 1911 and 6,307,403 long tons in 1910. Of the total coastwise shipments for the first quarter of 1912, 2,841,152 long tons were shipped from New York, 928,307 long tons from Philadelphia, 891,456 long tons from Baltimore, 677,133 long tons from Newport News and 1,225,363 long tons from Norfolk.

River Movement

The river movement of coal, on the other hand, shows a much smaller volume during the first three months of 1912 than during the corresponding period in 1911. The shipments by way of the Monongahela River during that period in 1912, 2,105,610 short tons, were much smaller than during the same period in 1911, namely, 2,988,513 short tons.

The river movement during the month of March, 1912, taken as a whole, however, shows a slight increase, when compared with March of last year.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

The "New Nitrogen" in Firedamp*

It is well known that the "nitrogen" of air is a different gas from that derived from nitrogen compounds, and has a different specific gravity. It was this fact which led to the discovery that the inert gases in air were not nitrogen and carbon dioxide solely, but included argon, krypton, xenon, helium and neon in the following proportion by volume, as determined by Sir William Ramsay. So that overlooking niton, the latest discovery, we have the following composition for air:

PERCENTAGE VOLUMETRIC COMPOSITION OF AIR

Oxygen	20.941
Nitrogen	78.122
Argon	0.937
Krypton	0.000262
Xenon	0.000047
Neon	0.000115
Helium	0.000004
	100.000428

Through M. Le Chatelier, Messieurs Moureu and Lepape presented a paper on the percentage of these rarer gases in firedamp:

"We recently determined the volumetric relations of krypton to argon, of xenon to argon, of xenon to krypton and of argon to nitrogen in a large number of natural gases from thermal springs and in a volcanic gas. These various ratios are extremely constant, and their mean respective values are only slightly higher than those which obtain in atmospheric air.

"Having had occasion recently to study the rare gases found in firedamp, we sought to discover whether they would follow the same law of proportions found in gaseous mixtures of an entirely different origin.

"For this purpose we have calculated the argon-nitrogen ratio of the firedamp samples studied, and, by application of our spectrophotometric method for determining the proportions of krypton and xenon, we have been able to calculate approximately the ratios of krypton to argon, of xenon to argon and xenon to krypton. Further, we have been able to determine the values of the same ratios in a sample of crude argon, obligingly put at our service by M. Th. Schlœsing, Jr., who extracted it from the mine gases of Ronchamp, Anzin and Plat-de-Gier.

RATIOS OF NITROGEN, XENON AND KRYPTON IN MINE GASES TO THEIR RATIOS IN AIR

Source of Firedamp	$\frac{Ar}{N}$ (in mine) / $\frac{Ar}{N}$ (in air)	$\frac{Kr}{Ar}$ (in mine) / $\frac{Kr}{Ar}$ (in air)	$\frac{Xe}{Ar}$ (in mine) / $\frac{Xe}{Ar}$ (in air)	$\frac{Xe}{Kr}$ (in mine) / $\frac{Xe}{Kr}$ (in air)
Lievin, France	1.38	1.4	1.2	0.9
Anzin, France	0.97	1.0	1.1	1.1
Lens, France	1.72	0.5	0.3	0.7
Mons, Belgium	0.82	1.3	2.1	1.6
Frankenholz, Palatinate	0.85	1.1	1.2	1.1
M. Schloesing	0.85	1.0	1.0	1.0

"We see that these numbers in general are quite close to one another and vary comparatively little from unity, which is the value of each of the ratios for air. Moreover, they are all (except three of the ratios, which apply to the firedamp of Lens) comprised between the extreme limits reached by the corresponding ratios of the gaseous mixtures previously studied. It seems permissible for us, therefore, to affirm that the ratios between chemically inert gases are as constant in the firedamps as in other natural gas mixtures. We should recall, in this connection, that Mr. Schlœsing has already observed that the ratio of crude argon to xenon in firedamp varies within narrow limits, and that it is sometimes very near to the value with which it occurs in the air.

Absorption of Rare Gases

"Although the number of samples was limited, we could not fail to observe that the majority of the above ratios were smaller than the mean ratios for natural gases from thermal springs, while the ratios for the Lens firedamp were especially small. This remark leads us to think that in permeating through beds of coal to form, with the methane, the gas we term firedamp, the crude subterranean nitrogen (nitrogen plus rare gases) is selectively absorbed by the coal, and this results in lowering more or less the relative proportions of the heavy rare gases.

"Helium always exists in the *crude* nitrogen of the mine atmosphere, and often in abundant proportions. But its ratio to any one of the other inert gases is not at all regular. We know that this is true also, for the natural gaseous mixtures, and that is explained by the fact that helium is constantly produced by the decomposition of radio-active substances, and these are inequally distributed in the crust of the earth."

*Specially translated by E. P. Buffet for Coal Age.

Supplying Cities with Coke-Oven Gas

In the last five years the German papers have often discussed the project of supplying the larger cities with gas from the coke ovens; but many who have read concerning the project have never considered that coke is really a more important product of coal-gas works than gas. One thousand pounds of coal yield about 160 lb. of gas and 550 of coke, which, as a rule, is sold at a low price to local consumers. The local coke consumption is determined only by the necessary supply; but as the gas production increases as a rule, more rapidly than the population of the cities, there is usually a good supply of local coke at low prices.

But what would happen, asks *Hygiene und Industrie,* if all, or the greater part, of the municipal gas plants of the Rhenish-Westphalian district were to go out of service? There would be no more gas coke, and this would have to be replaced by iron-works coke. But this material, which has only about five per cent. higher heating value than the gas coke, costs thirty per cent. more; and the production depends on the condition of the market. If the cities are to be supplied with gas from the cokeries, the coal mines would have not only the gas monopoly but the coal monopoly as well.

Taking a concrete example—a city with an annual gas consumption of 1,059,000,000 cu.ft., would use up 100,000 gross tons of gas coal and deliver 55,000 tons of coke to local consumers. But if instead of gas coke the furnace coke was used, at $1.25 a ton higher price, the inhabitants would be "out" $68,750 a year; or to put it another way, the 1000 cu.ft. of gas would cost six cents more than where a municipality had its own gas works. So an examination of conditions leads to the conclusion that the municipal gas plants should not be vacated.

Who's Who—in Coal Mining

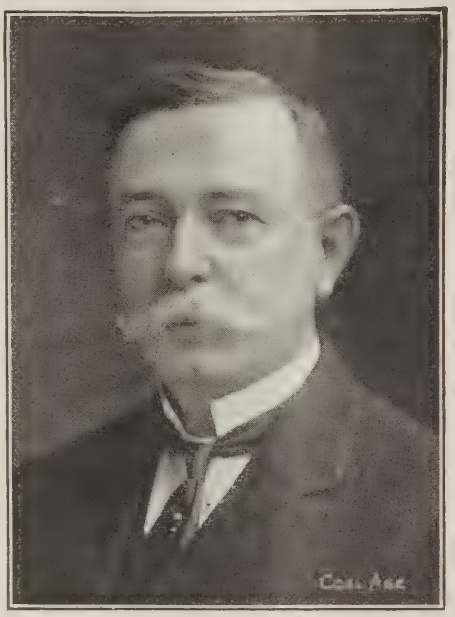
Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

Believing in what you do is half the battle. A man leading a forlorn hope, but who can see only right and justice in his great effort, is likely to accomplish more in the way of execution than the fellow with the easy task whose heart and enthusiasm are not in his work. Earnestness of purpose may not be the greatest asset a man can have, but surely no other personal merit excels it in value. H. M. Chance is sincere and always believes in what he says or does. We don't know that he has ever led any forlorn hopes, but if he has it's ten to one that they were not forlorn when he finished with them. Concentration and serious intent are his chief characteristics.

Born at Philadelphia, Jan. 18, 1856, Mr. Chance was educated at the Central High School, later graduating from the University of Pennsylvania in the Civil and Mining engineering courses, as well as completing special work in geology under Lesley, the father of topographic geology. Immediately on leaving college in 1874, he became an assistant to Lesley, who had just been made State Geologist, and until 1884 "H. N." was located in the iron, oil and coal districts, reporting upon six counties in the western part of the state, and finally preparing a special report upon the mining methods and appliances used in the anthracite coal fields. In 1884-5, Mr. Chance conducted an examination of the Deep River and Dan River coal fields in North Carolina for the State Board of Agriculture, which was then performing the functions of a geological survey.

Having determined to obtain a practical knowledge of the operation of mines, and believing that a mine superintendent should be able practically to carry out the work he is called upon to supervise, he became interested in some iron-ore mines in Lehigh County, Penn., investing most of his capital in the venture. Mr. Chance here gained the experience he sought, but paid for it in time, labor and money. The ore was brown hematite, mined underground and required heavy timbering. It was worth $3 per ton delivered at the furnace. As he had to mine four tons of material to win one ton of ore, and since there were expenses of 35c. for hauling, 40c. for freight, and 25c. per ton for royalty, the profit was nothing unless the cost of mining could be kept at less than 50c. per ton.

Although he succeeded in keeping the mining charges at a low figure, the price of ore at the furnace soon fell to $2, which meant that the cost of mining



H. M. Chance

would have to be reduced to less than 25c. per ton. Having no desire to attempt this impossible task, "H. M." retired from the venture, poor in pocket, but with an experience that enabled him to serve efficiently a firm of tunnel contractors during the next two years as their chief engineer and as assistant superintendent of excavation and construction.

In his study of mining methods while in the Pennsylvania Survey, Mr. Chance became interested in ventilation, in the hygiene of mines, in the effect of pathogenic and dusty mine atmospheres on the men, and in the question of first aid to the injured. This was long before the organization of first-aid corps was effected. In order to grasp these subjects, he commenced the study of medicine, and in 1882 was graduated from the Jefferson Medical College with the degree of M. D.

In 1885 Mr. Chance made some examinations of coal discoveries in Mexico for the Mexican Central Railroad Company. In 1887-8 he conducted an exploration for fuel supply for the Chicago, Burlington & Quincy Railroad Company, finally developing the coal field at Cambria, Wyoming, which was recently described in Coal Age, and which since 1891 has furnished a large part of the fuel supply of that road for its lines west of the Missouri River.

In 1889 he located, selected and developed coal lands for the Choctaw Coal & Railroad Company, tracing the coal from McAlester eastwardly to the Arkansas line, a distance of about 100 miles, and discovering and developing the Grady coal basin and locating the railroad through it. The road was built and the mines were opened and operated successfully under the able management of Edwin Ludlow, until the property was finally absorbed by the Rock Island system.

In 1889 he permanently located at his present headquarters in the Drexel Building, Philadelphia, and has since then been engaged in a general consulting practice in geology and mining engineering. During this period, he has served many of the larger bituminous and anthracite coal-mining companies, especially in the solution of difficult problems, in matters effecting the purchase and sale of properties, in disputes over boundaries, and in arbitrations and appraisals. He has given considerable attention to the supervision of exploratory diamond drilling and other development work to demonstrate values and quantities.

In the boom mining period which followed the discovery of Tonopah, Nevada, in 1901, and which lasted until the decline of Rhyolite, Greenwater and other camps that failed to "make good" about 1907, Mr. Chance was engaged in the examination of minor prospects and a number of metal mines. In all his work as a consulting engineer, he has developed or reported upon coal properties in at least 20 states and territories, iron mines in half as many localities and precious-metal properties in western states and Mexico. In fact, it is probable that no engineer in America has had a wider and more diversified experience than H. M. Chance, and as an authority on the working geology of the United States, few operating engineers are his equal.

He originated the movement that led to the organization, four years ago, of the Mining and Metallurgical Society of America, in which movement he had the warm coöperation of F. L. Garrison, and the benefit of the suggestions and support of Prof. H. S. Munroe, J. F. Finlay, W. R. Ingalls and several other celebrated engineers.

He has been an occasional contributor to various techincal journals, and to the Proceedings of the American Institute of Mining Engineers, Engineers Club of Philadelphia, Mining & Metallurgical Society of America and American Phil. Society, of all of which organizations he is a member.

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FLOYD W. PARSONS, Editor.

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Of this issue of Coal Age, we will print 7500 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

The Anthracite Wage Settlement

The anthracite suspension has ended, and all hope that the miner and operator would emerge from the turmoil with a satisfactory and permanent working agreement was vain. It is true that in an editorial of May 11, we urged the miners to accept the offer made them by the operators, but this stand was taken because it was apparent that some miners were not satisfied with the provision assuring peace for four years, but were desirous of the opportunity of resuming strife with every returning spring.

We cannot congratulate the miner on what he has forced the operator to concede. It is true that his wages have been raised, but he has also obtained, not merely the right to agitate, but also the need for agitation. He who receives a flat wage, which does not change with the flux of economic conditions, which regards neither the ability of the wage to purchase a living, nor the price at which the commodity produced is sold, nor the right of the workingman to benefit by newly developed instruments of production, is bound before long to be dissatisfied and strike.

It was in view of this fact that we had hoped that the miner would have urged successfully an agreement so flexible, so self-molding to all the changes of circumstance, a wage at once scientific and sufficing that the cost of agitation and the wages of unrest would have become as unknown as the desire for protest.

It is the more to be regretted because the defects of the agreement are those which the miner has himself sought through his representatives. If we mistake not, he opposed himself to arbitration, the sliding scale and the conciliation board and prepared himself for a battle, to be followed by four years of skirmishes, foraging expeditions and the like. He has scheduled another battle to take place four years from the present date, so that the air is thick with frays and rumors of war.

This seems perhaps a strong characterization of the labor situation, so much have we become used to "excursions and alarums," especially in the bituminous fields. We have accustomed ourselves to a seething state of agitation and discontent and we do not realize now how uncalled for it all is and how easily it might be avoided, if only a little solid thinking could be made to replace the prejudices which too often animate both parties to the controversy.

The recent quarrel was amicably conducted. What physical violence was shown, was due only in the most indirect way to the action of the union, and it would be unfair to ascribe any blame to that organization. The operators' and miners' representatives met in a most friendly manner and discussed their differences, but while all manner of countesy graced the quarrel, men were idle, the productive energies of coal mining stood still and war is no less war though the combatants are knightly.

From his conduct of the struggle we draw the conclusion that the miner is not seeking stable conditions, but is arranging an atmosphere of discontent, to be followed by biennial, triennial or quadrennial triumphs of discord. The more frequent the disturbances the better he is pleased. Agitation, like machinery, needs more than oiling. It seems generally conceded that the parts must be set in motion frequently in order to secure good results.

How much better it would have been if the matter had been left to a conciliation board consisting of seven members, three representing capital and three labor, and one a competent statistician chosen by both parties. On the latter should devolve the duty of making a continued investigation of the cost of living, and of preparing a special index of cost prices, based on the actual purchases of the average miner. Wages should vary with the selling price of coal, as they have ever since 1903, but they should also increase with the increased cost of living.

Of course, whatever increase in the selling price of coal may result directly from a rise in wages, should not be recognized by a conciliation board as a cause for an increased wage; the tidewater basis should be raised by an amount equal to that increase of wage, whenever the price of labor is adjusted.

We do believe, however, that to maintain the relative level of the miner with other classes of workmen, the wage increment should be dependent not only on an increased selling price, and on the growth of the cost of living, but also, in a rough degree, on the productivity of all labor engaged in the output of those things which the miner consumes. Year by year the time expenditure on articles is reduced because of the invention of new means and facilities of production. In this increased productivity of labor, all should share. In the manufacture of iron, for instance, labor-saving methods have immensely reduced the labor expended. Labor *should* benefit, under past conditions *has so* benefited and, unrestricted, *will* in the future benefit by this improvement.

In fact, the well-being of the European workingman, despite the waning natural resources of that continent, is due to increased productivity resulting from an extensive use of machinery, which use has cheapened the products which he has to purchase. Had the old hand-labor processes been retained, the condition of labor in Europe would have become increasingly distressing.

When the last word is said, the laborer is entitled to a proportionate share of other men's labor. To determine the equivalence of a man's toil is by no means easy, but we think it should be attempted. It might be well tried for ten years, even if after that time a revision might be permitted on appeal of either party. Such an arrangement would be preferable to one which bluntly calls for an agreement on the basis of blind force, followed by unaltered wages for four years, regardless of changing conditions and ending in another test of strength four years hence.

Sulphur in Coal

Our stereotyped methods of analysis do not bring out the condition of the sulphur in coal. The tendency of foreign scientists, however, is to emphasize the importance of that sulphur which is contained in unstable compounds. Many foreign analyses list the sulphur emitted at low temperatures separately in giving proximate determinations, stating what proportion is emitted at or below some definite degree of heat. Anyone taking a whiff of the gases from a newly charged coke oven will realize that the sulphur which is loosely combined is to be found in large quantity in most coking coals. The odor from the oven is much reduced when the charge becomes hot, as the sulphur is not so rapidly emitted at high temperatures after the loosely combined sulphur compounds have been driven off at a low heat.

The sulphur, which is thus loosely combined or entirely free in the coal mass, can be eliminated in coking, and is, therefore, not objectionable as a constituent of a coal prepared for use in the manufacture of coke. On the other hand, it is believed that coal, the sulphur of which is not largely in combination with iron or calcium, may be peculiarly subject to spontaneous combustion. If pure sulphur and iron filings are wetted, covered over with clay and gently heated, their mutual chemical action creates such heat that the resultant emission of steam makes the mass burst with some violence, so that the presence of iron and water would, it would seem, aid in hastening the heating of the coal.

Investigators should study this problem instead of assuming, as is done too often, that pyrite or marcasite is the probable cause of the heating, and, after proving that those minerals are not to blame, decide that sulphur cannot be the cause of the trouble. It is significant that those coals, which have been devolatilized in their early history, forming anthracites and near-anthracites, are not subject to spontaneous combustion.

It is possible that the heat which devolatilized them removed not only the bituminous content, so called, but that part of the sulphur content which was not in combination with iron or calcium, and which was, in other words, not a part of any stable compound.

If the presence of iron in stockpiles of coal aids in heating, as suggested, it might be easy to trace its effects. This theory of spontaneous combustion will explain why water only encourages an incipient fire, and why heating occurs largely where oxidation is clearly at a minimum.

Discipline at Industrial Works

A high efficiency in operation at any industrial plant will be obtained only when a thorough and effective system of disciplining is in force. The employee at such a plant feels intuitively that his efforts are known and appreciated, which is probably the greatest incentive to continued and sustained application that can be offered the average self-respecting man.

To imbue such a spirit in the working personnel at our collieries, the superintendent or foreman must carry an ever-increasing record of each man in his mind. That such records must eventually become confused and lead to serious and reprehensible mistakes in the judgment of the men is inevitable, and every coal official knows the loss of prestige which results from such inconsistencies.

In an effort to overcome this deficiency, the Hudson & Manhattan Co., operating an extensive subway system in New York City, has recently made a radical innovation in this respect. This consists of a system of demeritage, whereby employees are disciplined according to record, the discipline being confined to one of three things—reprimands, demerit marks and dismissal.

Demerit marks are imposed, according to a fixed scale, for violation of rules, neglect of duty, accidents, etc., and when a total of 60 has been reached, dismissal automatically follows. No demerits are inflicted without first giving the delinquent an opportunity to defend himself, and the records are kept private, except as regards the man himself and the company officials.

As an offset to the demerits and an incentive to further effort, there is also a system of merits. Thus an employee receiving no demerits for six months is credited with 10 merits, and in a like proportion for deeds of heroism, loyalty, good judgment in emergencies and suggestions for the prevention of accidents and damage to the company's property. Each merit cancels one demerit.

One of the principal advantages of such a system is that it permits a man who has either wilfully or unintentionally got in trouble to redeem himself. It should also stimulate the employees to exert their best efforts and effect a greater harmony and spirit of coöperation among them.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Thick Vertical Coal Seam

Referring to the question of Charles F. Sherman, COAL AGE, Apr. 6, p. 851, *re* best method of developing a vertical seam of coal, 16 ft. thick, to a depth of 1000 ft. and one mile long, would say I would be glad to answer this question if Mr. Sherman had given the data necessary, in such a case, to enable one to judge of the conditions and arrive at a satisfactory conclusion. Mr. Sherman has failed to state the character of the coal, the nature of the overlying and underlying strata, and to explain the surface conditions and whether the seam is gaseous or free from gas.

After an experience of 25 years in the working of thick pitching seams of anthracite, bituminous and lignite coals, I consider it would be almost impossible to give a satisfactory answer to the question asked without having the above information. To answer the question as it stands, it would be necessary to assume the conditions named above, and the assumed conditions would probably be different from those that actually exist and with which the engineer must contend. The answer in that case would be of no value to him.

J. W. POWELL,
Mine Manager.

Coalmont, B. C., Canada.

In response to the above letter, Mr. Sherman sends the following:

In regard to my inquiry published in COAL AGE, Apr. 6, p. 851, would say that the vein, which is practically 16 ft. in thickness, extends nearly vertically to a depth of about 1000 ft., where it starts to flatten out. The coal is a good hard lignite; and as yet no gas has been found. The hanging wall (roof) is a soft sandstone, while the footwall (floor), at present, is a fireclay, which, however, we expect will be replaced by sandstone, at greater depths. The property is located in a mountainous region, where the surface conditions are very rough.

CHARLES F. SHERMAN.

Farmington, Ill.

Standards in Coal Washing

The article on "Standardization in Coal Washing," by G. R. Delamater, of Denver, Colo., in the March issue of *Mines and Minerals*, gives a complete method of determining the efficiency of washing coal. In the issue of Sept. 29, 1904, of the *Engineering and Mining Journal*, under the heading of "Standards in Washing Coal," attention was called to the lack of any standard methods of determining plant efficiencies, whereby the superintendent of a washery could compare his results with those obtained by others. I believe this subject to be of such importance as to warrant the republication of that editorial, which was as follows:

STANDARDS IN WASHING COAL

Proximate analyses of coal showing fixed carbon, volatile hydrocarbons, sulphur and ash and fuel value in thermal units are of high value to the consumer, and also to the producer, and we hope the day is not far distant when grades will be bought and sold on a guaranteed analysis rather than on the strength of some sort of a trade name. In connection with this matter of coal analysis we call attention to the needs of producers for new data. One of the new developments in the coal industry is the opening of thin seams of poor quality in territory where thicker seams of better quality are not far distant. This development is due as yet not so much to the exhaustion of the good seams as to the high price of good coal lands in districts convenient to our great manufacturing centers and the control of coal lands by great corporations. It is now cheaper in some localities for a newly formed corporation to get title to lands carrying thin, poor seams and use the latest methods of mining and preparing the coal than to get lands carrying coal seams more easily worked and made merchantable. This applies particularly to coking coals.

By washing the coal and by using ovens of improved type excellent coke can be made from seams that show very poorly on analysis. There can be no question, therefore, of a decided increase in the proportion of coke made from washed coal, and in the great extension of coal washing. The matter to which we call attention is the lack of any sort of a standard by which results obtained in washing, particularly in washing rather finely ground coals, can be compared. Analyses of the run-of-mine coal and of the washed coal are valuable, but owing to the variations in the physical structure of coals and the contained impurities, are not sufficient. What the superintendent of a coal-washing plant wants is a standard by which he can make a direct comparison between his work and the work of another man as published in the proceedings of some society or the columns of some mining publication—that is a standard specific gravity test.

It is customary to test the working of washing plants by using solutions dense enough to float coal; in this way the amount of heavy impurity in the washed coal and the amount of coal in the sludge can be determined quickly and with sufficient accuracy for ordinary purposes. The trouble is, when it comes to comparing results, that most papers on coal washing do not state what was the specific gravity of the fluid used.

While it is not possible to use fluids of the same density for all coals, yet it is highly desirable that the specific gravity of the fluid used should be stated. We call the attention of the superintendents of coal-washing plants and manufacturers of washing machinery to this important matter.

The method outlined by Mr. Delamater seems to follow along the lines suggested in that editorial, as all of his formulas are based upon the specific gravity or the float-and-sink test, as he terms it.

I think that the one great value of Mr. Delamater's method is that the separations are made in an exactly similar manner to that which must be employed in the actual washing of the coal, with the exception that a specific-gravity bath is used for making the float tests; this method Mr. Delamater assumes to be the only one having an efficiency of 100 per cent.

However, I should be glad to have the opinion of other readers on this subject, and if any have better methods to suggest, I hope they will be allowed to make use of the columns of COAL AGE to present them. Discussion by those familiar with the subject should result in a standard method being adopted which will be of great assistance to all engaged in this work, and, I think, will go a long way toward the attainment of a higher efficiency in the washing of coal.

It is certainly better to know exactly what one is doing in comparison with others, and I do not think this has been possible in the past with no standard methods of determining efficiencies.

New York City. S. T. A.

Mine Car Construction

I was interested in Mr. Shurick's article on mine cars, COAL AGE, May 11, p. 1008.

The chief requirements for good mine cars are strength, lightness and durability. Where the gradient of the road is not heavy, and the load to be carried does not exceed 1500 lb., wooden cars, strengthened by flat iron bars, give good results. They will stand a fair amount of rough handling, are easily repaired and are not so easily knocked out of shape as iron or steel cars. They are also much cheaper to build than other forms of mine cars.

Red Lodge, Mont. B. H.

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

Coal and Mineral Pitch

Are deposits of pitch very commonly associated with the coal measures; or what is the origin of this substance and where do the largest deposits occur? Is there any large quantity of coal in the Philippines?

PROSPECTOR.

Boulder, Colo.

[Pitch is the black, viscous residue that results from the distillation of coal tar and other bituminous substances. Mineral pitch (asphalt) occurs naturally and is the result of the evaporation of petroleum, which has escaped through the pores and crevices of the containing rock strata, into the atmosphere. The occurrence of petroleum and pitch deposits is not necessarily associated with the coal measures, although their modes of formation and origin are analogous. The petroleum-bearing rocks are the sandstones and limestones, but not commonly the shales.

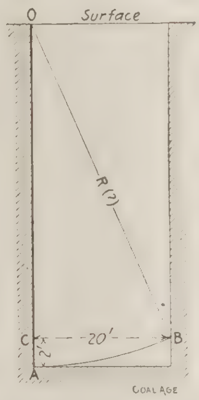
The same metamorphic agencies of heat and pressure that operate to change bituminous coal into anthracite, also assist the evaporation of petroleum and the production of asphalt or mineral pitch. The large deposits of pitch found in Mexico, California, Venezuela, Trinidad, West Africa, Borneo and Russia testify to vast quantities of petroleum which have escaped into the air. The composition of the residual pitch varies according to the degree of oxidation and evaporation of the oil.

Pitch is often found in conical masses from a few inches to 50 ft. in height. Each cone is symmetrical, and while the outside is hard and dry, the center is a little crater from which the flow has occurred. The largest pitch deposit in the world is Pitch Lake, Trinidad. This covers a quarter of a square mile.

As far as has been discovered up to the present time, there are four principal seams of coal in the Philippine Islands, all bituminous. These deposits, it is believed, amount to many millions of tons. The coal deposits in these islands is of increasing commercial value; and its importance to the United States as a coaling station cannot be overestimated. The field is as yet wholly undeveloped and unexplored, and for this reason no accurate information is obtainable relative to the depth or extent of the deposits. In this connection the article published last week, COAL AGE, p. 1054, will be read with interest.—EDITOR.]

A Shaft Problem

Please give a solution of the following problem in COAL AGE, as soon as you can: A bob attached to a string is suspended from the top of a shaft 20 ft. wide, and just touches the bottom. When the bob is swung to the opposite side of the shaft, as shown in the accompanying sketch, it lacks 2 ft. of touching the bottom. What is the depth of



SHOWING CROSS-SECTION OF SHAFT

the shaft? This question has caused considerable discussion here and a great many different answers have been given. We would therefore like to have the correct solution and the rule for obtaining the same.

Johnston City, Ill. R. R. HUDSON.

Assuming that the string is attached to the side of the shaft, at the surface, as represented in the sketch, the question involves a simple geometrical principle.

The depth of the shaft (OA) is the radius of the arc (AB) described by the bob. The sine of this arc is $CB = 20$ ft., and its versed sine $CA = 2$ ft. But, from a simple principle in geometry, calling the chord of the arc AB instead of the arc,

$$(AB)^2 = 2\,OA \times CA$$

$$OA = \frac{(AB)^2}{2\,CA}$$

But

$$(AB)^2 = (CA)^2 + (CB)^2$$

Hence

$$OA = \frac{(CA)^2 + (CB)^2}{2\,CA}$$

To find the depth of the shaft, in the present case, substitute the given values in the last equation: $CA = 2$; $CB = 20$; and

$$OA = \frac{2^2 + 20^2}{2 \times 2} = 101\ ft.$$

Drawing Pillars

I would like to call attention to what seems to me may be an oversight in the illustration on p. 981, COAL AGE, May 4, showing a good system of drawing back pillars by machines. It seems to me that since the entries, in this case, have been driven to the boundary and the work is all retreating, the rooms should be widened on the other side, or outby, so as to make the road and the straight rib on the inby side of the room. I want to ask if, in drawing the pillar between rooms 30 and 29, you would not lose the next one between rooms 29 and 28, and would not this be the case the entire length of this entry; would not every alternate pillar be lost? Should not the rooms, in this case, be widened on the outby rib?

PENNSYLVANIA FIREBOSS.

Hites, Penn.

[The usual plan is to widen the rooms on the far rib, in the direction of advance. In the present case, the work being retreating, the rooms, by the usual method, would be widened outby instead of inby as shown. The question, however, is open to argument, and can only be properly decided, in any given case, by the prevailing conditions of roof, floor and coal. With a fair roof and bottom and good coal, if a systematic method of timbering is preserved, there is hardly any question but that better coal will be obtained by working the pillars from the side toward the falls. The crush on the pillars will not then be as great as when the pillars are cut from the other side and worked toward the falls. In the latter case, the last end of each little stub would be badly crushed, if not wholly lost, and a heavier roof fall might be expected to follow its extraction, endangering the work.

In considering the question, regard must be had to the line of break following up and paralleling the line of pillar work, and unless conditions prevent doing so, the pillar coal should be worked back constantly away from the falls. The same principle holds here as when the pillars are worked back on end; or as in longwall retreating. Under some conditions, however, it would be necessary to work the pillars from the outby side or away from the falls, and get as much as possible out, leaving the rest.

The question is open to argument and we gladly invite its free discussion by our readers.—EDITOR.]

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Iowa Examination for Mine Foremen Held at Des Moines, April 9-10, 1912

(Selected Questions)

Ques.—What should be the volume of air for a mine producing 1000 tons of coal per day, and what would be the effective horsepower of the ventilator, with a 1-in. water gage?

Ans.—The number of inside employees corresponding to this tonnage, basing the estimate on the last Iowa report, would be about 650 men and, say 20 mules. The minimum volume of air required by the Iowa mine law would then be

Air for men	$650 \times 100 = 65{,}000$	cu.ft. per min.
Air for mules	$20 \times 500 = 10{,}000$	cu.ft. per min.
Total...............	75,000	cu.ft. per min.

The effective horsepower for this circulation, under a 1-in. water gage would be

$$H = \frac{75{,}000 \times 1 \times 5.2}{33{,}000} = 11.8\ hp.$$

Ques.—What plan would you adopt to fix a water gage at the intake to indicate the mine resistance where a furnace is used?

Ans.—In order that the water-gage reading shall indicate the total mine resistance exclusive of the shafts, it must be placed on a brattice dividing the main intake from the main-return airway. In case the mine is so arranged or the furnace shaft so located that this is not possible, the reading may still be taken so as to show the difference of pressure between the main-return airway, at the foot of the furnace shaft and the outside atmosphere, by connecting one end of the gage glass with a pipe leading to the surface; or the reading may be taken on the surface by connecting the gage with the closed mouth of this pipe leading down into the mine. In any case, the gage must be so placed and connected that its two arms will be open, respectively, to the main-return airway, at the foot of the furnace shaft, and the main-intake airway, or the atmosphere. In the latter case, the reading obtained would include the resistance of the downcast shaft, in addition to the mine resistance.

Ques.—How should a stable in a new mine be constructed and ventilated?

Ans.—The accompanying diagram (Fig. 1) shows one of many good arrangements for a mine stable at the shaft bottom.

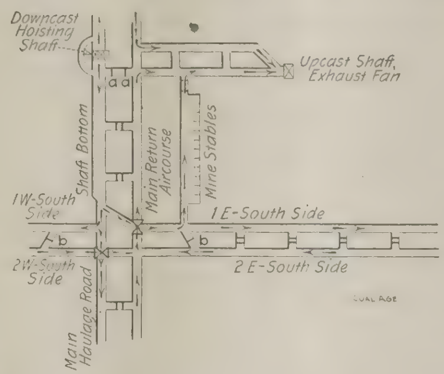


FIG. 1. SHOWING LOCATION OF MINE STABLES AT SHAFT BOTTOM

The principal points to be considered in the location of a mine stable are the following, in the order of their importance: 1. Easy access to shaft or slope bottom to facilitate the handling of the daily supplies and refuse between the surface and the stable, and the rescue of the mules in case of accident. 2. Good ventilation, water supply and drainage. 3. Fireproof construction and electric lighting, or protected lamps. 4. Ready access by good roads to the several districts of the mine. 5. Ample protection from roof falls, squeeze or creep.

In the plan shown in Fig. 1, the stable is located in the solid shaft pillar, between the intake airway of the first pair of cross-entries and the main-return air course leading to the upcast shaft. This arrangement allows an unobstructed entrance on the 1-E cross-entry. The other entrance leading to the main-return airway is protected by the two iron regulator doors, which control the "scale" of air taken from the fresh-air current on the 1-E entry, and afford ready access to the air shaft and the north side of the mine; or, by the double iron doors *aa*, to the main hoisting shaft. A 40-ft. pillar of solid coal separates the stable from the main-south-return air course. The floor of the stable is concreted and drains into the main sump at the shaft. The stalls and other fittings, as far as practicable, are of iron. The stable is furnished with a good supply of drinking water for the mules, and is equipped with fire extinguishers, hose and pipe-line attachments at points sufficiently protected and numerous that one or more of these will be available in case of need.

Ques.—What does a low water gage, with a large quantity of air passing, indicate?

Ans.—This condition indicates an economical expenditure of power to the extent that the ràtio of water gage to quantity approaches a minimum for that mine.

It shows a large air volume per unit of power expended. It shows a comparatively small rubbing surface per unit of *area of passage* or the total sectional area of all the splits combined. It shows a comparative freedom from falls or other obstructions in the air courses, and an ample size of breakthroughs in rooms and entries. Such a circulation approaches the ideal.

Ques.—How would you proceed to turn a cross-entry at right angles to the main entry without using a compass?

Ans.—Suspend a bob from each of the two respective points or stations A and B (Fig. 2) of the entry survey.

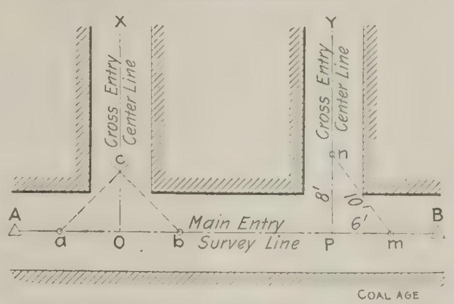


FIG. 2. SHOWING TWO METHODS OF SETTING OFF A RIGHT ANGLE WITHOUT USING A COMPASS

Stretch a string carefully in line with these bobs or points. By means of this string, line in the points O and P opposite the centers of the respective cross-entries. Also line in the points a and b, respectively, at any convenient equal distances, on each side of O. Then from these points a and b as centers and with any fixed radius ac, greater than aO, describe in turn the intersecting arcs which determine the point c and the line OX at right angles to AB. These lines can often be laid off with chalk on the roof, but the work requires care.

In a similar manner the triangle Pmn may be laid out, using the numbers 3, 4, 5 or any multiple of these more convenient, as 6, 8, 10 ft. This gives a right triangle, because

$$6^2 + 8^2 = 10^2$$

and makes the line PY at right angles to AB.

It is important to remember that all measurements must be made in the horizontal plane for any angle other than a right angle, which can be laid out on the pitch.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

The New Dangers of the Pittsburg Coal

BY SIM REYNOLDS* AND W. H. REYNOLDS

Despite the work of the Bureau of Mines, of the state mine inspectors and of the technical journals, we find a dangerous adherence to old beliefs and a reluctance to accept new light on industrial problems. I recall an old practical miner, who went down to the Bruceton experimental mine. His features bore the inevitable blue stamps of the practical miner, and his knuckles, stiff and calloused, showed how long an acquaintance he had had with actual mining work.

He had been sent to Pittsburg "to see what the Government chaps were up to anyway," and he arrived seemingly determined to accept nothing on faith, nor was he prepared apparently to accept the tests and statements of more scientific men than himself, no matter how conclusive their theories might be—to them. This old mining official had, perhaps, many a time sought a "cap" in his burnished Davy, years before we were efficient to the point where we could open and shut a door on the main haulway. As he ambled about, he convinced us that there still existed, if not among the younger men, at least among many of the old school of mine officials, who are equally charged by the state with the care of many human lives, such a narrowness of mind and viewpoint, as is certain at some time or other to be the cause of a disaster.

In this particular instance, the man had evidently been sent by his employer to witness the demonstration. He passed through the mine previous to the explosion, and at frequent intervals made tests for methane. This not being in evidence, the old man very carefully examined the coal dust lying on the shelves, and even took the additional precaution to gather a handful, placing it in an envelope with deliberation and distrust. This dust he carefully sealed and put away for further examination.

"There may be something in it besides coal dust," said he, doubtfully. And after waiting for the "blow-up," while the first few ineffectual attempts were made to set the blast off, he added: "If there is nothing in the stuff but just dust, I would not be afraid to light the shot with a squib and sit around the rib corner until it goes off." But we are inclined to the belief, that when he saw what happened when the mine did really explode, the old mine boss changed his opinion somewhat.

*Pittsburg-Buffalo Coal Co., Marianna, Penn.

How Conditions Have Changed

The main difficulty with which we have to contend, is that many men fail to understand how the nature of the work in the Pittsburg coal has changed from earlier years. The Pittsburg bed, in the portions of the field which were earlier developed, is exposed in extensive crop lines along the banks of many rivers and streams.

Consequently the coal has had an opportunity to lose the gas, naturally contained in it, so that where so exposed it has been robbed of its principal element of danger. The time has come when the deeper developments of the Pittsburg field are made or are being made. The parts now mined and to be mined are many of them 500 ft. below the level of the valleys, and under the higher hills they are at least 1000 ft. deep. Consequently the coal has not had a chance to emit its explosive gases and more care will have to be taken in the newer mines for this reason.

Old-time Shooting

But there is another danger which does not appear to be generally understood. Where the measures were more shallow, the coal could be dislodged by light shots, but now a very much heavier charge is needed in order to shoot down a cut of coal. It is true that in earlier days, a heavy charge was sometimes used to bring down the thick plate over the top of the coal bed, so that there might be room for hauling where a part of the seam was too thin for working without that provision, but only the lightest of charges were used to bring down the coal.

These roof charges, though heavy, were probably not as great a source of danger as shots in the coal itself. Even when a shot placed in the rock strata failed to work and a "blow-out" resulted, its destructiveness was at the initial point nullified to a great extent by having nothing but rock dust to work in. We have worked in mines in the Pittsburg district where thousands of rooms were commenced and finished without the use of a drill and hence without powder or other explosive.

Consequently we have seen such mines operating day after day with coal dust from an inch to six or eight inches thick lying over every rod of the entry for miles with every projecting ledge and every square yard of surface in the rooms covered with that explosive substance. But nothing untoward happened, or we would not be recording this condition.

It is hard to convince the fire bosses, the foremen, the miners even, who have year after year been as familiar with this dust as a three-year-old boy is with mud, that there is any danger in it. They will strenuously aver that in places where they have worked from boys up, there have been acres and acres of such dust-laden workings, and no efforts whatever were made to remove or dampen it, and no accident happened as a result.

Present-day Shooting

Of course not, how could anything happen? Coal dust without heavy shooting and without something in the way of a gas or electric combination is certainly innocuous. But in view of the later development in this same field, we shudder to think of the consequences which would possibly have followed a good "solid shot," containing from one to two 5-lb. cans of powder, such as are fired in some of the mines in which we have worked.

Between such mines and a shaft which reaches the deeper and more gaseous portions of the bed, there is a vast difference; the difference existing between the early years of coal dust and no disasters and the years of smaller quantities of dust and disaster. The failure to distinguish properly between the new conditions and the old is a phase of the human element in mining, which has cost dearly in more ways than those specified.

Medical Treatment in Belgium

In Belgium it was found necessary to take a step in paternal legislation in order to rid the mine workers of ankylostomiasis. At first the men who were infected were induced to quit work occasionally for a day in order to receive treatment, but the work done in so short a time was not satisfactory and it was ultimately decided to spread the treatment over a longer and more continuous period. This made it possible to use less violent vermifuges. Wintergreen oil and oil of eucalyptus in most cases then took the place of thymol and extracts of male fern.

While the men were undergoing treatment they received 30c. per day from the provincial funds and usually the coal companies paid 39c. per day additional.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission has rendered an opinion in the case of the Association of Bituminous Coal Operators of Central Pennsylvania versus the Pennsylvania R.R. Co. In this case the complainant attacked the defendant's present rate on bituminous coal from the Clearfield district of Pennsylvania, to South Amboy, N. J. Upon the facts disclosed by the record, it was held that "there has been no unjust discrimination as against the Clearfield operators practiced by the defendant carrier, nor does it appear that the rates attacked are unreasonable."

The opinion is lengthy and includes an historical survey of the situation as to coal rates in the district referred to. Finally the Commission reaches the conclusion that:

It is clearly beyond the power of the Commission to reduce the Clearfield rate upon the ground urged by complainant. It may well be that in times past rates from this and from other fields have been adjusted with relation to the cost of mining coal and that the carriers undertook to make a rate upon which all producers would be brought into competition at common markets and rates so adjusted as to leave to the coal operator a reasonable profit upon his investment. Those rates would fluctuate not with respect to the cost of carriage nor to the value of the service as such, but solely with respect to the needs or advantages of the shippers. Upon the shipper favorably situated in location, and having a thick vein of coal at a slight depth and resulting cheap cost of operation, a higher rate would be imposed than upon his neighbor who might suffer under the disadvantage of a high wage scale and a thin vein. It has been repeatedly said by the Commission that it was not our function, nor that of the carriers, to equalize economic conditions. In this case it fairly appears that the profits made by the Clearfield operators upon tidewater coal are slight, and that if rates should be made so as to sustain an industry which because of intense competition within itself, or because of local disadvantages, yields but a slight profit, the present rate should be reduced. But we do not understand the law as permitting us to fix a reasonable rate solely upon this ground.

Alaskan Coal for the Navy

Congressman Booker has offered a bill designed to bring about the use of a part of the Alaskan coal supply as fuel for warships. The bill is intended "to provide for a permanent supply of coal for the use of the United States Navy and other governmental purposes, and to provide for the leasing of coal lands in the Territory of Alaska."

The Secretary of the Interior is authorized to "lease to any person above the age of 21 years who is a citizen of the United States, or any association of such persons or any corporation organized under the laws of the United States, any of the lands in the Territory of Alaska to which patent has not been earned or to which equitable rights have not been acquired and which contain deposits of coal or lignite, under such restrictions and upon such terms as in his discretion will best serve to develop the fuel resources of Alaska and which shall protect the interest of the public in such resources. And all such coal lands in Alaska are hereby reserved from entry except as provided in this Act, and except as to other forms of entry not inconsistent with coal leases."

Secretary Meyer recently appeared before the Naval Affairs Committee of the House, and suggested that the government consider a plan to use the Alaskan coal for United States naval vessels on the Pacific. The Booker bill is intended to take cognizance of this suggestion as follows:

The President of the United States is hereby authorized to reserve such tract or tracts of coal lands in the Territory of Alaska as may be deemed sufficient to meet the requirements of the Government of the United States and to provide for the mining of coal in the same for the use of the Navy and Army and for other public purposes: Provided, that if any part of the lands so selected be equitably claimed by any person or persons, under rights of location or otherwise, the Secretary of the Interior is authorized to secure cancellation of such claim by a return to said claimant of the expenses incurred by him on account of such claim, or by giving such claimant a preferential right to a lease upon lands of similar value in some other locality, or by both of such considerations, wherever such negotiations shall fairly determine the rights of the parties and secure to the Government such land as its use may require.

Alabama

Birmingham—About 10,000 acres of coal land, near Warrior, are being developed by the American Coal Corporation. The Louisville & Nashville R.R. is building a branch to the property An output of from 1500 to 2000 tons a day is contemplated.

It is announced that the Bureau of Mines will reopen its mine rescue station at Birmingham, July 1, with C. H. Brown in charge. At that time instruction in mine rescue work will be resumed. Mr. Brown, who was previously in charge of the station, was called to Pittsburgh on Apr. 1.

Colorado

Denver—The suit of the U. S. Government against the Colorado Fuel & Iron Co. was heard recently in the district court. In this case, the government questions the right of the coal company to hold land, valued at $3,000,000, on which stands its Primero mine, the largest producer and the best paying property of the southern Colorado coal fields. The Colorado Fuel & Iron Co. is seeking by demurrer to prevent the government from asserting title to the land, which it claims was obtained by fraud. The question raised by the C. F. & I. Co. is new in coal-land litigation. It seeks to have the government precluded from asserting title because the company already has had two adjudications by the land-office officials in its favor. The government makes the unique plea that at the time of these land-office hearings it was not able properly to present its case because the facts as to the kind of land involved were concealed and it did not have an opportunity to obtain a hearing on the real merits of the case.

Reports from Louisville and Lafayette show that more or less violence continues to take place in the northern coal fields, consisting chiefly in attacks on nonunion miners by striking members of the miners' union.

Illinois

Bloomington—A fire, which was discovered in the mine of the McLean County Coal Co., near here, May 9, got beyond control, and the workings have been sealed up. Twelve mules were taken out but four perished in the mine. Flames had spread from the second to the third level before being discovered, and it is thought the loss may be heavy. The mine will be closed for a month.

Princeton—The mines of the Spring Valley Coal Co., at Seatonville and Dalzell, as well as the mines at Marquette and Ladd, have been opened, but the two mines at Spring Valley will not resume work for perhaps two or three weeks, on account of repairs that are being made. Rumors of an indefinite suspension at the two Spring Valley mines have been denied by the coal company.

Harrisburg—Mines of the O'Gara and Saline County coal companies in this vicinity have resumed operation, although the outputs so far have been small. The Big Four R.R. has about finished cleaning up the huge pile of coal which it had stored here, amounting in all to some 87,000 tons.

Waterloo—St. Louis men have taken options on about 300 acres of coal land, near Millstadt. The seam runs 6 ft. thick, and it is understood that the property will be developed.

Springfield—Following the agreement of the miners to return to work, only a few mines in this vicinity resumed operations, and those which did start up employed only about one-half their regular force. Mines of the Lincoln Park, Cora, Jefferson and Chicago-Springfield companies remained closed.

Kewanee—Drilling operations, which have been carried on lately east of here, on the property of the Kewanee Coal Co., have proved disappointing, and the project of sinking a shaft will be abandoned. It was hoped to find the Spring Valley seam at least 36 in. thick in this locality, but the last hole disclosed a thickness of only 17 inches.

Vilia Grove—A 6-ft. seam of coal was struck near here recently by the Douglas Oil & Gas Co., while prospecting for oil. The coal lies at a depth of about 300 ft., and is overlaid by a 26-ft. stratum of slate, promising an excellent roof for mining purposes. It is thought that the oil company will take steps to secure the coal rights on the property.

Indiana

Terre Haute—With practically only one question—that of the weekly pay day—preventing an agreement, the joint wage conference of operators and miners adjourned, after a 3-days session, until May 20. No action has been taken on the six demands set forth by the miners, but according to statements of both operators and miners, the matter of adjusting a contract hinges entirely upon the settlement of the demand for a weekly pay. National officers of the United Mine Workers' organization have expressed the opinion that unless the Indiana miners can prove beyond doubt that their demand for a weekly pay will not increase the cost of producing coal, it is in conflict with the provisions of the Cleveland agreement. An effort is being made to unionize all the men working at the stripping operations in the block-coal field. They number about 500 in all. A meeting of the miners and operators of this district will be called to take action on a wage scale as soon as District 11 has reached an agreement.

Brazil—The German Coal Co. and the Bee Ridge Coal Co. have signed an agreement with the miners, acceding to the demands made by the miners' union, and have resumed operation. Neither of the mines employs many men and most of their output is used by local consumers.

Iowa

Des Moines—A tentative wage-scale agreement was submitted by the subcommittee to the general committee of operators and miners, which reconvened here, May 14. It was understood that all points in dispute had been satisfactorily covered.

Perry—An extensive new coal field will be opened up for development a few miles south and east of this city during the summer. The seam is several feet in thickness and of a superior quality. It is thought by miners that the new field is a part of the seam which crops out at Ogden and points further north, and not a part of the field now operated in this county, near Madrid.

Dallas—Development work on the Indiana Consolidated Coal Co.'s shaft, in Dallas Township, was resumed recently. The combination air shaft and manway will extend to a depth of 65 ft. Work on the new Rock Island road, in the southeastern part of Marion County, known as the Carlisle-Allerton cutoff, is being pushed with all possible speed. That portion of the line near the Indiana Consolidated Coal Co.'s mine is practically finished.

Kentucky

Louisville—Coal operators in Kentucky are keenly interested in the improvement of transportation facilities which will enable them to get into central freight association territory more easily and are following closely all new work of the railroads. That preparations are being made to render better service is evidenced by the completion of the Kentucky & Indiana bridge at Louisville; the prospective construction of a bridge near Paducah, by the Burlington and other lines; the rebuilding of the Pennsylvania bridge at Louisville, operated by the Louisville Bridge Co.; the construction of a bridge by the Owensboro & Rockport Bridge & Terminal Co., which has given notice of its plans for building at a point between Owensboro, Ky. and Rockport, Ind.; and the reconstruction of the bridge of the Norfolk & Western near Kenova, W. Va.

W. C. Black and Jesse Turner have leased a coal property on Straight Creek, in Bell County, and will put it in operation at once. They have announced that the capacity of the mining plant will be considerably enlarged.

Boxley & Co. have begun the construction of a 20-mile section of the Williamson & Pond Creek R.R., the contract for which was recently awarded them. A number of subcontracts for grading and tunneling have been let, and a big force of men has been put in the field. Meanwhile the Pond Creek Coal Co. is pushing development work on its coal property.

Pineville, Ky.—The Continental Coal Corporation, which was formed a year ago for the purpose of taking over a number of operating companies in the Straight Creek district of eastern Kentucky and Tennessee, recently gave a banquet here to the employees of its operating and commissary departments, celebrating the first anniversary of the company's organization. Fifty-six were present. White L. Moss, vice-president and general manager of the company, was toastmaster.

Barbourville—The Knox County Coal Co., which was recently organized with $250,000 capital stock, will have its chief offices in Lexington, and will proceed with the development of coal lands in Knox County.

Ohio

Columbus—Attorneys for the New Pittsburg Coal Co., operating mines at Nelsonville, along the line of the Hocking Valley R.R., appeared before the Interstate Commerce Commission May 15, in an effort to obtain a readjustment of rates to Lake Erie ports. The present rate is 75c. and the company is contending for a reduction of 30c. per ton. It is alleged that transportation costs of the railroad company do not exceed 40c. per ton, and that 37c. is a fair average. The commission made an exhaustive examination of the case and an early decision is expected.

After a ten-days session the joint conference of operators and miners of the Hocking sub-district, the basing territory for Ohio, adjourned May 15, having reached a complete agreement. The contract which has been signed, consists of 35 sections. It goes into every detail of the working conditions and will have an important bearing on the settlements reached throughout the various mining fields of the state.

Bridgeport—A deal was closed here May 16 whereby the Woodsfield Coal Co., of Fairmont, W. Va., purchased from W. R. Hawkins and R. L. Hoskinson, of Waynesburg, Penn., 4600 acres of coal land in Monroe County. The deal involves $200,000.

Two men were injured, one probably fatally, when a 20-ton electric locomotive at the Wheeling Creek mine of the Lorain Coal & Dock Co. went down a 20-ft. embankment, near here, in the morning of May 17. The motor was buried in several feet of mud, one of the victims being pinioned under the frame.

East Liverpool—The Quaker Valley mines at Rogers have been sold to the Mullins Coal Co. and the mines which have been idle for some time will now be operated to capacity. The Mullins

company has other holdings at East Palestine, New Waterford and New Philadelphia.

Pennsylvania

Bituminous

Greensburg—The Loyalhanna Coal & Coke Co., operating mines in Derry Township, recently filed a suit against Michael Hines, James Quinn and Columbus Johnston for $150,000 damages. The plaintiff in its statement charges that the defendants own a tract of coal adjoining its tract of 1000 acres in the Pittsburg seam. During the last six years, the plaintiff alleges, the defendants have gone over their line and mined a large block of coal belonging to the plaintiff. Under the act of 1876 treble the value of the coal taken is asked.

Pittsburg—The Interstate Commerce Commission recently dismissed the complaint of the Association of Bituminous Coal Operators of the central Pennsylvania district against the Pennsylvania R.R. Co., holding that there exists no discrimination against the operators in the Clearfield district of Pennsylvania, and holding to be reasonable the existing rates on bituminous coal to South Amboy, N. J. The complainant alleged that the present rate of $1.55 per gross ton was unjustly discriminatory in favor of the Latrobe and Greensburg districts, which have a rate of $1.65. It was sought to have the rate reduced to $1.44.

Butler—Declaring that the new scale demanded by the miners cannot be paid without operating the mines at a loss, the Great Lakes Coal Co., of Pittsburg, owning four mines at Kaylor, has announced an indefinite suspension. Five hundred men are thrown out of work. The mines have been prepared for a shutdown for the past year.

Boswell—The Atlantic Coal Co., with operations near here, has recently acquired a tract of 1500 acres of coal land in Brothersvalley, Black and Summit townships. This adjoins another tract owned by the company, consisting of about 500 acres. These tracts are underlain with the B seam of coal which here runs from 6½ to 9 ft. in thickness. It is understood that the Atlantic company will commence operations here at an early date, building a plant of 1200 to 1500 tons daily capacity along a spur of the B. & O. R.R.

Connellsville—Connellsville coke production and shipments remain stationary at 400,000 tons and 12,000 cars weekly, chiefly because there is a persistent deficiency in the labor supply in spite of the fact that the region pays the best wages in the world. The furnace interests recently blew out 1530 ovens and fired 60, making a net decrease of 1470. Independent operators seem to be well supplied with orders.

The little Junction plant of the Marietta-Ganier Coke Co., at Broadford, idle since April, 1910, was fired up lately.

Anthracite

Scranton—One man was killed, two seriously and one slightly injured at midnight, May 16, when a slide of rock occurred near the Consolidated colliery of the Hillside Coal & Iron Co., in Moosic, where a 30-ft. cut was being made in fighting a mine fire.

The court recently handed down orders appointing mine inspectors' examiners and miners' examiners. W. L. Allen and Leon Whaite, mining engineers; and Patrick Flannelly, James Strong and John Bartosch, miners, were reappointed examiners of applicants for mine inspector.

The city council has passed a resolution authorizing the city solicitor to frame an ordinance whereby it is hoped that the streets of Scranton may be protected against damage by cave-ins. The resolution is now in the hands of the mayor.

The Bradley washery in South Scranton was destroyed by fire Saturday evening, May 18. The fire is supposed to have been caused by defective insulation of the electric wiring. The washery had not been in operation since Apr. 1. The loss will reach $25,000, of which amount about three-fifths was covered by insurance.

Wilkes-Barre—The tri-district convention of anthracite mine workers, which met here May 14, after a four days' session, voted on May 18 to accept the tentative wage scale agreement which was reached by the subcommittee of operators and miners on Apr. 25. The vote was 323 to 64 in favor of acceptance. There was at first much opposition offered to a ratification of these terms but President White and the more conservative element, in the end, easily dominated the convention. At a meeting in Philadelphia on May 20, representatives of the operators and miners signed the new agreement.

Mauch Chunk—The Anthracite Drifted Coal Co. has been organized by J. G. Reber and G. A. Alleman of Shoemakersville to recover the fine coal which has been washed down the Lehigh River and has collected above the dams at Parryville, Lehigh Gap and Three Mile Level, near Easton. Arrangements have been made with the Lehigh Coal & Navigation Co. permitting this work to be carried on.

Rhode Island

Providence—The mines and property of the Rhode Island Coal Co. at Portsmouth were sold at auction, May 17, by order of the U. S. District Court. All property of every kind owned by the corporation was sold excepting the mined coal in the yards at Newport. The real estate comprises a tract of 2446 acres and the whole property carries a mortgage of $100,000.

Washington

Chehalis—It is stated that P. C. Cockerill and other men of Sioux City, Iowa, whom he represents, will probably buy the coal mine at Littell which is owned by W. A. Conniff. Mr. Cockerill states that he has a market for all the coal that could be mined on the property.

West Virginia

Wheeling—Miners of the fifth Ohio subdistrict opened their convention here May 13 with 96 delegates present from 104 local unions representing 17,000 men. They appointed a scale committee, to report to the convention, and met the operators May 15. The Cleveland scale was used as a basis of settlement, but many questions relating to "deadwork," "sticky bottoms" and outside day work threatened to make trouble.

Bluefield—The Tierney Coal Co., which was recently incorporated in this state, is a holding company which owns some 11,000 acres of coal land in Pike County, Ky. This will be divided up and leased to operating companies. The property is underlaid by the Freeburn and Thacker seams and is located on the west side of Pond Creek. It will be served by the new line of the Norfolk & Western R.R., which is to be extended into that territory from Williamson and it is expected that construction work on this road will be started within the next few weeks.

Charleston—Despite the fact that one-half the mines in the Kanawha district were idle during the month of April, the coal output for that month passed all previous records, totaling 1,864,220 tons.

Fifteen hundred miners are on strike in the Paint Creek section.

Fairmont—Caving of the old Commercial mine on Coal Run recently caused a considerable subsidence of the surface and damaged property in the neighborhood. After an examination of the mine, further trouble was thought to be unlikely.

Canada

Regina, Sask.—Word was received from England, May 13, that J. H. Haslam had completed the formation of a $5,000,000 company with British capital for the exploitation of the Estavan coal fields. It is understood that Viscount Haldane and Winston Churchill have been named as directors of the new concern.

Ottawa, Ont.—William Ross, minister of mines and forests in British Columbia, recently interviewed Premier Borden in regard to the law compelling all railways in British Columbia to use oil for fuel after December 1914. Mr. Ross protested that this would be a great blow to the coal industry and urged that in an effort to protect the forests, the new provincial system of forestry patrol be given a trial rather than the compulsory use of oil.

Personals

F. E. Zerbey, general manager of the Kingston Coal Co., is recovering from an operation for a severe attack of appendicitis.

W. A. Ogg, comptroller of the Island Creek Coal Co., visited Duluth recently on business, and inspected the company's new dock, under construction at that point.

Harry E. Loomis, vice-president and general manager of the National Coal Co., of Cleveland, Ohio, recently sustained a fractured skull, as the result of a fall, while in Baltimore, Md.

H. J. Schmitt, assistant superintendent of the safety department of the Tennessee Coal, Iron & R.R. Co., has been made manager of a southern bureau of industrial safety, which he organized.

L. F. Card has been chosen superintendent of the Mine Foremen's Association, recently organized at Knoxville, Tenn. Kentucky, West Virginia, Virginia and Tennessee are represented in the organization.

Thomas R. Jones, formerly inside district superintendent, Lehigh division of the Lehigh Valley Coal Co., has been appointed inside superintendent of the Lehigh division and Coxe collieries, effective May 15.

Arthur Lewis, formerly district superintendent, Lehigh division of the Lehigh Valley Coal Co., has been appointed division engineer of the Lehigh division and Coxe collieries, with headquarters at Hazleton, Penn., as heretofore.

Benjamin W. Robinson, of Madisonville, Ky., a well known operator and formerly general manager of the St. Bernard Mining Co., suffered the loss of his home at Knot Lick, Mo., as the result of the tornado which passed that way recently.

Alexander Sharp, of Vancouver, B. C., mining engineer for P. Burns and associates, will shortly proceed to Alberta, to spend the summer in developing the Burns' coal mines, situated in the eastern foothills of the Rocky Mountains, southwest of Calgary.

Dr. J. J. Rutledge, of the Federal Bureau of Mines, has been spending a few days in Alabama, inspecting the mines and devoting considerable attention to investigating the working of gasoline locomotives, a number of which have recently been installed in Alabama.

George T. Robinson, superintendent of mines for the Cambria Steel Co., has tendered his resignation, to take effect at the end of the present month. He leaves to look after his personal interests in a number of coal companies and coal properties. Mr. Robinson has been with the Cambria company for the past 21 years, 11 years as superintendent of coal mines.

Construction News

Butler, Penn.—Thomas Lochrie has asked for bids on 12 new miners' houses at Argentine.

Dunlo, Penn.—The Mountain Coal Co. is installing an electric power plant at its local operation.

Wallins, Ky.—The Terry's Fork Coal Co. is installing electrical equipment and will operate its machinery with motor drives.

Milwaukee, Wis.—The C. Reiss Coal Co. is building a large new dock at Green Bay and will install coal-handling equipment and machinery.

Birmingham, Ala.—The Little Cahaba Coal Mining Co. will install an electric-power plant and equipment at its mines at Piper and Coleander.

The Sloss-Sheffield Steel & Iron Co. has placed orders for boilers and equipment aggregating $35,000.

Joliet, Ill.—The L. M. Rubens Coal & Transfer Co. will build a coal-storage yard of 5000 tons capacity, along the Chicago & Alton tracks.

Madisonville, Ky.—It is reported that Isaac and Bernard Bernheim will develop the coal property here, recently purchased from William Harris.

Durant, Okla.—A large central electric plant will be built at the coal mines 10 miles from here, to furnish power to Fort Worth, Dallas, Little Rock and vicinity.

Erie, Penn.—It is reported that plans are being made for the addition of another large coal-handling rig at the Susquehanna coal docks of the Pennsylvania R.R.

Clarksburg, W. Va.—The Maryland Coal Co. has awarded a contract for grading and laying tracks at its new mining property at Wendell, to C. P. Keeley & Co.

Mt. Sterling, Ky.—The Eastern Kentucky Land Co. has sent out inquiries for prices on equipment with a view to the development of coal land near Cumberland Gap, Tenn.

Brownsville, Penn.—Contract for a concrete lined slope and other construction work at the Lilley Coal & Coke Co.'s new mine has been awarded to the Drake-Stratton Co., of Pittsburg.

Ashland, Ky.—The Kentucky Solvay Coke Co., which was recently incorporated with a capital of $650,000, expects to spend $500,000 on the construction of its new coke ovens and byproduct plant at Ashland.

Warrior, Ala.—The American Coal Corporation, Belton Gilreath, president, is developing 10,000 acres of coal land for a daily output of 1500 to 2000 tons. It is reported that from $350,000 to $500,000 will be spent on improvements.

Louisville, Ky.—The Harlan Coal Mining Co. has awarded contracts as follows: Power plant and electric mining machine equipment, to the Morgan Gardner Co., Chicago; conveying machinery, to the Jeffrey Mfg. Co., Columbus, and boilers, to the Skinner Mfg. Co., Pittsburgh.

Barbourville, Ky.—The Harlan Coal Mining Co., recently incorporated, is perfecting arrangements for the development of 10,000 acres of coal lands. The land will be subdivided and leased. It is reported that eight or ten separate mining plants will be installed this summer. These will be electrically equipped.

Publications Received

INVESTIGATIONS OF EXPLOSIVES USED IN COAL MINES. By Clarence Hall, W. O. Snelling and S. P. Howell. Bulletin No. 15, U. S. Bureau of Mines. 196 pages, 6x9 in., illustrated.

The bulletin describes the method used in testing explosives, and defines what a permissible explosive is. On this subject, W. O. Snelling says: "The underlying causes for one explosive being safer than another in the presence of explosive mixtures of gas or coal dust have been investigated during the past few years. The many thousands of lives lost in coal-mine disasters have shown the necessity of such investigations, and have stimulated to a marked extent researches in regard to the preparation of explosives suitable for use in coal mining. It has been found that every known explosive, if fired in a sufficiently large charge, will cause the ignition of an explosive gas mixture, but explosives have been found to differ widely in regard to the amount that can be fired without causing such ignition. Ordinary black blasting powder, for example, will cause the ignition of explosive gas mixtures very readily, as little as 25 grams invariably serving to bring about this result. Certain other explosives, in quantities as great as 1000 grams, after repeated trials, under conditions exactly similar to those used in testing black powder, have invariably failed to cause ignition of the explosive gas mixtures."

Trade Catalogs

National Foundry & Machine Co., Louisville, Ky. Catalog No. 12. Reilly Steam Pumps and Air Compressors. 160 pp., 5¼x7¾ in., illus.

Shear-Klean Grate Co., Chicago, Ill. Booklet "Save Coal," descriptive of a new shaking grate, recently placed on the market. 12 pp., 4x9¼ in., illus.

The Goulds Manufacturing Co., Seneca Falls, N. Y. Bulletin No. 112. "Handy Data on Power Pumping." 16 pp., 7¾x10 in., illus. Contains a compilation of the data required for figuring on the usual pumping installations for various purposes with special reference to belt or gear driven pumps.

Industrial

The executive offices and New York show rooms of the H. W. Johns-Manville Co., manufacturers of asbestos, magnesia and electrical supplies, were moved Apr. 20, to the new 12-story H. W. Johns-Manville Building, Madison Ave. and Forty-first St., New York City, from their old quarters at 100 William St., where they have been located for the past 15 years.

Increased business interests in this and other parts of the country have necessitated the move. The large floor area and spacious rooms in the new building, will enable a much larger and more complete stock of goods being carried on hand than heretofore, and will also permit of a better supervision over the company's long chain of branch offices, warehouses, stores and factories scattered throughout the United States and Canada.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

The conclusion of the anthracite strike is viewed with general satisfaction in trade circles. Even though prices ease off and the market settles down into the customary summer dullness, all uncertainty has, at any rate, been removed and normal conditions will soon prevail again. Anthracite dealers will try to lay in as much low-priced summer coal as possible, and the season's trade promises to be very active.

The consumers are impatiently waiting the announcement of the new anthracite circular, and it seems there may be some trouble in fixing a satisfactory scale of prices. The steam quotations cannot be increased because of the competition with bituminous, while an advance in egg would tend to shift the demand for this grade to stove and chestnut. This apparently only leaves three sizes, representing less than half the anthracite production, upon which the increased cost of mining can be made up.

The present outlook in bituminous is not encouraging. There has been an almost continuous heavy production since the first of the year, and with all hopes of profiting by the anthracite suspension now gone, only a rigid curtailment at the mines can prevent a repetition of last season's low prices. The Eastern movement is confined almost entirely to contracts, and prices are easy, with very little new business being done.

The demand at Pittsburgh is light, with the mines working about 50 per cent. capacity, chiefly on Lake orders. In Ohio the trade is proving a decided disappointment, although there is as yet no attempt to force the market by price-cutting. There is very little of the customary early summer stocking of domestic, but a fairly strong demand for screenings is in evidence.

In the South the market is in a very satisfactory condition, due to a renewed activity at the blast furnaces, which has taken this grade of coal out of the commercial market. Larger tonnages are moving in the West, and the demand is slightly improved.

Boston, Mass.

Some of the bituminous shippers are freely predicting a repetition of last year, and the feeble hopes built on the anthracite-strike prospects have now vanished. Only a rigid curtailment and strong control on the part of operators can prevent another season of small returns. The months January to May saw a heavy movement, particularly from the West Virginia districts, and it will be hard to put production back to an off-year basis. The export market, from which much was expected, is also falling off for the present. The trade in general is beginning to realize that stocks are large and that without special inducements the demand will be light for months to come.

The all-rail trade is gradually recovering from the effects of the March "flurry," and will soon be on the usual basis. For summer months certain of the mines are offering at last year's contract prices, but buying is only from hand to mouth.

Georges Creek shipments have been heavier than usual. These shippers were the first to announce contract prices and have reaped benefit also from the anthracite barges they were in position to use. An increasing differential between their price and that on Pocahontas and New River will tend to offset the advantage they have enjoyed so far this season.

The settlement in anthracite will be welcomed in New England. With the suspense over, dealers will now plan spring shipments and get forward as much of this low-priced coal as they can store. A strong demand and a slow shipping season are looked for through the summer, and dealers are anxious to hear what the opening prices will be. There have been rumors that one of the anthracite companies that has always been prominent in the tidewater trade is to withdraw, in order to concentrate along the line and in the West.

Current wholesale prices are about as follows:

Clearfields, f.o.b. mine	$1.10@1.35
Clearfields, f.o.b. Philadelphia	2.35@2.60
Georges Creek, f.o.b. Baltimore	2.70@2.80
Pocahontas, New River, f.o.b. Hampton Roads	2.70 or less
Pocahontas, New River, f.o.b. cars Boston	3.60@3.70
Pocahontas, New River, f.o.b. cars Providence	3.45@3.50

New York

Anthracite—The final agreement between the anthracite miners and operators has caused a decided flurry in the hard-coal market here. Preparations are being made to handle heavy tonnages when the mines get under full operation again, and consumers are anxiously awaiting the announcement of the new circular. The large operating companies are now fixing the new scale, which will doubtless show an appreciable increase over the one now in effect.

The hard-coal trade is in a strong position, and the season's shipments will probably see some new records established here. Supplies are down to an unusually low point, and there is considerable doubt expressed as to the ability of the mines to catch up before fall.

Pending the announcement of the new schedule we continue to quote prevailing prices at the old circular as follows:

Broken	$4.50
Egg and stove	5.00
Chestnut	5.25
Pea	3.25
Buckwheat	2.75
Rice	2.25
Barley	1.75

Bituminous—The bituminous market has settled down into the usual summer dullness, and it is thought the next two months will see a relapse in this trade. The large wholesalers, however, maintain optimistic views for the future, and believe that conditions are about normal for this period. Bituminous has undoubtedly been sustained to some extent by the uncertainty in the hard-coal situation, and with this feature eliminated the market will probably weaken.

Spot bituminous prices, f.o.b. New York, are about as follows:

West Virginia steam	$2.35
Ordinary grades Pennsylvania	2.45
Fair grades, Pennsylvania	2.55@2.65
Good grades, Pennsylvania	2.70@2.80
Best Miller, Pennsylvania	3.00
Georges Creek, West Virginia	3.15

Pittsburgh, Penn.

Bituminous—Demand for coal continues slack in the local market. Mines are now running at better than 50 per cent. of capacity, but chiefly on Lake coal, the movement in which has now assumed fair proportions. The expectation continues that this will prove to be the banner year in Lake shipments. Prices in the local market have not been well tested, and the quotations announced at the opening of the mines may still be quoted as nominally the market: Mine-run, $1.22½; ¾-in., $1.32½; 1¼-in., $1.47½; slack, 82½c., per ton at mine, Pittsburgh district.

Connellsville Coke—Contracting for furnace coke for the second half of the year has definitely begun, two contracts being announced in the past few days, one 10,000 tons monthly at $2.35 and one for 6000 tons monthly at $2.40. Several weeks ago, a contract for 10,000 tons monthly was made at $2.35. Many of the operators have set $2.50 as their objective point, but furnaces will not pay

this price without a struggle. The merchant furnaces, as a rule, cannot afford to do so, on account of the low price of pig iron.

The prompt market has eased off in the past two or three days, and prompt furnace coke can now be secured without difficulty at $2.25, against $2.40 freely paid a week ago. The $2.25 price has even been shaded today. We now quote: Prompt furnace, $2.25; contract furnace, $2.35@2.40; prompt foundry, $2.75; contract foundry, $2.75.

The *Courier* reports production in the Connellsville and lower Connellsville region, in the week ending May 11, at 401,960 tons, an increase of 116 tons, and shipments at 4331 cars to Pittsburgh, 6339 cars to points west and 1321 cars to points east, a total of 11,911 cars, an increase of 62 cars.

Philadelphia, Penn.

The long, expensive suspension in anthracite is now at an end, and probably the public will be asked to pay the bill. Much speculation is rife as to what the probable prices will be. With a market practicaly bare of coal, there will probably be no concession in prices made, the operators depending upon this fact to dispose of their output. If the latter arrangement is followed out, and the trade remains indifferent, the coal, in all probability, will be placed in stock, to provide for the tremendous demand that will come in the fall. It is almost a foregone conclusion that there will be an advance in the prices of some of the sizes —probably stove and pea—if not now, then later on in the fall. When it is remembered that the steam prices have to remain at their present level, in order to meet the competition of the bituminous coals, and cannot, therefore, be burdened with any of the increased cost of mining, and that any advance in the price of egg is likely to shift the demand for this size to stove and chestnut, it leaves little to bear the burden of the increased cost of production but the three intervening sizes, representing only 40 to 45 per cent. of the output.

Reports from the mines indicate that it will be a month before the collieries will be operating on anything like a normal basis. The opportunity afforded by the suspension led many of the foreign element to take advantage of the idleness for a trip to their homes in other countries, while others have gone to the bituminous fields. Most of the latter will soon return to the anthracite mines, and the former, as soon as they are aware that peace is assured.

The bituminous trade seemed to have profited little by the suspension in the anthracite region. One operator said that he had not had such a dull period for many years, and might be compelled to close down his plant. Many bituminous operators have been turning down contracts, in the hope of reaching more benefits through a continued strike in the anthracite, but the prices of 1902 saw no duplication in the 1912 difficulty.

Baltimore, Md.

While coal moved with regularity at all of the railroad piers in Baltimore throughout the week, there was a hesitancy on the part of shippers to forward their product through this port for fear there might be a renewal of the strike. Consequently, the local market was not very active, especially so far as spot business was concerned. Consumers desiring immediate deliveries were as timid as the operators, and took no chances of having it held up at this port.

Practically all of the shipments handled at the piers here during the week were moving under contract, and, to the credit of the railroads, operators have not had much to complain about in the movement. The stevedore strike is still in progress, and many laborers are being intimidated, but the railroads have done everything possible to get their full quota of men at the piers, and they have succeeded in doing quite well; they have their full complement of men at work, and expect no further trouble.

Inquiries at the offices of the local operators shows that very little new business is being booked at this time. Prices are easy, and it was stated by one operator that the low grades could be purchased for 65@70c. per ton, with the next best at $1@1.10 per ton. The big vein Georges Creek coal is now bringing between $1.60 and $1.70 per ton.

The coke market is gradually improving. Inquiries are increasing, and some business is being closed; the improvement in the steel trade is responsible for this.

Buffalo, N. Y.

There is not much activity in the bituminous market yet, but here and there a consumer is running short, and the demand will increase slowly from this time on. Prices are not strong, though it is claimed they are firmer than in the East, especially in New England. This section suffers from an excess of production, but not to the extent the West Virginia markets do.

There is practically no anthracite moving, though if anyone is in great need of a little it can generally be obtained. There has been no complaint from the consumers in that trade and would hardly be any till it is time to stock up in September. There is all manner of speculation as to the price that will be asked when the supply returns, the general belief being that higher prices will be asked.

Some members of the bituminous trade claim to be getting full prices, and say that the very low quotations reported are for inferior grades or small amounts that are in danger of incurring car service. Prices are not very strong, however, at the following regular figures: Pittsburg three-quarter, $2.57½; mine-run, $2.47½; slack, $2.25. Coke is not strong, but is fairly active at $4.50 for best Connellsville foundry. Stock coke is stronger than the higher grades.

There is a fair amount of contracting for bituminous, some believing that the usual tonnage is already placed, though at the beginning of the season neither buyer nor seller was anxious to contract. There is not much difference in price, either for immediate consumption or on contract, from last year, so that the bituminous trade is not getting on its feet very rapidly yet. Profits will continue to be small.

There is no coal traffic from here by Lake yet, and it will be some time after the mines are active before there will be much anthracite for shipment. Much effort will be made to catch up with last season when the start is made, but it is doubtful if it can be done, as the Eastern demand will be heavy.

Cleveland, Ohio

Very little improvement, if any, has taken place during the past week in this market, owing to the general dullness in the trade and the large amount of coal that manufacturers stored prior to the suspension. A great deal of this coal is still on hand and manufacturers are loath to stock up further until they see prospects of a business revival and this is making the trade slow.

A number of mines have started up in the past two weeks, due principally to the opening of the Lake trade. It is reported by some operators that difficulty is experienced in procuring sufficient men to work in the mines.

The greatest demand is for the fine sizes. There seems to be quite a shortage of that grade, owing to the mines not running full. Prices are: No. 8, $1.55@1.60; No. 6, $1.45@1.50; Pittsburg gas slack, $1.55@1.60. A small quantity of coarse coal came to this market during the past week, and there has been great difficulty in disposing of it at a fair price.

The increased cost of mining makes this situation rather discouraging to the operator. However, this condition is looked upon as only temporary, as when Lake shipments start, which will be about June 1, the demand will resume its normal activity.

Very few contracts have yet been made, which is contrary to the usual custom in the past. Manufacturers prefer taking chances in the open market. Many domestic dealers are also holding off this year, a condition which has never existed in the past.

Columbus, Ohio

The May coal trade is proving a disappointment in all branches, with the exception of the Lake movement. It is found that both steam consumers and retail dealers are stocked far beyond normal for this period of the year. In the case of the steam trade, heavy tonnages were taken on in March, sufficient to run plants, in many instances for several months to come. This is particularly true of the mine-run grade.

The fine-coal market is being stimulated by idleness at mines in Indiana, where district conditions have not yet been settled. This has caused an advance in price of 10c. a ton on nut, pea and slack, and jobbers are readily buying up every car of these grades available.

It is in the early domestic stocking trade that the dullness is most marked, as May usually sees these grades sold up well into the summer. The present condition is explained by the fact that a very large tonnage of high-priced coal was shipped from the mines during the extreme cold weather in the early part of the year. As a result, dealers are now lacking yard room for stocking splint, smokeless and other grades, which they usually put in early.

Slow delivery has been hard on shippers, as bills are not usually paid under 30 days from time cars arrive at destination. Many operators are giving more thought to their collections than to new business. No attempt appears to be made at forcing the market by price cutting, and there is hope of a prosperous domestic business later in the summer.

Birmingham, Ala.

The coal market of Alabama retains its strength and is tiding over the dullest part of the year in very satisfactory manner. Dealers have been prosecuting a vigorous campaign for business and have to their credit, orders which heretofore have not come to the Birmingham district. The contracting for steam coal is opening with very satisfactory outlook and June and July will witness several important orders rounded into contracts at good figures.

Just now iron is buoyant and promising. Furnace companies are not actively seeking markets for their surplus coal, as was the case a few months ago. All of the iron companies are figuring on increasing their furnace capacity and the indications are that they will prefer to store coal rather than push it into the open market as a labor shortage seems probable in the coal fields.

It also seems certain that more commercial coal will be mined this year than any previous year if the present rate keeps up. The output is being taken care of in new markets west of the Mississippi River, by increased bunkerage at New Orleans, Mobile and Pensacola, by railroads not hitherto using Alabama coal and by making some gain in the fiercely competitive fields of Georgia.

Commercial coke producers report an active market with abundance of orders at favorable prices. The situation at the more northern furnaces has tended to assist in keeping Alabama coke firm at present prices. In the coke market as in the coal, the furnace requirements ease competition in the open market and the year promises to show a gradual improvement on this account.

Indianapolis

There is little or no change in the situation in this state. Both operators and miners are greatly disappointed because mining has not been resumed, and much interest is manifested in the action of the joint conference now in session at Terre Haute.

Orders are piling up with the operators which they are unable to fill. It is not pleasing or encouraging for them to see their customers going to other fields to obtain coal. The Lake trade continues to order Indiana coal, but without avail. Domestic consumers and manufacturers have borrowed coal, much of it from the railroads, to keep their plants going, but even this source is beginning to show such a diminution as to look decidedly ominous.

Those who prophesied that the Indiana mines would resume operation more than a week ago are again as confident that they will be at work before the close of another week. The weekly pay remains the only difference in the way. The operators declare that a weekly pay will increase the cost of construction in violation of the Cleveland agreement, and the miners' officers admit that it is up to the miners to prove that it will not.

St. Louis, Mo.

There is a slightly larger tonnage coming into the St. Louis market, and the demand has increased some over last week. However, the incoming tonnage has exceeded the demand, and this has resulted in a cutting of prices.

The contract for the schools of St. Louis went to the Devoy & Kuhn Coal & Coke Co., at $1.82 delivered for screened lump coal from the Belleville or Standard district. The other city contract, calling for 4000 tons of No. 4 washed coal, went to the Southern Coal & Mining Co. at $1.90 delivered. The rate on this coal is 52c. as well as on Donk Bros., who were the next lowest at $1.92 delivered.

There are a few other contracts of a like nature that are still hanging fire, but it is hard to prophesy as to what they will go at. On Carterville district coal contracts have been let as low as $1.05 at the mine on mine-run, 75c. on screenings, $1.25 on nut and $1.35 on everything above two inches. It is understood that the railroad mine-run contracts this year will be in the neighborhood of $1.12.

There is very little demand for coke, and practically nothing doing in the smokeless line right now.

The market opened the early part of the week as follows:

Williamson and Franklin County	
6-in. lump	$1.30@1.40
3x6 egg	1.30@1.40
2x3 nut	1.25@1.35
2-in. screenings	1.05@1.15
Mine-run	1.05@1.15
Mount Olive	
3-in. lump	$1.25
Nut	1.25
Screenings	1.10@1.15
Mine-run	1.10@1.15
Standard	
6-in. lump	$1.00@1.05
2-in. lump	0.95@1.00
2-in. screenings	0.95@1.00
Mine-run	0.90@0.90

Chicago

Within the last week a slight improvement has been noted in the Illinois coal market. Small orders have appeared here and there for domestic lump.

A resumption of cold weather has caused a steady consumption of coal which has led to a small amount of buying from the retailers. Springfield lump continues at $1.50 and steam lump remains firm at $1.25. Southern Illinois steam coals are a little higher, as a result of a boost in freight rates. Reports indicate that mines in the Hocking Valley district are running at about full time; a small part of this coal is reaching Chicago. The Chicago price has not been changed, being $1.50 at the mines, or $3.15 f.o.b. Chicago.

There are some inquiries for coke contracts. Spot business is fairly good and prices are steady to firm.

Prevailing prices at Chicago are:

Sullivan County	
Domestic lump	$2.37
Egg	2.12
Steam lump	2.02
Screenings	2.02
Springfield	
Domestic lump	$2.32
Steam lump	2.07
Mine-run	1.97
Screenings	1.97
Clinton	
Domestic lump	$2.27
Steam lump	2.02
Mine-run	1.92
Screenings	1.92
Pocahontas and New River	
Mine-run	$3.15
Lump and egg	3.30@3.55

Coke—Prices asked for coke are: Connellsville and Wise County, $4.75; byproduct, egg and stove, $4.55; byproduct, nut, $4.55; gas-house, $4.75.

Portland, Ore.

Portland and all of Oregon are already in the midst of warm summer weather and there is little business for the coal man these days. Storage rates have not yet been announced but if the warm weather continues, the dollar will soon

be lopped off quotations to those who are willing to stock up when business is dull. There is considerable agitation here to have the railroads extend lines into the coal fields of eastern Oregon so that these can be developed.

San Francisco, Calif.

The importations by sea for the month of April were: 10,343 tons of Wellington; 4971 tons of Australian; 16,683 tons of Pocahontas and 4840 tons of steam coal from the state of Washington. Deliveries by rail were normal. Climatic conditions have not stimulated demand for household purposes and movement of coal has been far from brisk.

Owing to the small arrivals of Australian during the past three months, the total aggregating only 9636 tons, the stock of this grade has been considerably lowered; probably today there is not more than 10,000 tons on hand.

Prices remain unchanged, the rate to dealers being as follows per ton:

Wellington (British Columbia)	$8.00
Pelan Main (Australian)	8.00
Rocky Mountain	8.50
Anthracite (Pennsylvania)	15.00
Cumberland	12.50

Production and Transportation Statistics

The Girard Estate

Anthracite coal-mining operations on the property of the Girard Estate in 1911 were conducted on the largest scale on record. Both the production and shipments of coal, from the estate exceeded those of any previous year. Total production was 2,420,747 tons and total shipments 2,162,047 tons. As compared with these figures, the total production in 1907, the heaviest previous year, was 2,306,143 tons and the total shipments 2,101,199 tons.

The Consolidation Coal Co.

The Consolidation Coal Co. is now shipping coal at the rate of 40,000 tons per day. The business of the Consolidation has been heavy since the first of January. The shipments reported for the period from that date to May 9 totaled 3,587,257 tons as compared with 2,832,443 tons for 1911, or a gain of 754,814 tons for the current year.

The Car Situation

The idle car statement of the American Railway Association for the two weeks ended on May 9 shows a decrease in the net surplus of 8783. The total surplus over and above the shortages reported in some sections was 130,008.

This decrease, following a sudden and large increase in the number reported in the preceding statement, is explained by the resumption of activity in the coal fields and the release of stored up fuel in view of the settlement. In the two weeks just reported for, the surplus of idle cars decreased from 94,943 to $3,512. That general business has not improved correspondingly is indicated by an increase in the box-car surplus from 19,583 to 20,626.

The following table shows the surplus and shortages of cars on 167 roads on May 9 last:

	Surplus	Short	Net Surplus
Box	20,626	3,294	17,332
Flat	3,261	1,454	1,807
Coal, gond. and hopper	83,512	1,233	82,279
Other kinds	29,377	697	28,680
Total	133,776	6,678	130,098

Anaconda Copper Mining Co.

The coal department of this company produced during 1911, 800,073 tons, as compared with 828,529 tons for the year previous. Company is making extensive hydro-electric installations, by which they are effecting considerable economy in their coal consumption. The Belt mine, representing about one-eighth of their total production, is scheduled to be closed June 30.

The Island Creek Coal Co.

This company has produced during the first four months of the current year about 625,000 tons of coal, or at the rate of 1,900,000 tons for the whole year. Production during April exceeded 180,000 tons, and for May should reach about 200,000.

Foreign Markets

Germany

The following is a statement of the production, imports and exports in the German Empire, for the month of March, 1912, in metric tons:

	Production	Imports	Exports
Coal	12,811,823	497,457	2,420,993
Lignite	7,041,990	709,083	4,445
Coke	2,130,905	40,599	507,748
Briquettes	2,009,240	17,005	240,605

Great Britain

Business in all branches of the steam-coal trade continues very quiet; colliery outputs remain abnormal, with the result that supplies are very plentiful and prices show a further heavy reduction:

Best Welsh steam coal	$4.68
Seconds	4.50
Thirds	4.14
Best dry coals	4.62
Best Monmouthshire	4.32
Seconds	4.14
Best Cardiff small coal	2.52
Seconds	2.40

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those of Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days, less 2½ per cent.

British Exports in 1911

The total coal exports from Cardiff were 16,127,777 tons. The northwestern ports exported 711,703 tons, and the northeastern ports, 21,716,027 (New Castle 6,884,611 and South Shields 5,299,752). Humber ports exported 6,264,063 tons, and other English ports 325,376. Scotland exported 10,382,311 tons and London only 2089.

Nearly half the coal exported by Great Britain brings prices ranging between $1.92 and $2.66 per ton. Of the grand total, the Bristol Channel ports exported about 40 per cent., but these ports are responsible for practically the whole of the coal exported at prices exceeding $3.12, the figures being 19,221,076 tons out of a total of 19,727,291.

Financial Notes

The International Coal & Coke Co., capitalized at $3,000,000, paid $56,073.38 in dividends, expended $77,554.28 for maintenance and $47,029.61 for improvements and equipment at its plant during 1911.

The Island Creek Coal Co. will this year expend $500,000 for the erection of a huge dock at Grassy Point, Duluth, capable of handling 400,000 tons of coal and storing 200,000 tons. This development is to be paid for with surplus cash funds already in hand.

In the first quarter of 1911 operations of the Pittsburgh Coal Co. resulted in a considerable deficit, whereas this year the net earnings for the first three months showed a substantial surplus. An increase in the preferred dividend from 5% is in prospect.

That the Lehigh Coal & Navigation Co., which owns no railroad, is making money on mining coal, is shown by the payment of 8% dividends and by the increase of capital stock from 19,000,000 to 26,500,000; by a scrip dividend of 15% in 1910 convertible into stock and a 10% allotment of stocks at par in 1911.

The Reading Co. owns directly, through the Philadelphia & Reading Coal & Iron Co., over 40% of the anthracite deposits of Pennsylvania, and indirectly, through the Jersey Central, which holds 97% control of Lehigh & Wilkes-Barre Coal Co., 17% more. The Reading Coal & Iron Co. produces roughly 10,000,000 tons and the Lehigh and Wilkes-Barre 5,500,000 tons of anthracite per annum out of the total of 65,000,000.

Chairman Taylor, of the Pittsburgh Coal Co., states that the pension-fund plan becomes effective Apr. 1 next. The pension fund on Dec. 31 amounted to $92,329. The year's receipts of the relief fund, including a balance of $45,755 on Jan. 1, 1911, were $161,842, the company appropriating $32,129. After the 1911 disbursements had been made there remained a balance of $42,886. Since the fund was established, receipts have amounted to $1,068,386, and disbursements to $1,025,500.

In the five years 1907 to 1911, inclusive, the Philadelphia & Reading Coal & Iron Co. paid out for rail transportation a total of $40,283,313. Undoubtedly the major part of it went to the Reading Ry., but not all. Granting that it did, however, and assuming that the railway's expense ratio on moving the hard coal from the Coal & Iron Co.'s collieries is 50% (ratio of all expenses in 1911 was 60.6%) the railway saved for its net $20,141,000 on coal carried for the controlled property during these five years. Deducting from this railway net the $9,900,000 said to have been lost on the operation of the collieries, a little over $10,200,000 is left to represent the profit of Reading coal mines to it

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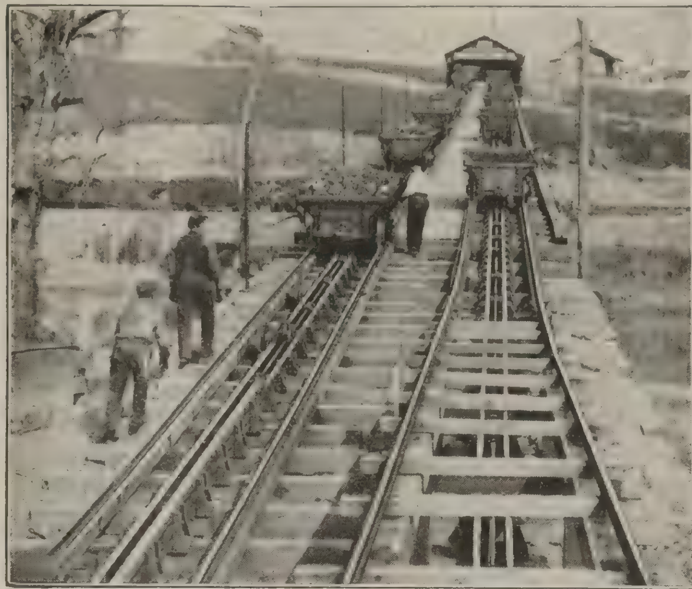

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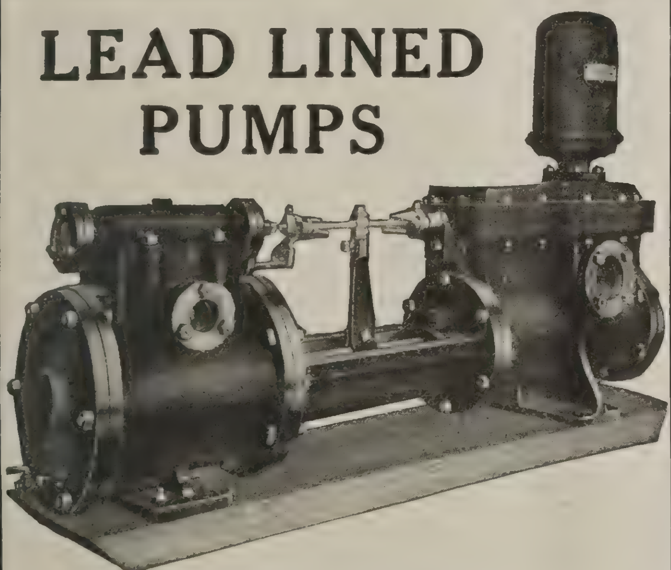

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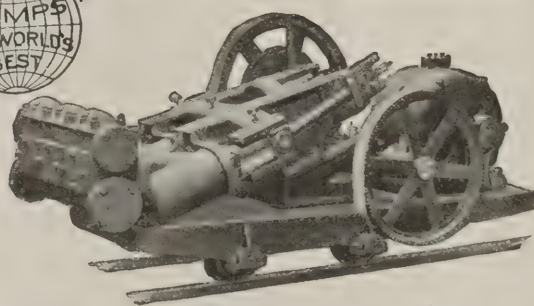

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COAL AGE

Devoted to Coal Mining and Coke Manufacture

Volume 1, No. 34.
Issued Every Saturday.
Hill Publishing Company.

NEW YORK, JUNE 1, 1912

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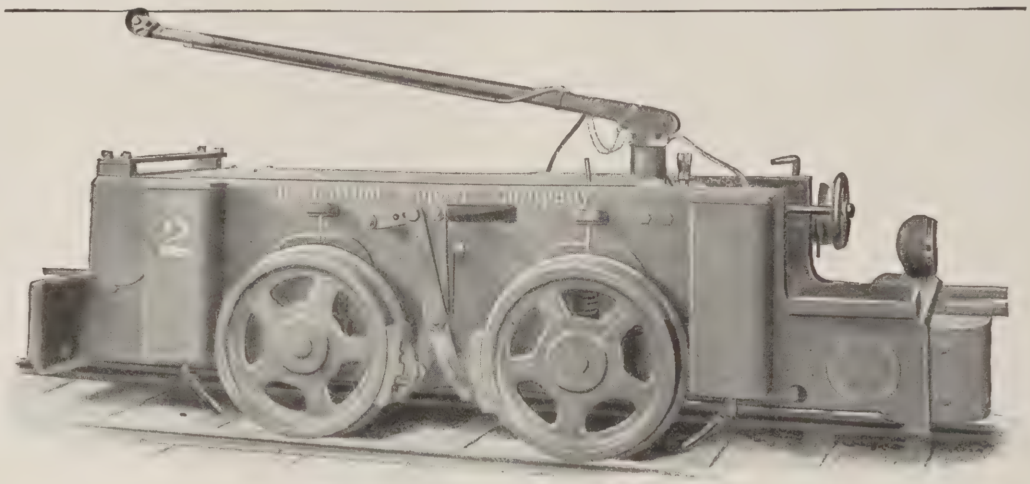

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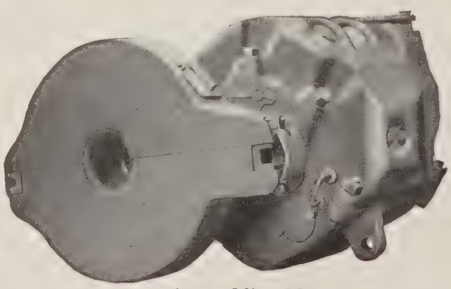

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COAL AGE

Vol. 1 NEW YORK, JUNE 1, 1912 No. 34

CONSERVATION as indicated by high percentage extraction of our coal areas is a question of great moment, but elimination of the larger wastes of human effort is even more important. Losses of material things are visible; a lack in operating efficiency is less tangible. The former stirs us deeply; the latter is but vaguely appreciated.

At no time in history has the demand for competent men been so far in excess of the supply. Too many are looking for the ready-made man, and too few are willing to secu e competent help by themselves training employees. The idea that "Captains of industry are born, not made ' is too broad; men must be trained right, as well as born right. No great man can compete wi h a number of ordinary men efficiently organized.

In the future, *system* will come before the *man*. Under efficient management, the superior man rises more surely and more rapidly than ever before. The correct synonym of *conservation* is *national efficiency*, and the latter can be brought about by the general adoption of systematic management, rather than by the discovery of extraordinary men.

Good management is an exact science, based upon definite laws. Fundamental principles are applicable to all activities, whether individual or corporate. Any scheme where the organization of employers, as well as employees, is for war rather than peace, is poorly devised. The chief aim of every plan should be to secure maximum prosperity for both employer and employee.

If an operator and miner working together become so skillful that they can mine two tons of coal while a competitor and his workman mine only one ton, it is certain that the first operator can pay higher wages, and still have a larger profit than his competitor. In other words, maximum prosperity can only exist as the result of maximum productivity.

When engaged in a game of sport, the employee strains every nerve and muscle to win. If he failed to do so, he would be branded as a "quitter." But in the routine of his daily work, the same man plans to do as little as he can. If he acted otherwise, his fellow-workers would condemn and threaten him. In the labor world it is thought honorable to "soldier," and that belief is the most dangerous disease that has afflicted society today. Nothing would do more toward promoting prosperity and eliminating poverty than doing away with the ancient and respectable habit of "killing time."

The fallacious reasoning that causes workmen to approve "soldiering" is based on the belief that "a material increase in the output of each man or each machine results finally in throwing a number of men out of work." It is also true that the evil habit has been fostered by defective systems of management, which include a total ignorance on the part of employers as to the proper time in which work of various kinds should be done.

The tendency to "take it easy" is encouraged also by "rule-of-thumb" methods, which should be replaced by scientific schemes, based on a careful study and elimination of unnecessary motions, and the substitution of fast for slow methods of working. There are at least a dozen ways of doing each act in mining coal, and for the same reason there is a variety of implements used for each class of work.

There is always one method and one implement which is better and faster than any of the rest, and it is in the discovery, selection and development of these higher efficiency methods and tools that the value of scientific management rests. All old systems make it imperative that each man shall do his work as he thinks best, without help or advice from the management. This plan makes it impossible for employees to work in accordance with scientific rules, even where such laws exist. It is just as essential to know how to manage men efficiently, as it is to handle problems in ventilation, pumping or haulage.

The Lanchow Mines in China

By K. P. Swensen*

The Lanchow Company is purely a Chinese institution, but under the technical management of three German engineers. These men, following the dictates of their training, have built up a plant of wonderful permanency. Among the many problems encountered, one of the most serious was the difficulty in overcoming the oriental prejudices and customs.

The best known and most extensively worked coal field in China, is that district in the northeast part of the country. This area extends west from the Gulf of Pechihli to the vicinity of Peking and the western boundary may be said to follow southward approximately in the direction of the south branch of the Great Wall, traversing the border line between the provinces of Chi-Li and Shan-Si and southward into Ho-Nan. Nothing but the merest conjecture can give one an idea of the vast quantity of coal lying in reserve in this area, from which, at the present rate of consumption, there is probably a supply sufficient to provide the world's needs for several centuries.

Of the many districts in the field, the most important and oldest is that of the Kaiping district, situated along the line of the Imperial Railways of North China 60 miles north of Tientsin. The principal operator in this district is the Chinese Engineering and Mining Co. which has its largest plant in Tongshan. It is interesting to note that the history of this company from the date of its beginning in 1879 up to the present time, correlative as it is with the modern industrial progress in China, is typical of the manner in which the whole of China has slowly and hesitatingly accepted the Western innovations in industry, government and commerce during the process of her awakening.

General View of the Lanchow Mining Co.'s Surface Plant, Showing Auxiliary Hoist to the Left

Prejudices of the Orient

Enterprises in China, whether the result of foreign or Chinese initiative, have always had the wall of native prejudice and ignorance to contend with. This feeling exists, to a certain extent, to this day, as may be noted in the extreme difficulty that foreigners or progressive Chinese have in obtaining concessions favorable to modern mining development, or in any of the industrial enterprises in which foreign control is concerned. The attitude of the Government, however, is very strongly in favor of native enterprises at all times and gives every encouragement it can to such ventures. Lack of capital, or unwillingness on the part of the Chinese to invest in new and unfamiliar undertakings, continues to be the reason of the present undevelopment of her vast mineral resources.

When we consider the extremely low cost at which the Chinese are able to mine coal with their cheap labor and modern machinery, there is every reason to believe that in a comparatively short time, they will find a market on the Pacific Coast region of America, notwithstanding the coming completion of the Panama Canal, unless the Alaska coal fields become heavy producers. Lack of shipping ports with good harbors, and of railway and steamship transportation facilities are at present the drawbacks to the Chinese in realizing this ambition.

There is a need for a world market for Chinese coal, as there now seems to be an oversupply in the Orient of all coals except the navy lump. Local needs are therefore easily supplied by the production of the present plants in operation. In the Kaiping district a fair grade of bituminous coal sold at the mine at as low a price as $1.10 per ton during the summer of 1911, when competition among the different companies was keen. This allows for a very meager profit or none at all on a heavy investment even though coal may be mined in China at a figure that is easily one-half of what must be paid in the United States.

Shipping Conditions

A Chinese coal mining company of Kaiping district, known as the Lanchow Mining Co., has recently started to produce coal and coke in competition with the Chinese Engineering and Mining Co. The company's property lies between the Tongshan and Linsi mines and the workable coal seams extend for a distance of about 15 miles. The parent shaft of the mines is at Machiakow, which is three miles from the railway station at Kaiping. A standard gauge railroad, operated by the company, is used for hauling the company's product to Kaiping, from which point it is shipped to the port of Tongku and also to Tientsin.

The shipping port of Tongku is ice

*Mining engineer, Nanking, China.

bound in winter, which prevents the company from shipping its product to points outside of its own local territory for at least four months of the year. Furthermore, the harbor is not deep enough to accomodate the deep sea going vessels. This places this company at a disadvantage with its competitor, the Chinese Engineering and Mining Co., who have their own private shipping port at Chin Wang Tao, which is free from ice all the year around, and from which coal may be loaded on to vessels of deep draught.

The Lanchow Mining Co. is purely a Chinese organization, started in 1909, and in which Chinese capital only is concerned; of the operating staff, there are only three foreigners in the employ of the company. These are the three German engineers, who constitute the technical management. It is the desire of the Chinese to employ only such foreign help as is absolutely necessary in the carrying on of this enterprise. In common with the practice of some of the other Chinese mining concerns, the Lanchow company has started up a mining school in conjunction with the works for the purpose of training its own engineers and officials who will eventually occupy the various positions in the management of the company. The company is at present capitalized at 4,500,000 taels,* about 3,000,000 taels having already been expended for the present surface equipment and underground development.

The Geology

The coal beds which are now being worked by the Lanchow Mining Co., occur in a limestone belt of Carboniferous formation which has been tilted and faulted, this latter being revealed in the stratification of the nearby hills which rise abruptly out of a vast area of alluvium and loess. This condition has made it necessary for the company to do its prospecting, in the tracing of outcrops, by sinking test pits. Indications of the location of the main seams were discovered from examination of the old native pit workings.

*The Chinese tael is equal to an ounce of silver, or about 70c. gold at the prevailing market price of silver.

Opposite View of the Surface Plant, Showing Trestle for Conveying Coal to the Boiler Plant

The coal-bearing formation, consisting of shales and sandstones and a variety of shaley clays, appears to be along the north fold of a syncline, which has been described by Drake.*

Beginning at Tongshan where the inclination is steepest, it follows in an easterly direction for a distance of 21 miles until Linsi is reached. At Linsi, the location of one of the Chinese Engineering Co.'s mines, the dip of the seams is only 10 deg. At Tongshan, the western extremity of the syncline, the formations have been greatly disturbed by upheavals. At the Lanchow workings, however, the seams thus far encountered are quite regular and undisturbed. There are no serious dislocations by faults and the earth pressure is not great. At Ma Chia Kow the dip of the seams is about 30 deg. and there are 13 exposed, 3 of which are workable. These are 5 ft., 23 ft. and 49 ft., 6 in. in thickness, respectively.

Present Development

The present stage of the work is largely one of development, notwithstanding the fact that at Ma Chia Kow, a coal reserve has been found which will guarantee an output of 3600 tons per day for a period of 20 years. The management contemplates a huge output in the near future, and even though the present stage of development is a mere fraction of what they hope for, after the completion of the present shaft-sinking operations and their underground connections, the engineers feel justified in expending the capital required for the present elaborate equipment. Besides the parent shaft at Ma Chia Kow, there are three other pairs of shafts situated along the strike of the seams at intervals of about 3300 feet.

*Paper on "The Coal Fields of Northeastern China," by Noah Fields Drake, A. I. M. E., Feb., 1901.

The coal is characteristic in quality of that found throughout the district. It is of uniform grade, has qualities which make it well suited for steam purposes and is especially well adapted for coke manufacture. The coal has the disadvantage of being very friable. Two typical analyses of the coals are given as follows:

	No. 12 Seam Slack	No. 12 Seam Lump	No. 9 Seam Slack	No. 9 Seam Lump
Moisture	1.30	1.52	0.96	0.80
Vclatile matter	23.60	25.12	26.56	27.50
Fixed carbon...	59.86	53.06	56.65	51.70
Ash	16.24	20.30	15.84	20.00

The surface equipment recently completed at the Ma Chia Kow shaft is as uptodate in point of efficiency for the economical handling of material as may be found in any part of the world. A characteristic feature noted in every industrial plant laid out by trained German engineers, is the thoroughness with which all details are worked out. To an American, visiting this plant who is familiar with the current practice at home the most noticeable feature is the very substantial nature of the surface structures and the machinery equipment, which seems to point to a policy that takes no regard for the consideration of the financial balance and adjustment of ultimate profits that would involve a limit to first cost expenditure.

The policy of great permanence prevails throughout the plant. This appears to be the practice in Europe, particularly in Germany and this mine may serve as an example of how European practice differs from that of the American operators. The buildings are roomy and sub-

stantially built of brick. The office building, here as in all important Chinese establishments, is an elaborate one. In the eyes of the Chinese, this building must by all means come up with their ideas of the fitness of things by having it made to look as pretentious and dignified as possible. A large reception room with a number of ante rooms is always required for guests and business visitors.

Power Plant

The boiler house presents a typical illustration of the splendid surface equipment of this plant in general. There are seven fire-tube boilers of the Lancashire type which carry steam under a pressure of 180 lb. per sq.in., each having a heating surface of 1300 sq.ft. and provided with superheaters. The superheaters take the place of the economizers, found at most large boiler plants and the experience of many engineers shows them to be the most satisfactory in efficiency as well as in ease of operating and cleaning. In the firing of boilers, it is to be noted that here, as at many other plants where labor is plentiful, advantage is not taken of its cheapness. Firing is done by electrically operated mechanical stokers. The coal for firing is conveyed direct from the shaft house over a steel trestle and dumped in reinforced concrete bins over the boilers.

The power plant contains one unit, a compound engine and generator set of 1250 kw., which provides all the power required for running the Ma Chia plant and for furnishing lights for the other mines. A second similar unit will be installed later and also a low pressure steam turbine which will utilize the exhaust from other engines which may be run condensing or non-condensing. The voltages supplied are either 3000 or 500 according to the size of the motors, while the lights take 110 volts.

Hoisting, Ventilating and Pumping Machinery

Electric power is used in all departments of the mine except for hoisting. Eventually with the growth of the adjoining mines, it is planned to make the Ma Chia Kow plant a central power station to furnish power and light for all the works of the company.

For ventilation, the mine is provided with a main airway 4x6 ft. situated 33 ft. above the main level from which auxiliary air passages provide the circulation to the working faces and thence by way of the main haulageway to the upcast. The ventilating fans are high speed, electrically driven and two in number having capacities respectively of 87,000 and 123,000 cu.ft. per minute.

For handling the mine water, a main pumping station is being put in at the lower level, where three, electrically driven, centrifugal pumps will be installed having a capacity of 88 cu.ft. per minute each. At present the mine is making 123 cu.ft. of water per minute which is handled by one high pressure centrifugal pump and a sinking pump hung in the main shaft. The capacity of this sinking pump is 88 cu.ft. per minute and it is lowered up and down by an electric gear-driven hoist.

View Showing Surface Plant to the Left and General Offices to the Right

The air compressor is of the straight line type and has a capacity of 5300 cu.-ft. per minute. The compressor plant will be added to as it is expected that air winches for underground hoisting as well as air drills will be used to a large extent in the future operations.

Shaft Equipment

The main shaft has an inside diameter of 18.6 ft. and a depth of 690 ft. The lining is of a very substantial nature, consisting of hard limestone blocks trimmed and cut to conform with the curvature of the shaft and placed in a double layer, giving a lining about 18 in. in thickness. The auxiliary shaft, the wooden head frame for which may be seen in the accompanying illustration has a depth of 350 ft. and an inside diameter of 11 ft. When the installation is completed for the main hoisting shaft, the auxiliary will be used only for an airshaft. A glance at the illustration will show how the coal is being temporarily hoisted from this shaft, conveyed to an electric elevator and thence to the coal handling floor of the shaft house.

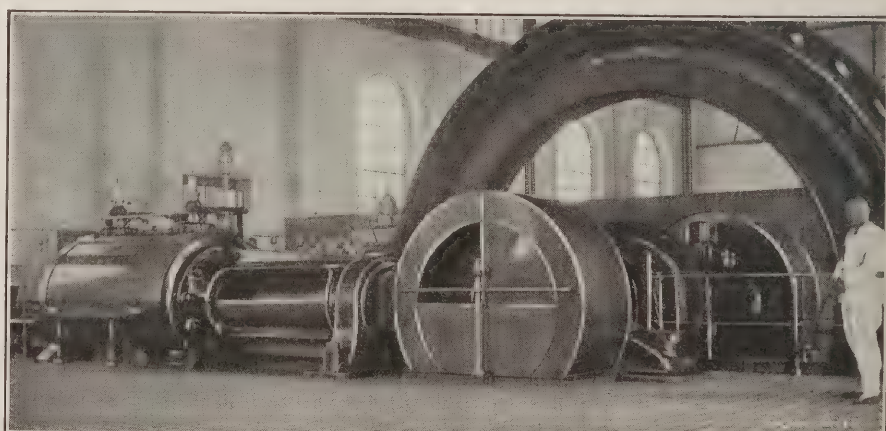
The main shaft has four compartments, all of which are to be used for hoisting coal. There is a cage for each compartment having four decks, each deck accommodating two cars each having a capacity of 0.55 tons of coal each.

To facilitate the speed of hoisting there are double landings at the underground stations and in the tipple, the arrangement allowing for two decks of loaded cars and two decks of empties being transferred at the same time. The cages are then moved a stated amount and the two remaining decks of each cage are taken care of in the same way. In the tipple house, of the two landings, the upper one is the auxiliary, from which the loaded cars are being lowered to the main floor by means of a small electric elevator. A similar arrangement is provided for at the underground loading station.

Three principal grades of coal are produced, the mine product being dumped by the ordinary car revolving tipple, on a travelling iron belt where boys usually do the picking, and thence over shaking screen. These screens feed directly into freight cars, which are hauled by the company's own locomotives to the main railway line 9 miles distant. The maximum capacity of this plant is 4800 tons per 16 hours.

The Timber Supply

The underground workings present another example of the long life and



Interior View of the Lanchow Mining Co.'s Power Plant

permanence which is expected of the plant, such as we are not accustomed to seeing in America even in the old producers. Advantage is taken of the cheapness of labor and particularly of the skill of the Chinese as masons. All main haulageways are supported by massive masonry lining, consisting usually of brick walls and an arch made of limestone blocks; reinforced concrete is also used to a certain extent.

The timber used in the temporary openings is an inferior grade of Chinese wood, which is crooked and knotty. As the central portion of China is practically deforested, the item of supplying timbers for mining purposes must necessarily be an expensive one and in most cases, recourse must be had to masonry supports where practicable. Here it may be pointed out that the native burned bricks of China are of good quality and very cheap.

NEAR VIEW OF STEEL HEADFRAME

For the future timber supply the company has already planted over 1,250,000 trees consisting mostly of acacias. These trees will grow from 4 to 6 in. in diameter in 5 years time and while they will only furnish timber of an inferior quality for mining purposes their planting will be profitable in other ways as the country is practically treeless.

System of Mining

The workings are opened up by a main haulageway parallel to the strike, and on the footwall side. Blocks of coal are exposed having 100 ft. along the strike and a length along the 40 deg. dip, corresponding to 165 ft. vertically. The filling method of mining is used throughout as the Chinese authorities object to having the surface disfigured by the caves resulting from subsidence, an occurence which would follow to a very considerable, if not a dangerous degree in the mining out of such thick seams. The seams encountered thus far have been regular in strike, dip and thickness. With the filling method in use, the system of regular extraction and watchful supervision over the laborers is not so necessary, as would be the case in mining where roof settlement plays so prominent a part. This adds to the safety of the workmen and to the ease in handling a large force of unskilled Chinese labor.

The mining of a block of coal is commenced at the base, a slice about 6 ft. in width being extracted horizontally from the roof. The coal is then conveyed in cars, or in baskets, by coolies to the temporary inclined hoisting station, from whence it is lowered or raised, as the case may be, to the main haulageway. Both compressed air and electric operated winches are used for this purpose. When a bench of coal is removed, extending across the width of the seam, the space is filled with waste rock which comes from the dead workings or from limestone quarries on the surface. The waste is shot down through chutes, which also serve as airways.

The coal is mined by the contract system in which Chinese contractors are used. There are at the present time 1200 men at work with the contracting force and 800 men employed by the mining company. The contractor is paid 18c. gold for slack and 22c. per ton for lump. Crosscutting, timbering and brick lining is paid for by contract at so much per meter.

Competition and Over Production

Owing to an over production of coal and coke in the North China coal areas, the Lanchow Co. has been suffering from competition which carries away the profits. It is hoped that the Chinese will eventually construct a shipping port, and with this a line of steamers of adequate size, that will give them more independence in disposing of their products.

To look into the future that lies before this company, it may be mentioned that there are iron ore bodies situated from 10 to 15 miles away from the coal mines which are said to contain large quantities of a good grade of iron ore. Negociations have already been under way towards getting foreign capital to invest in the development of these bodies of ore and the building a complete steel plant. The present company, with such an enlargement in the scope of its work, would then assume great importance as an iron and coal producer and become a factor in the ever increasing industrial development of China.

Permanent Board of Arbitration

By E. Jacobs

A joint application has been made by the official representatives of the Western Coal Operators Association of Canada and District 18 of the United Mine Workers of America, respectively, for the appointment by the Federal Department of Labor, Ottawa, of a chairman of a permanent board to which differences between the western coal mine operators and their employees are to be referred in the event of the parties not first agreeing without such reference.

For some years it has been customary, when disputes arose, for one or both of the parties concerned to apply for the appointment by the department, under the "Industrial Disputes Investigation Act," of a Board of Conciliation and Investigation for each individual dispute in which the services of such a board were invoked, the procedure being for each party to name its representative on the board and in the event of these two not agreeing upon a chairman, the department to choose one. When the long dispute of last year, which extended over nearly eight months, was brought to a close, the desirability of having a permanent board was mutually recognized, and now the department has been asked to name a chairman in accordance with the understanding then reached.

Seven Thousand Men Affected

The Western Coal Operators Association comprises in its membership most of the operators of coal mines in Alberta and the Crow's Nest District of British Columbia situated along the main transcontinental line of the Canadian Pacific Ry. Co. and its Crow's Nest line. District No. 18 of the United Mine Workers of America has branches throughout the area thus indicated. A general strike of employees at all the coal mines and coke ovens in District No. 18 involves the cessation of work by approximately 7000 employees, beside throwing out of employment others, such as train crews, not directly connected with disputes between operators and employees. The desirability of establishing a permanent board, having the confidence of both parties and sufficiently familiar with local conditions to enable the speedy settlement of differences, is generally conceded, so that there may not again result such a great loss to both parties immediately concerned, and to consumers of coal generally, as was the case last year.

Kentucky Mining Institute

The next meeting of the institute will be held at Lexington, Ky., June 10 and 11, as noted in COAL AGE of May 4, p. 969.

Electric Power Plants for Mines

By Henry D. Jackson *

The degree of remoteness from other plants and the probable life of the mines are two most important factors in determining the general type of electric plant for a coal-mining operation. Low fixed charges, attained by the use of inferior machinery, may be more than offset by the high operating costs which are entailed. General and detailed considerations regarding power-plant design.

Electric power for use in coal mining operations may sometimes be purchased to advantage from an established source but usually must be generated on the ground where it is required. As a rule, coal mines are not so situated as to enable their operators to purchase power at a price which compares favorably with that at which they can produce it for themselves.

Not infrequently, however, conditions are such that a number of small operations can profitably combine in the erection of a central station, from which power is furnished to each plant according to its needs. In an arrangement of this kind, it is a comparatively easy matter to determine the proportion of the total cost that each operation should pay by installing meters, either at the central station or at each of the receiving stations.

Owing to the more or less isolated location of the usual coal-mining operations, the prevailing arrangement for supplying electric power consists of a generating station for each plant, although not necessarily for each mine, as there are frequently a number of separate openings, subsidiary to one principal operation.

Probable Life of Plant Important

In determining the general character of a power-plant installation of this kind, the probable life of the mining operation is of prime importance. If the supply of coal is likely to be worked out in a comparatively short time, the installation should in general be inexpensive, as in the end a considerable portion of the building and apparatus will probably have to be abandoned. It is therefore advisable to build a plant which, while satisfactory for the time it is likely to be in use, will not represent any great sum of money at the time it has to be abandoned.

The same criterion does not apply, however, to the item of machinery, or at least not to an equal extent, because this part of the equipment probably need not be abandoned and it is essential that the engines for a power installation should be strong and reliable as well as desirable that they should be of comparatively low cost. Unfortunately these two items are not as a rule entirely reconcilable. A strong and reliable engine means good workmanship, material and design and is usually fairly high in cost.

It always should be kept in mind that while apparatus of low initial cost entails correspondingly low fixed charges, on the other hand, it is extremely likely to mean high operating costs. Generally, low priced engines require an excessive amount of steam, and the capacity of the boilers must consequently be increased, which fact acts to offset the saving on the engines. Also, the maintenance charges on an inferior machine are great because of the repairs which are inevitably required by an engine that is poorly designed and constructed. Another item of expense is that resulting from the frequent shut-downs which are necessary in order to effect these repairs.

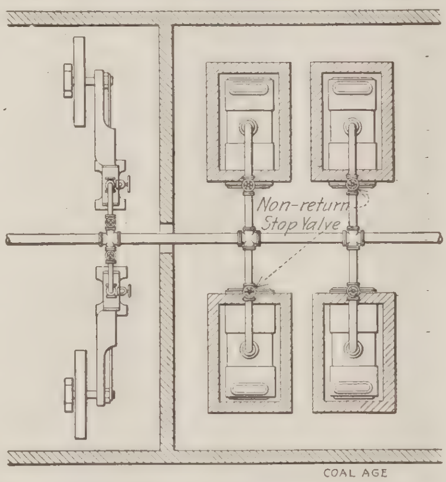


Fig. 1. Steam Main and Connections

Fixed Charges vs. Operating Cost

Therefore, in selecting the engines which are to be installed, it is essential that the questions of first cost and operating cost should carefully be considered and balanced. The load which is likely to come upon the engine through the year should be estimated as nearly as possible. On one hand, is the comparatively expensive engine with low steam consumption, small repair costs, high fixed charges on the engine and reduced fixed charges on the boiler plant. On the other hand is the comparatively low-priced engine with correspondingly high operating costs and high fixed charges on the larger steam plant which is required. Figures should be obtained on engines of different types and the operating costs and fixed charges carefully worked out. The same method of procedure should be followed out with reference to the boilers and other apparatus, until the entire plant is carefully covered.

In regard to electrical apparatus, it is equally important in this case to consider whether it is cheaper in the long run to install a direct-connected generator or a belted generator. The lower efficiency of the belted unit together with the greater space it requires, thus entailing additional cost for building and foundations, must be taken into account in comparison with the smaller building and foundations required by the direct-connected outfit of higher first cost. The generator itself should be purchased on exactly the same basis as the engine. A low-priced generator usually means exorbitant repair costs, and a high-priced generator may mean excessive fixed charges. These items must be balanced in order to obtain the best results.

Simplicity of Arrangement Desirable

In deciding on the general arrangement of a plant it is important to secure the simplest practicable form of layout, in order to insure a low first cost. Simplicity, however, does not mean the cutting out of essential features. The plant should be carefully designed to avoid, as far as possible, all likelihood of breakdowns. The best material and fittings consistent with the purpose and life of the installation, should be used throughout. A breakdown due to imperfect or inferior material will result in a loss far greater than the difference in cost between inferior and good material. Particular attention should be paid to facilities for receiving coal and for handling supplies and repair parts, also for the removal of ashes.

If more than one unit is installed, every precaution should be taken to enable the several units to be operated independently so that repairs can be made to one set of engines or boilers while the others are in operation. Inter-connections between boilers and engines should be arranged so that any boiler or set of boilers can be used by any engine.

To insure continuity of operation, automatic non-return stop valves should be placed on every boiler, as it is frequently found that a boiler gives out in one way or another and allows the steam from the other boilers to blow through it, if this precaution is not taken. At prac-

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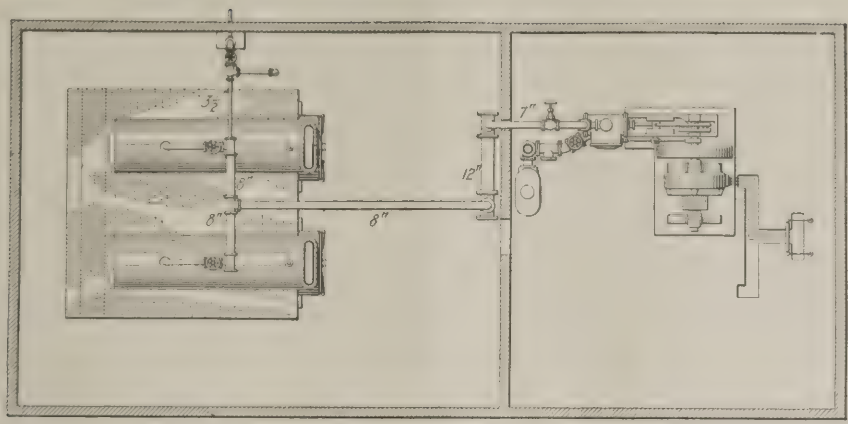


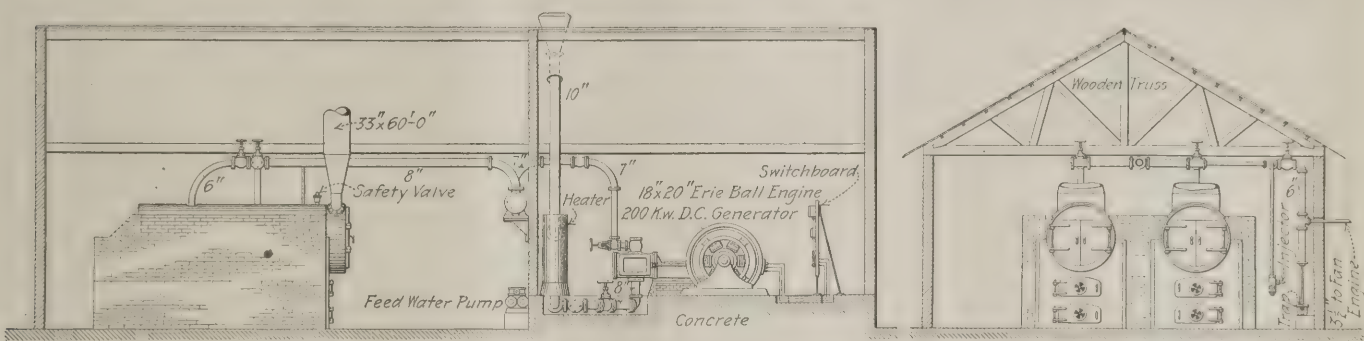


FIG. 2. SIMPLEST POSSIBLE FORM OF POWER PLANT, ALSO SHOWING DRAIN FROM STEAM LINE TO FAN

tically all mines it is quite essential that fans, pumps, and frequently the hoisting engines should always be in operation; if non-return stop valves are used, an accident to any one boiler will allow the other boilers to remain in operation unless the accident is so serious as to totally destroy or wreck the whole plant.

The piping between engines and boiler room should be as short and direct as possible, and every provision should be made to take care of expansion in the steam lines. All steam piping should be carefully drained, and valves should be so arranged that no water will be held in the pipe when the valves are closed. All pockets and loops in the piping should be drained by means of traps, and the water returned to the boilers if practicable.

Feed Water Economy

Frequently, one of the greatest difficulties in the coal fields is found in obtaining good water for the boilers, and therefore no water which has been purified by being made into steam should be thrown away if it can safely be returned to the boilers. "Safely" is here used advisedly, as it is often found that the exhaust steam which has passed through engines is contaminated with oil to such an extent that it would be unsafe to return it to the boilers. Under these conditions the use of closed feed-water heaters, or open heaters with oil separators, will allow the heat in the steam to be delivered to the feed water.

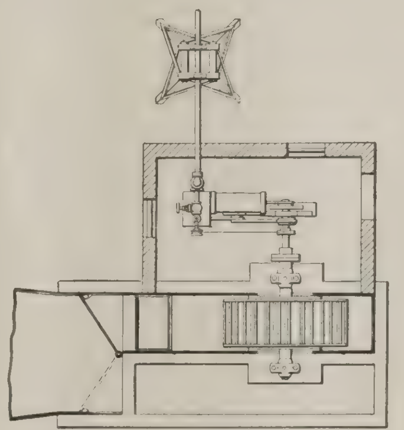
The question of whether or not to operate a plant on a condensing basis, depends entirely upon the supply of water available for condensing purposes. It is frequently found that while there may be a scarcity of water suitable for boiler supply, there is at the same time plenty of water available for cooling purposes. Under these conditions it is usually wise to operate condensing since the consequent decrease in the size of the boilers and the smaller consumption of fuel and water soon pay for the additional cost of the condensing apparatus. Then too, it is frequently possible to install small turbo-generators which are lower in cost than a reciprocating-engine set of equivalent capacity because of the smaller amount of room which they require and the higher speed at which they operate. These allow the return of all the water of condensation to the boilers because no oil comes in contact with the steam, in an apparatus of this character.

It may not be out of place here to refer to the use of steam driven fans. These are required in a number of instances because it is desired to operate the ventilating plant when the main electric generating unit is shut down. It may frequently happen in a case of this kind that the fan is located at some distance from the power station and requires the installation of a long steam line. Every precaution should be taken to absorb the expansion and contraction taking place in a line of this kind and in such a way as to avoid undue strain upon the pipe itself or upon any of the buildings.

Design of Long Steam Line

Furthermore, the condensation taking place in a pipe line of this sort is likely to prove a source of considerable trouble. It is dangerous to allow the condensed water to reach the engine and it is equally dangerous to allow it to get back into the main steam line. In the first case it is liable to wreck the machine and in the second case, a slug of water in the main line may rupture the fittings. Provision should be made (1) for draining this water as it forms, and (2) for preventing it from getting to either the engine or the main steam line in case the drain fails to operate.

Another point which has to be taken



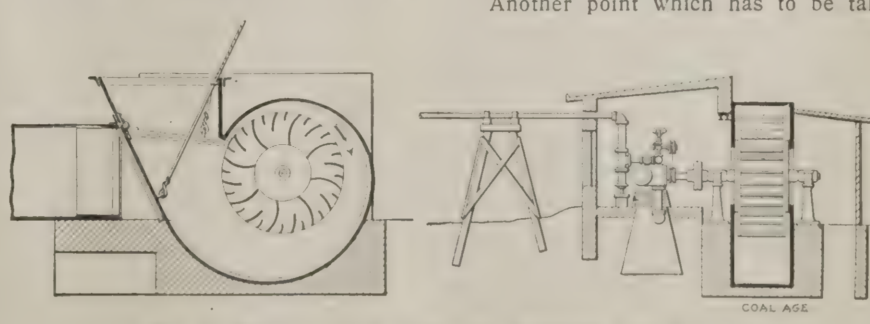


FIG. 3. STEAM-LINE ANCHORAGE, RECEIVER AND TRAP

into account in connection with a long steam line of this kind is the possibility of excessive vibration due to the intermittent flow of steam which results from supplying a reciprocating engine. This vibration frequently can be avoided by installing, at or near the fan engine, a receiver having sufficient capacity to supply the engine with steam, without materially lowering the pressure in the receiver, and thus allowing a continuous flow through the pipe. Figs. 2 and 3 show the beginning and end of a pipe line which runs to a fan engine. The anchorages and also the methods employed for preventing water from getting to either the engine or the main pipe line are illustrated.

Receivers and Steam Traps

In the end elevation of the power house, Fig. 2, it will be noted that there is shown a vertical pipe from which the fan engine line is taken off at about midway of its height. This pipe acts as a receiver for water which may condense in the steam line. The water is drained off from the pipe by means of a steam trap. At the fan engine, a similar pipe will be noticed which serves a like purpose and also acts as a receiver for smoothing out the fluctuations of the steam in the pipe line.

A layout of the power plant proper, in its simplest form is shown in Fig. 2. Provision is made for an additional boiler and engine. In case it is desired, an extra main may be provided for carrying steam from the boiler room header to the engine header, thus giving more assurance of a steam supply to either engine in case of accident. However, this arrangement is in most cases unnecessary if care is taken to purchase high grade material for the simpler form of layout.

It may be unnecessary to suggest that room should be provided in the boilerhouse for the removal of tubes from the boilers but it is not uncommon to find that in existing plants such provision has not been made. Another suggestion of demonstrated practical value is the use of a stop valve between the boiler and and the blowoff valve, in order to keep the latter in good condition. This is a point which is frequently overlooked, with the result that the blowoffs leak, stick and in general are the source of much inconvenience and occasionally a shutdown.

There is usually urgent necessity for a careful analysis of all water used for boiler feed purposes throughout the coal fields. Water in these localities frequently contains, in addition to the more usual scale forming material, impurities which will rapidly and seriously injure the boilers. Under such conditions it is advisable to use some system of feed water purification. Purifying apparatus will often save many times its cost in boiler repairs. Sometimes the system of water purification may be combined with a feed water heating apparatus.

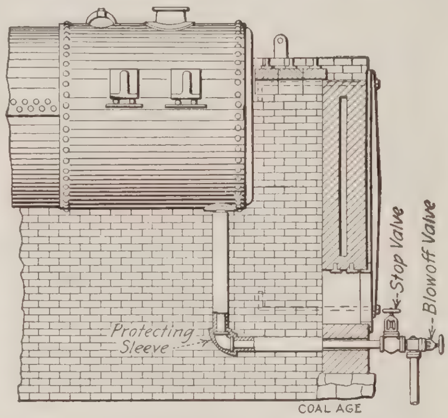


Fig. 4. Blow-off and Stop Valve

Feed Water Heating and Purification

The installation of a good feed water heater is always worth considering (1) because of the saving in fuel and (2) because it saves the boilers. Whether the open or closed type of heater should be selected, depends largely upon the conditions of service. The closed heater possesses the advantage that with its use oil cannot possibly be carried over to the boilers from the engine exhaust. On the other hand, if the water used contains salts which precipitate at a comparatively low temperature, the closed heater will soon become inefficient unless frequently cleaned, and under these circumstances it is usually advisable to install an open type heater, in which the salts can readily be thrown down and easily removed. In the latter case, oil in the steam may be taken care of by means of an oil separator.

The heater should usually be connected as shown in Fig. 6, that is, as a non-thoroughfare. This arrangement operates to prevent even the small amount of oil which may pass the oil separator from getting into the heater and consequently reaching the feed water. The amount of steam required for heating the water is usually only about one-fifth of the engine exhaust and this much will readily be drawn into the heater by the reduced pressure, which results from the condensation of the exhaust steam.

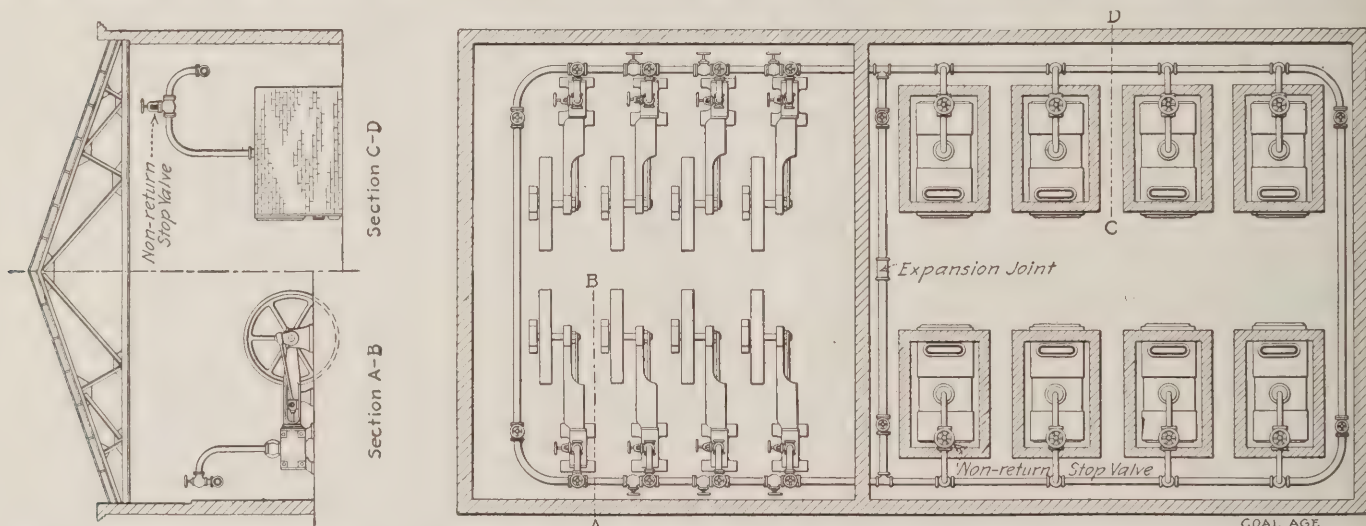


Fig. 5. The Ring System of Piping, Devised to Insure Continuity of Operation, Seldom Justifies Its Greater Cost

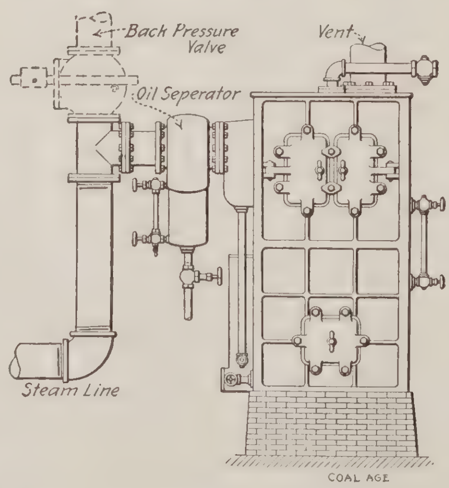


Fig. 6. Non-thoroughfare Heater

The Screening Problem in Illinois

By A. Bement*

An interesting review of the relative production of the different sizes in the Illinois fields. The results of a change in the methods of payment from a lump to a mine-run basis are graphically shown. The use of mechanical stokers by large consumers has materially strengthened the demand for the finer sizes and the author is inclined to the belief that these will eventually command the highest prices.

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The accompanying diagrams, Figs. 1, 2 and 3, show graphically the production of the various grades of coal in the state of Illinois. The output is shipped as mine-run, or prepared as lump, egg, nut and screenings, the latter mostly through 1¼-in. perforations. The output where division is made is more commonly separated into 1¼-in. lump, known generally as railroad coal, and screenings. In certain districts, however, notably the southern part of the state in Williamson, Madison and Macoupin Counties, a different separation prevails. The fine coal goes through a screen having 3-in. perforations and is then separated into five sizes which are washed and enter the market as washed and sized coal.

The Abrupt Decrease in the Production of Lump

Prior to 1898, lump coal was by far the principal product, as in the early days of mining there was very little demand for the fine sizes. Every effort was therefore made to produce as large a percentage of lump as possible and before the decrease in lump production occurred, just prior to 1900, as shown by Fig. 1, payment for mining was upon the lump coal basis. The drop in the curve illustrates the results of the change in the method of payment from the lump to the mine-run basis, which occurred at that time. Formerly, it had been to the advantage of the miner to produce as much lump coal as possible; with the mine-run basis of payment, however, this incentive was no longer present.

The result was the production of a very large tonnage in the form of screenings for which there was small demand and consequently they sold at a very low price; about 25c. per ton at the mine would probably represent the average. The rapidly increasing use of automatic stokers, however, gradually changed this condition by enlarging the demand for screenings to such an extent that the fine coal threatens to become the principal product, a condition just the reverse of that formerly existing.

The price of raw screenings, at the present time, is subject to great fluctuations. Within the past year, they have been as high as \$2.38 and as low as 20c. per ton at the mine, with an average of about 85c. for the year. This great fluctuation in price is due to the supply being so variable, as screenings are only made when lump coal is being produced, and are thus limited by the lump demand. At such times as the supply of screenings is inadequate.

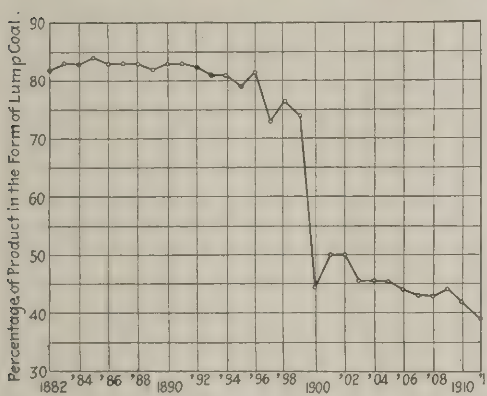
Relative Production of Sizes

Diagram, Fig. 2, illustrates the respective percentages of lump, screenings, mine-run and egg coals produced since 1900. From this it will be seen that from 1906 to 1909 there was a marked falling off in the production of mine-run, due largely to the increasing demand for fine coal. Since that year, however, the percentage of mine-run has increased rapidly up to the present time while screenings show a decline. This is because the demand for screenings so much exceeded the supply that it was necessary in a great many cases to purchase mine-run and crush it.

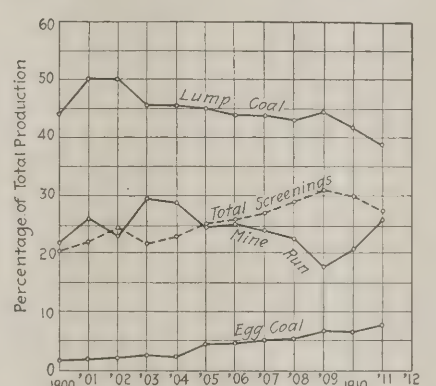
The effect of the increasing percentage of mine-run is also apparent upon the lump coal curve, while that of egg coal shows a steady but moderate increase. One of the factors influencing the production of egg is that it is found to be a most satisfactory size to place in storage, a practice which is gradually becoming more common in the territory tributary to the Illinois coal fields.

Diagram, Fig. 3, is based upon the data presented in Fig. 2, except that a division is made of the fine coal into raw screenings and washed coal. This shows that the production of standard stoker fuel, or in other words, raw screenings, was in 1911 very much smaller than mine-run, while the washed coal output shows a steadily increasing gain. This washed coal in the form of screenings and the washed sizes is largely used in hand-fired furnaces and domestic fires, although there is a certain amount used in stokers, where it is felt that a superior quality of fuel is desirable.

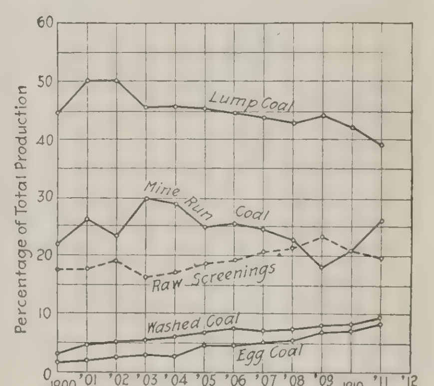
There is a marked tendency toward an increase in the demand and price of the smaller sizes; thus the washed sizes Nos. 4 and 5, the former ¼x⅝ in. and the latter that which passes through ¼-in. perforations are in larger demand than are Nos. 1, 2 and 3. If this condition continues, the small sizes will soon command a higher price than the larger. This reasoning applies to raw screenings also, and a time may come when they, as well as all of the fine coal, will bring a price higher than that obtained for lump. If this comes to pass, mine-run coal will be at a premium, compared with lump, and on a par with raw screenings. In fact, raw screenings may command a slight premium over mine-run, as it would be more desirable for a power plant to purchase screenings which are coal in a crushed form than to buy mine-run and crush it.



Years of Illinois Coal Production
Fig. 1



Years of Illinois Coal Production
Fig. 2



Years of Illinois Coal Production
Fig. 3

COAL AGE

Profiles Showing Fluctuations in Production of the Illinois Coals

The Hookworm and the Miner

By R. S. Ogilvie
and N. P. Brooks

It has been demonstrated in Germany that sanitary provisions can eradicate hookworm whether mines are dampened or kept dry. The authors declare that in omitting moistening to avoid ankylostomiasis, there is danger of replacing the disease by miner's consumption.

It is an indisputable fact that wet mines are much more widely infected than dry workings, but no one ever heard of an absolutely dry mine. We shall find a certain number of feeders in every underground operation of any extent and where we find them, if the temperature is suitable, the mine under the present lack of sanitary precaution will be almost sure to become infected with the larvæ of hookworm. The area of infection will be less but it will claim a certain number of victims each year.

A paper by J. Wroe (vol. 29, pt. 3, of the *Transactions* of the Institute of Mining Engineers) gives a few statistics as worked out by investigators for the coal mines of Germany. The following figures are the result of two years' study of the conditions in four German collieries. The Julia and Heydt mines are, in general characteristics, very similar. Both were dry mines and they had been sprinkled for several years in accord with the German law. By a special act all watering was stopped in the Julia while it was continued in the Heydt as before. At the same time, active treatment of the men and of the mine to eradicate the hookworm was begun in both. It consisted in treating all the feeders of water with milk of lime, in treating all the men infected and in, as far as possible, isolating the infected workers.

JULIA AND HEYDT MINES

Examination	Men examined	Men infected	Percentage
First:			
Julia	1168	228	19.52
Heydt	928	166	17.89
Second:			
Julia	1088	16	1.47
Heydt	928	20	2.15
Third:			
Julia	1063	10	0.94
Heydt	886	13	1.47

Throughout the time between the first and third examination prophylactic treatment of the mine continued. The first two inspections were separated by a time space of one year. The second and third examinations in the Julia mines were 18 months apart but in the Heydt mine only 17 months.

How Larvae Were Destroyed in Two Normal Mines

The Recklinghausen Collieries Nos. 1 and 2 were more or less wet and had never been watered. No. 1 had a steep pitch and was a crowded mine.

RECKLINGHAUSEN COLLIERIES
Mine No. 1

Examination	Men examined	Men infected	Percentage
First	1141	144	12.76
Second (after 12 months)	1306	52	3.98
Third (after another 18 months)	1227	30	2.44
Fourth (after another 22 months)	1006	29	2.88

Mine No. 2

Examination	Men examined	Men infected	Percentage
First	1425	53	3.70
Second (after 12 months)	1826	14	0.77
Third (after another 18 months)	1766	4	0.22

These statistics of the Julia and Heydt mines show that in the watered mine there was a slightly larger number of men infected than in the unwatered mine, but the percentage was so small that if a larger number of operations had been taken the results might show that the difference was due to other causes than the presence of moisture. We think it would be safe to say that when using due prophylactic measures, we can disregard the slight danger which exists of increasing the hookworm disease amongst the miners and can spray and drive steam into the workings as much as we consider necessary.

Our study of the question has brought us to believe that the temperature, pitch of the seam, and general working conditions will be found to influence the spread of the disease much more than watering the mines. The latter certainly can have no bad effects if the scheme which we are offering is carefully carried out from the start or is introduced into an old mine. The sure way to guard our miners from infection of the hookworm is to prevent the mine soil from becoming infected with its larvæ.

Life History of the Worm

There seems to be no intermediary host necessary for the development of the parasite. The ovum is passed into the feces and there develops into larval form. It then reënters the human body and grows to an adult worm. The mode and route of entry are still under discussion but the majority now accept the theory that the larvæ enter through the skin, usually through the skin of the feet. The problem then is how to keep the ova from reaching the mine floor and if they are deposited thereon how to prevent their development to maturity.

One of the first things on the ground when a new shaft is to be sunk should be some form of sanitary to be used by all men employed in sinking. The form which we recommend is an incinerator, the McCaul being quite satisfactory as it will take care of a large quantity of material and is fitted with a privy cover.

As the work progresses there should be furnished stout galvanized-iron cans of 10 to 20 gal. capacity, each can being furnished with a tight-fitting privy seat which can be easily removed when the can needs emptying. As the work progresses and entries are opened up with accompanying working places, new cans should be installed as fast as needed in such places as will be easily accessible to the employees. When possible the cans should be set in the return air way. We would recommend the use of a sufficient number of sanitaries so that men in charge of the work can make one collection daily, replacing the used cans with others which are empty and sterilized. The privy cover can be transferred to the fresh can, an ordinary tight tin cover being placed on the full can while it is being taken to the surface.

Incineration

The incinerator building should be placed as near the exhaust shaft as possible and should be a sufficient distance from the intake shaft to prevent the gases from the burning excreta entering the mine. There should be a large steam chest into which the exhaust steam from the hoisting engine can be turned.

On bringing the cans to the surface they should be emptied at once into the incinerator, then placed in the steam chest and the steam turned on. The cans should remain there for several hours, the duration of the steaming being dependent on the amount of steam which is available. After cooling, if the cans need any further cleansing, it can safely be done anywhere with a hose or by some other means.

One Man Can Care for All Sanitary Needs

The expense of such a method should not be great. One man can easily look after the cans in a large mine or in two small mines if they are close together. The residue makes a good fertilizer and the use of it will nearly pay the running expenses of the incinerator. It will be hard at first to get the men to use the cans; but if the pit bosses and under-bosses insist, the change can be easily effected and there will not be any of these evil smelling, nasty places which are to be found in nearly every mine and the hookworm will no longer infest the intestines of the miners.

DISEASES OF RESPIRATORY TRACT

It is well not to lose sight of one danger in guarding the men from another. In every dusty mine a great deal of disease of the respiratory tract is found. Anthracosis or miner's consumption is more common than the hookworm disease, though it is not as serious an ailment. A dry mine would probably increase the number of sufferers from anthracosis, at least as much as it would decrease the number of hookworm patients.

Throughout an old mine the feeders should be thoroughly treated with milk of lime weekly. Men known to be suffering from the disease should be isolated as far as practicable and should be warned that they are a source of danger to their fellow workers.

Firing Shots in Still Air

By John Verner

No conclusion of value can arise from a comparison of explosions in different mines, when complete descriptions of these are not available. But some scientific deductions are permissible when two explosions occur in the same mine. By considering only manifestations in identical workings, the argument seems favorable to shooting in still air.

*Chariton, Iowa.

Mr. Rhys, state mine inspector of the 2d Iowa district, in his review of my paper on Iowa mine explosions[1], in the May 11 issue of COAL AGE, after citing a number of explosions in different Iowa mines, occurring with the fan running at its usual speed, reduced speed, or stopped entirely during shot-firing time, presents his conclusions that slowing down the fan before touching off shots does not lessen the force of the explosion, nor make it less destructive, and that the evidence is decidedly against my theory.

FAN SPEED AND VENTILATION

Even a cursory reading of Mr. Rhys' article makes it evident that the above conclusion cannot have any value, because it is based solely on the unessential matter of the fan's speed at different mines where explosions occurred. He does not give any consideration whatever to the actual condition of the ventilation and other influential factors existing in these mines when they exploded. At one mine the fan may be run at top speed, and yet the ventilation of the working places may be objectionable and the current feeble; at another mine the fan may not be running at all, and yet through the force of natural ventilation the working places may be found adequately ventilated and with a fair air current passing through them.

Some years ago, I found at the bottom of the downcast of a certain old mine, an entering air volume of 11,500 cu.ft. per min., with the fan running at 88 revolutions. After this old mine was closed down, the fan was placed at a new plant and produced 36,000 cu.ft. of air per min. at the reduced speed of 62 revolutions.

Supposing it had been possible under the adverse conditions existing in the old mine to produce a feeble explosion in its working parts, and supposing that under the favorable conditions prevailing in the new mine a disastrous and violent explosion had occurred there, would that justify the assumption that the difference in fan speed was a factor in determining the mildness of the explosion in the old mine and the great violence shown in the new?

To prove or disprove that an increase or decrease of draft tends to increase or decrease the violence of explosions, it is necessary that the tests to that end be made in the same mine and under otherwise identical conditions, or in consequence too many undetermined considerations will vitiate the results.

The opportunity for making such tests was afforded by the two explosions cited by Mr. Rhys, which occurred in mine No. 4 of the Cleveland Coal Co., on Jan. 5, 1901, and on Feb. 5 of the same year. I am well acquainted with all the features of these explosions, because I investigated them personally immediately after their occurrence. Mr. Rhys states correctly that the two explosions started in the same part of the mine and almost in the same place, that otherwise similar conditions prevailed and that their course was identical.

TWO CASES AND BUT ONE DIFFERENTIAL

There was, however, a marked difference in the effects. While the primary cause of the first explosion was apparently of greater power than that of the second, the second explosion showed much greater violence than the first as it extended toward the shafts. I was unable to discover any visible signs to account for this difference in effects, but I did find that the mean temperature on the day of the first explosion, Jan. 5, was 27.5 deg., and on the day of the second explosion, Feb. 5, 5.5 deg. Supposing that on both dates the fan was running at the same reduced rate of speed, it will be readily apparent to one conversant with the subject of mine ventilation that a drop of 22 deg. in the temperature of the air entering a mine means a considerable increase in the velocity of the air flow through the workings, and I can say that under the favorable conditions existing in No. 4 mine, this natural ventilating force became particularly effective, and consequently the draft facilities at the second explosion were materially better than at the first. Accepting Mr. Haas' rule that the magnitude of a dust explosion is measured by the availability of the air supply, other conditions being the same, the cause for the greater violence shown in the second explosion is reasonably accounted for.

THE BELIEF OF THE SHOTFIRERS

Mr. Rhys says: "Since 1902, the practice of slowing down the fan at firing time has become quite general throughout the state. Whether right or wrong, the belief in its protective value is such that it would be almost impossible to secure shotfirers in new mines, especially during the cold season, unless the fan was stopped or slowed down at firing time." Is it probable that such general and persistent belief can be founded solely on imagination? As a rule, the Iowa shotfirer is a man of intelligence and good judgment, and well trained in his hazardous work.

His daily opportunity to observe results under varying conditions enables him to become a competent judge as to whether the conditions found tend toward safety or lead into danger. When, after a test of ten years, he still declares his belief, that the reduction of draft at firing time is beneficial, his judgment should be received with due respect and consideration, especially in the absence of any proof showing that it is at fault.

SLOWING THE FAN AT LEAST A PALLIATIVE

There is no direct proof that the practice of slowing down the fan at firing time has prevented the occurrence of an explosion in an Iowa mine. As a palliative, it has been and is now considered useful, but its greatest merit lies in the fact that its general trial in this state for ten years has brought to the Iowa shotfirers and many miners the firm belief, strengthened by personal observation and experience, that although ample and thorough ventilation is desirable and necessary, it brings with it an element of danger that demands careful consideration in providing for a mine's safety. That belief should be implanted in every mining community in this country.

[1]See "Causes of Iowa Mine Explosions," by John Verner, Feb. 3, 1912; Vol. 1, pp. 545-547.

West Virginia Coal Mining Institute

The ninth semi-annual meeting of the institute will be held in Charleston, W. Va., June 6, 7 and 8. A program has been arranged as follows:

Thursday, June 6, 10 *a.m.*—Address of welcome, by Gov. William E. Glasscock; president's address, by Frank Haas; five-minute talks by the vice-presidents; "The Use of Gasoline Motors in Coal Mines," by A. J. King, mining engineer, Charleston, W. Va.

2 *p.m.*—"Quality and Quantity of Mine Air," by Karl F. Schoew, mine inspector, Fairmont, W. Va.; "Points of Interest in Mine Ventilation," by J. T. Beard, associate editor COAL AGE, New York, N. Y.; "Successful Store Management in Relation to Mining Communities," by Charles H. Lantz, general manager, Buxton & Landstreet Co., Thomas, W. Va.

8 *p.m.*—"The Projection and Development of a Mining School," by E. N. Zern, professor mining engineering, West Virginia University, Morgantown,; "Mine Accidents and Their Prevention" (stereopticon), by Ira D. Shaw, international secretary Y. M. C. A., Pittsburgh, Penn.

Friday, June 7, 10 *a.m.*—"Coal Mine Accidents," by David Victor, chief mine inspector, Consolidation Coal Co., Fairmont, W. Va.; "Safety in Coal Mines, Especially in West Virginia," by F. C. Cornet, mining engineer, Charleston, W. Va.; "Some Experiences in the Drainage of Mines," by C. E. Tucker, superintendent, Consolidation Coal Co., Frostburg, Md.

2 *p.m.*—Trip to the Blue Creek oil fields, 15 miles from Charleston, on the Coal & Coke Ry. Special train will leave Charleston at 2 p.m. and return at 5:30 p.m.

8 *p.m.*—Banquet at Hotel Ruffner, Toastmaster: Gov. William A. McCorkle. Speakers: Hon. George E. Price, "Railways and Coal"; Hon. Malcolm Jackson, "Laws"; Hon. Henry G. Davis, "Pioneer Days"; Dr. J. A. Holmes, "Scientific Research"; Dr. I. C. White, "Geology"; Hon. L. E. Tierney, "Practical Mining"; J. C. McKinley; Hon. Z. T. Vinson; Frank Haas, "Institute Work"; Hon. George S. Laidley, "Education"; Dr. J. E. Robbins, "Village Sanitation."

Saturday, June 8, 10 *a.m.*—"Lubrication," by L. A. Christian, consulting engineer, Keystone Lubricating Co., Pittsburgh, Penn.; "Required Qualifications of a Successful General Manager, from a Superintendent's Point of View," by T. H. Huddy, general superintendent, Boomer Coal & Coke Co., Boomer, W. Va.; question box; reports of committees.

The sessions will be held in the Senate room of the State House, at Charleston.

Coal Mining Institute of America

The summer meeting of the institute will be held in Johnstown, Penn., June 25 and 26, and will be devoted to a discussion of practical mining problems. The institute headquarters will be at the Crystal Hotel and sessions will be held in Library Hall. The following program has been arranged:

Tuesday, June 25, 10 *a.m.*—Address of welcome, by C. S. Price, president, Cambria Steel Co. President's address, A. W. Calloway, general superintendent, Rochester & Pittsburgh Coal & Iron Co. Business session. Symposium: Weak links in the operating chain, (a) executive officers, (b) mine superintendents, (c) mine foremen and assistants.

1:30 *p.m.*—Continuation of morning program. Question box, State Mine Inspectors Nicholas Evans and T. W. Williams presiding. The afternoon session, from 3:30 o'clock on, will be devoted to the discussion of practical questions submitted by members of the institute.

6 *p.m.*—Institute dinner. Toastmaster: H. S. Endsley. Speakers: John Fulton, C. C. Geer and Frank Gray.

Wednesday, June 26, 9 *a.m.*—First-aid demonstration and contest, in charge of Thomas B. Dilts, mining secretary, Pennsylvania State Y. M. C. A., and Harvey J. Hill, special secretary, Y. M. C. A. Judges: J. A. Metzgar, M. D., Latrobe, Penn.; F. C. Keighley, Uniontown, Penn.; H. M. Wilson, engineer in charge U. S. Bureau of Mines, Pittsburgh, Penn.; F. W. Cunningham, state mine inspector, Charleroi, Penn.; A. C. Beeson, chief engineer, Pittsburgh-Buffalo Co., Pittsburgh, Penn. The Coal Mining Institute of America will award an engraved silver cup to the winning team.

12 *Noon*—The Cambria Steel Co. will tender a complimentary luncheon to members of the institute and a sight-seeing trip has been arranged. The party will be taken by special train through the mills and works of the Cambria Steel Co.

If the institute so decides an evening session can be held in Library Hall. Charles L. Fay, Wilkes-Barre, Penn., is secretary-treasurer. M. G. Moore is chairman of the committee on local arrangements.

Alabama Coal Operators Association

The annual meeting of the Alabama Coal Operators Association is to be held at Birmingham, June 11, at which time officers will be elected. The annual outing of the association is to be held June 12, at the Docena mines of the Tennessee Coal, Iron & R.R. Co. near Birmingham.

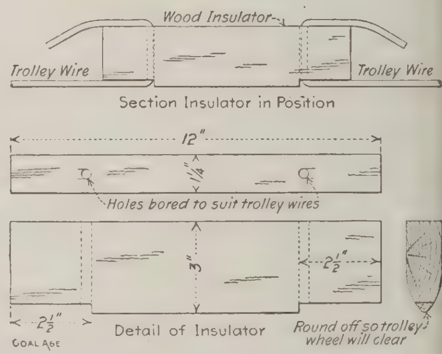
Among the speakers who will address the meeting will be Dr. S. C. Hotchkiss of the U. S. Health and Marine Hospital Service; Morris Knowles, sanitary engineer for the association; Dr. Robert Nelson, city health officer, and H. M. Wilson, chief engineer of the U. S. Bureau of Mines.

An interesting feature of the outing will be an exhibition of mine machinery, safety appliances, mine lights, permissible explosives, rescue apparatus, fireproofing, brattice cloth, etc.

A Home-made Trolley Wire Section Insulator

By Arthur O'Brien

A section insulator for coal-mine trolley wires, can readily be made from a stick of oak or maple, as shown in the accompanying illustration. Although insulators of this type are simple in construction and cheap to make, they have shown themselves to be thoroughly reliable in every-day service around the mines.



Trolley Wire Section Insulator

Maple is the best wood for the purpose, but oak is frequently used, because it is more likely to be available around mining plants. Where it can be done, it is a good plan to boil the stick, after it is worked into shape, in paraffin, or to paint it with an insulating varnish that will soak into the wood. The only advantage that appears to come from [illegible] treatment, is that moisture, which might in time split the wood, is kept from entering it. The device gives quite satisfactory service without treatment of any kind.

The dimensions given in the sketch are approximate, and may be varied within reasonable limits to satisfy local conditions. The length, however, should not be much less than 12 inches.

When installing the device, care must be taken to so bend the trolley wires that it will stand vertically. Experience has shown that merely turning the ends of the trolley wires over, as shown in the illustration, provides sufficient support for the insulator. The trolley wires should be supported by an insulating hanger and clamp at points a few feet away on each side of the section insulator.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Explosion Prevention by Oxygen Reduction

The prevention of explosions by a reduction of the oxygen content of the mine air was recently advocated by J. Harger in a lecture before the Geological and Mining Society at Manchester University on Feb. 27.

In the course of the lecture, Dr. Harger stated that neither a candle nor a lamp would burn in air in which the oxygen was reduced to 17 per cent., yet a man could work continuously in such an atmosphere and not observe or feel any difference in his condition from the reduction of oxygen. No shortage of oxygen was noticeable until the reduction reached 14 per cent., while at 12 per cent. the shortage was most marked, and at 7.5 per cent. life was extinguished.

Dr. Harger said that air containing 17 or 18 per cent. of oxygen, with a moderate amount of carbon dioxide up to 1 per cent., was entirely suitable for the human requirements and was as good as ordinary air. A man breathing atmospheric air (21 per cent. oxygen) exhaled a mixture of gases containing 16.5 to 17 per cent. of oxygen and 4 to 3.5 per cent. of carbon dioxide. The reason this was expelled was not because more oxygen could not be taken by the lungs, but, because the depth and frequency of breathing were unconsciously regulated to keep the carbon dioxide within the lungs at 5.5 per cent. The slightest increase in the carbon dioxide was sufficient to excite the nervous center, which regulates breathing, to increased activity.

To prevent explosions, Dr. Harger suggested the taking of flue gas, purified from all harmful ingredients, the mixing of them with fresh air entering the mine workings in the proportion of one part to 30 of fresh air or one part to 15 for the most dangerous mines.

In the discussion which followed, the colliery managers and engineers took a prominent part, and they argued that there is often a great difference between laboratory tests and conditions in extensive workings. What effect would the reduction of oxygen have on workings far removed from the shafts? Must we unlearn all that we have learned about ventilation and the need for a maximum percentage of oxygen? Dr. Harger in reply stated that on the first application he would reduce the oxygen to 20 per cent. in ordinary mines, while in the dangerous mines he would reduce it to 19 per cent.

Precise Surveying for a Connection

By Frederic C. Noble*

Every coal engineer, at some stage of his career, is called upon to "make a survey connection." These connections are most often of some important haulageway, and it is essential that the results be comparatively accurate. This paper describes the ultimate refinement in work of this character as applied on one of the most important engineering projects of the day.

The following is a description of the surveying methods used in constructing the tunnel under the East River (at New York) between South Ferry, Manhattan, and Joralemon St., Brooklyn. This tunnel was begun in March, 1903, and was opened to traffic in January, 1908. The tunnel consists of two parallel single-track tubes, of the usual cast-iron ring construction having an interior diameter of 15½ ft. The distance between centers is 28 ft. under the river and 26 ft. in Joralemon St. The Manhattan headings were driven from a double shaft in Battery Park. The Brooklyn headings were driven from two shafts (one over each tube) in Joralemon St., about 1200 ft. from the water front. Between the shafts, a distance of about 6000 ft., there are three tangents in the tunnel line, the middle or river tangent being joined to the Manhattan and Brooklyn tangents by curves of 4500 ft. radius (Fig. 1).

The intersection of the south tube lines of the Joralemon St. tangent and the Manhattan tangent produced was located on the roof of a dock warehouse at the foot of Joralemon St. It was necessary to determine the exact distance between this intersection and a point of known stationing on the south tube line in Manhattan, and this required a triangulation survey. It was apparent that no base line of suitable length could be laid out in the vicinity that could be measured directly from end to end as one of the sides of the triangulation system. Although the ends could be located on roofs, so as to be seen from each other, the measurement had to be made along a broken line.

The Triangulation System

A reconnaissance showed that a suitable base, about 3000 ft. long, might be obtained on the Brooklyn waterfront north of Joralemon St. The southern end of the base chosen was the above-mentioned intersection of the south tube lines. Its northern terminus was also located on the roof of a warehouse. Each of these points commanded a view of the other and of the adjoining waterfronts of Manhattan and Governor's Island, and, accordingly, were suitable for triangulation stations. In Manhattan, because of intervening buildings, it was found impracticable to locate a triangulation station on the south tube line in the vicinity of the shaft so that it would be visible from all the other stations. On this account two elevated points on the roofs of near-by buildings, one on each side of the Manhattan tangent, were chosen as triangulation stations, and carefully referenced to the point of known stationing on the south tube line, which was visible from them. On the northerly sea-wall of Governor's Island, two triangulation stations were chosen which marked the extremities of a shorter base used two seasons before in making a preliminary triangulation of the tunnel line. It was desired to include this base in the system so as to have an independent check on the measurement of the Brooklyn base.

The foregoing arrangement gave four fairly well proportioned quadrilaterals, the Brooklyn base forming one common side. In the system there were no angles of less than 26° or more than 78°, and the ratio of length of base to the distance sought was about 1 : 1½. By having four

Note—Abstract of a paper (copyright) presented before the American Society of Civil Engineers (New York), Feb. 7, 1912. The paper is entitled, "Notes on a Tunnel Survey," by Frederick C. Noble, and is published in the December issue of the "Proceedings" of the Society (p. 1302).

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quadrilaterals from which to calculate the coördinates of the Manhattan points, referred to the Brooklyn base as the axis, it was thought that any material error in the angular work could be detected, and this would give a measure of the error to be regarded as unavoidable.

Measuring the Base Line

The base line traverse was measured with a 50-ft., flat, steel-wire tape, provided with a spring-balance handle containing a level bubble, thermometer, and adjustment for temperature correction. It was marked with nicks at each end for use with plumb-bobs. The tape was tested for absolute length by comparison with a standard tape of known error, as determined by the Bureau of Standards at Washington. Measurements were made on cloudy days, or during early mornings in the shade, to secure uniform temperature conditions. The line was marked in advance every 50 ft., and paper pads, ruled with a longitudinal line, were weighted down at these points, so as to relieve the head chainman of the distraction of getting line from a transit. Each measurement was made by simultaneous plumbings at the ends of the tape, which was held level. The forward point was marked at the average of a number of trials. For each series of measurements a fresh sheet of the pad was used. With a tape of this kind the difficulty of steady and precise plumbing was such that no individual measurement could be depended on to less than 0.003 ft., or 1 in 17,000.

No doubt a better method consists in using a longer tape, supported at short intervals, with a tape-stretcher; and measuring directly, without plumbing, on portable stations, as was done later in connection with other tunnel surveys in New York. However, with care, it was found that the errors were not cumulative, and, in a distance of 2880 ft. measured in this way, the variation between the mean and the greatest extreme of several measurements was only about 1 in 100,000. The ends of the line measured on the docks were connected to the triangulation stations on the roofs in two different ways, in order to avoid repeating an error. The points on the copings were transferred to the dock level by casting down intersecting lines of sight from three transit set-ups. As a further check, an independent traverse, closing on the same points, was run by a different party in the marginal street back of the warehouses, and this gave a result agreeing with the dock traverse to 1 in 150,000.

Instrument Work

The triangulation sights were octagonal pine poles, 2¼ in. diameter and 8 ft. high, painted in alternate bands of red and white. These could be bisected readily, and gave no sensible difficulty from phase, because of the comparatively short range and the cloudy weather selected for instrumental work; but it would have been better practice to use higher targets with wide, flat vanes, set alternately at right angles.

The angles were read separately by two observers, with different instruments. These were ordinary engineers' transits, reading to 20 sec. on a 6¼-in. limb. The eight angles of a quadrilateral were measured separately by successive additions upon the limb. The entire angle at a station was also read, as a check on the sum of its components. To avoid bias, the angles were started at random near zero. Turnings were made, accumulating from left to right, until the sum became as nearly as practicable 360°, or its multiple. Reversing the telescope, and setting on the right-hand target, the same number of turns was made from right to left until the sum was diminished to near the original reading. Both verniers were read at the beginning, at the middle, at intermediate points, and at closing. In case an angle failed to close nearer than an average of 4 sec. to each turning, the result was discarded and the angle was read again.

When the third angle of any triangle of the system had been read, the angles were added, and if their sum varied from 180° by more than an average of 5 sec. for each angle, the three angles were read again. The quadrilaterals were tested in like manner. It was found necessary to read over only one triangle, and in this case the trouble was located at a station where the conditions for observing had been less favorable than elsewhere.

In comparing the observed angles, it was noted that the direct reading of an angle was generally greater (by 2 or 3 sec.) than its value as found by taking the difference between two angles; and that, at the end of an observation, the closing reading was nearly always greater than the first. As this pointed to a small persistent error, it was seen that it would have been a better program to measure each angle both directly and by its 360° complement, and to take the mean.

Computing and Checking the Triangulation

The set of observed angles of each quadrilateral was adjusted by the method of logarithmic residuals, based on the principle of least squares, according to Johnson, and using the rigid method of making the side equation correction. The angles read by each observer were adjusted separately. The corrections for spherical excess and reduction to sea-level were omitted as insignificant.

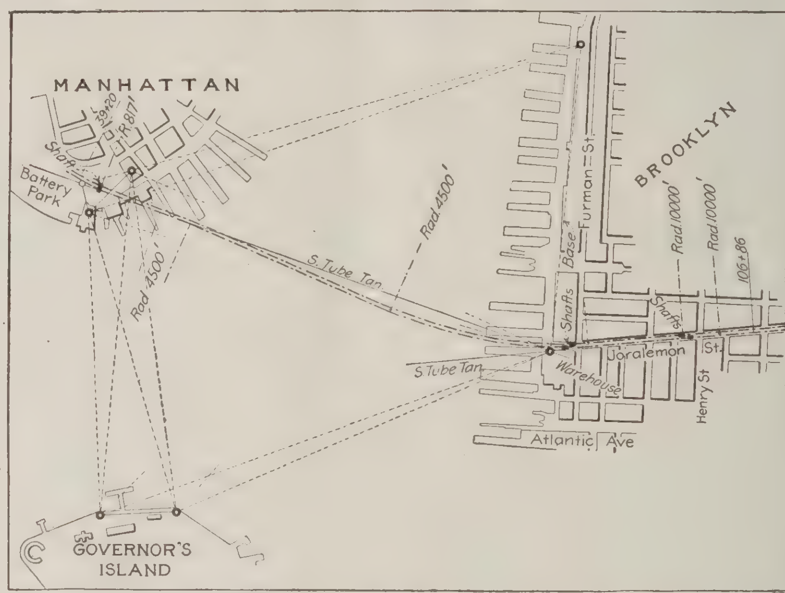

Fig. 1. Plan of Triangulation Survey for the East River Tunnel from the Battery (New York) to Brooklyn

The four quadrilaterals formed four pairs, each with a common triangle. These relations would give rise to additional equations of condition, and the simultaneous adjustment of all four quadrilaterals would be possible, theoretically. However, this was not attempted because the refinement would not pay for the effort, and because it was desired to compute each quadrilateral separately adjusted, so as to gain a practical idea of the effects of error in the angular work.

For the purpose of comparing results, the coördinates of the Manhattan and Governor's Island stations, referred to the Brooklyn base, were then computed for each of the four adjusted quadrilaterals of each observer. On plotting to full size it was found that for any point the various positions thus computed fell within the section of the target pole. It was seen that considerable time and labor would have been saved (and with sufficiently accurate results) by using any one quadrilateral, but the advantage of

learning in this way the probable extent of errors from all causes was thought to warrant the extra trouble.

The sides of the triangle formed by the two Manhattan triangulation stations and the point of known stationing in Battery Park were then measured, and the coördinates of the latter point were computed from those of the other two. The distance triangulated for was then determined. The computed length of the Governor's Island base (about 700 ft.) was found to agree with its original measured length within 0.016 ft., or much less than the probable angular error would account for.

The stationing of the Brooklyn intersection of the south tube tangents then being known, base-tape measurements were made from this point to the Brooklyn shafts. Stationing was transferred to the tunnel by plumbing in the shafts. All measurements, above and below ground, to determine stationing in the tubes, were made with the same kind of tape as that used for measuring the base, and in a similar manner. When the first headings were connected, the measured distance was found to be about 0.02 ft. short of that calculated. The discrepancy was somewhat more than had been expected, but may be adequately accounted for as combining the error in angular work with the error due to the difference in conditions, with the apparatus used, between taping in the tunnel and taping the base line on the surface. Its effect on the results of the surveys for alignment and grade, however, was very slight.

For establishing the Manhattan tangent alignment, there was no point on line in Battery Park, near the shaft, that was high enough to afford a sight to Brooklyn over the intervening ferry houses. For this purpose, two towers, about 35 ft. high, one on each tube line, were erected about 150 ft. west of the shaft. From these it was possible to look across the river over all obstructions and see targets on the warehouse roof in Brooklyn set on the Manhattan tube lines prolonged. The towers were built as triangulation towers usually are: with an interior tripod of three 8x8-in. timbers rigidly bolted together at the top and braced. This was inclosed within, but nowhere touching, a four-post tower braced on all sides and supporting a platform for the observer a little below the top of the tripod.

Plumbing the Shafts

Line was transferred to the tunnel in the following manner: A transit, mounted on a trivet, was set on the tower tripod on the tube center line, as plumbed up from a hub under the tripod by several reversals of another transit set on the center line a short distance away. The tower transit, fore-sighting on the Brooklyn target, set (by repeated plungings) a point on center line on the surface, about 10 ft. beyond the shaft. On this point a transit was set up, with its plumb-string in the mean position of the several settings; then, fore-sighting on the plumb-string of the tower transit, it aligned two plumb-wires suspended in the shaft.

Steel piano wire, 0.02 in. diameter, was used for this purpose. It was wound on brass reels 9 in. diameter. The reels were set, with their axes across the line, on stringers attached to the head-frame posts, high enough to permit sighting on the wire and to fore-sight by merely changing the focus. As the wire left the reel it ran over a small grooved wheel on a threaded axis, turned with a thumb-screw, by which slow lateral adjustment could be given. The wire was kept taut by a 20-lb. weight suspended in a pail of water at the bottom of the shaft.

The wires were shifted laterally until the vertical hair exactly bisected the plumb-string fore-sight and both plumb-wires. When this condition was reached, a transit set up in the tunnel below (as close to the wires as practicable) was shifted laterally until its vertical hair exactly bisected both wires. Then reversing, it threw the line forward, setting two or more plummet-lamps hung from verniers reading on graduated brass scales attached to the roof of the tunnel. Resetting on the wires, another set of readings was taken. Two more sets were taken in like manner with telescope reversed. The wires were then shifted and reset by the upper transit, and the previous operations were repeated for four more sets.

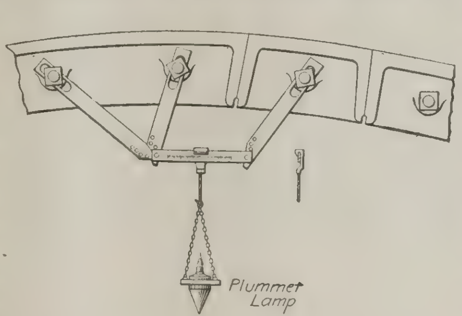

Fig. 2. Scale for Alignment of Tunnel

The whole of the foregoing operations was then repeated, after interchanging transits at top and bottom, turning the water pails containing the weights partly around, shifting the wires, examining them to see that they hung free, and interchanging the members of the party. This work of plumbing the lines down the shaft was usually done on Sundays, when the cages were not running.

The base between the wires was about 10 ft. at the Manhattan shaft and 15 ft. at the Brooklyn shafts, and in each case was as long as permitted by the width of the shaft. On account of the shorter base in Manhattan, and the extra operation there in transferring line, opportunity was taken, when the headings were afterward extended west from the shaft, to check the line by plumbing through a vertical 6-in. pipe sunk from the surface to the tunnel at a point on the center line of one of the tubes, about 130 ft. from the shaft.

Method of Aligning

The alignment scales were brass bars, 1 in. wide, ¼ in. thick, and 10 in. long, graduated to 0.01 ft. They were connected by three flat iron bars to the bolts of the tunnel lining at the roof (Fig. 2). The scales were read to 0.002 ft. by a sliding vernier from which a plummet-lamp was suspended.

The line established on the scales near the shaft, as the mean result of many days' droppings, was produced by repeated runs read on scales set at intervals of about 200 ft. These runs were made by different observers, and using different transits, until mean readings were well established on the advance scales. Where the tube was on a curve, the scales were placed on tangents as long as could be obtained, and usually near points of intersection. The angles at these points were carried forward by repeated turnings on the forward scales.

When it became necessary to carry the line through a lock, the transit was placed on a trivet on a timber wedged across the lock at the forward end, where it had the support of the bulkhead wall. It was then lined in with the last two scales, the forward one having been located as close as practicable to the lock, and a reading was taken on a paper scale set inside the lock over the outbord door. The lock was then taken in, and, before throwing the line ahead, the paper scale was read again to detect any possible movement due to change in pressure. No trouble was ever experienced on this account, however, and when the bulkheads were advanced the lines thus locked through checked quite satisfactorily with lines carried through in free air.

To assist in aligning a transit with two given points, a very useful device was furnished by the instrument maker. This consisted of two sliding plates, which were attached between the transit base and the tripod head or trivet, and permitted considerable range of lateral movement by a slow-motion screw.

Giving Level Points for Grade

Grade was established between the two sides of the river as follows: Level runs were made from the shafts on each side to benches under the Brooklyn Bridge on the river side of each tower, at which point the river is much narrower than at the tunnel line. Levels were set up on each side, and simultaneous reciprocal readings were taken a number of times. The instruments were then interchanged and the readings repeated. In this manner errors due to refraction, curvature, and imperfect adjustment were compensated.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

In the conduct of a great industry like coal mining, which requires the services and time of nearly a million men in the United States alone, there must be all kinds of individuals to handle the diversified work in hand. It is necessary that thousands of humans labor in the dark depths mining and loading coal; other thousands oversee the manual work and direct the physical effort of the mass of workers along intelligent lines; a smaller number of men control expenditures and pass on the plans formulated to secure efficiency in operation. All of these people, whether workmen or officials, are directly connected with the production of coal, and are specified as being in the operating end of the business.

There are other lines of endeavor, however, that bear a direct relation to coal mining, and which are absolutely essential to the successful advance of the industry, although the effort put forth cannot be measured in tons of output. These latter workers are the teachers and thinkers who spend the greater part of their time in the compilation of facts and the manufacture of ideas for the operating end to test out. It's the old, old story of theory as related to practice, and the futility of any effort based on either one, without reference or attention to the other. If all the brains of our industry lay centered in the strong arms of the sturdy toilers who mine the coal, the business as a whole would soon reach a sorry pass. But on the other hand, if all the strength needed to get the fuel out of the ground was mental horsepower, the final outcome would be no less disastrous.

We have written a number of sketches of prominent men actively engaged in the production of coal, and it is about time that something is said concerning the teachers and thinkers who work just as diligently and as effectively for the good of the industry. Few men are more widely known to coal people than H. H. Stoek, who has devoted most of the working hours of his life to the mental betterment of the men engaged in the coal business.

After graduating from the High School in Washington, D. C., in 1883, Professor Stoek entered Lehigh University, South Bethlehem, Penn., graduating in 1887 with the degree B. S. in Mining. He spent the following year doing post graduate work, for which he received the degree E. M. (Engineer of Mines).

H. H. Stoek

During the summer of 1885, while yet a student, Professor Stoek acted as assistant in the Department of Mineralogy, at the National Museum in Washington. During the summer of 1887 he filled the position of Government Inspector of Dredging Work on the Thames River, Conn. From June 1888 to January 1890, he was assistant engineer for the Susquehanna Coal Company, Wilkes-Barre, Penn., being engaged in surveying, general underground and office work.

In January, 1890, H. H. Stoek accepted a position as Instructor in Mining, Metallurgy and Geology at Lehigh University. From September 1893 to January 1898, he acted as Assistant Professor of Mining and Metallurgy, Pennsylvania State College. During the vacation months, while teaching at Lehigh and Pennsylvania State College, much time was spent in personal investigations and professional work. Among other things, a report was made upon iron properties in western North Carolina.

From January 1898 to 1908, Professor Stoek served as editor of *Mines and Minerals*, Scranton, Penn. During this time he visited most of the mining regions of the United States, making a careful study of the coal mines in practically every district, together with visits to the metal mines of most districts, excepting those on the Pacific Coast. This work was done in the interest of his paper, and the results of his investigations in the different fields were published from time to time.

Professor Stoek's editorial experience has not been confined solely to his work for *Mines and Minerals* but has covered a broad field of activities, which included the editorship of the "Coal and Metal Miners' Pocketbook," Fulton's "Coke," "Examination Questions for Certificates of Competency in Mining," and Lake's "Prospecting for Gold and Silver," also a number of volumes on coal mining comprised in the complete course of the International Correspondence Schools.

He is author of the chapter on "The Economic History of Anthracite," which forms a part of "The Economic History of the United States," being gotten out by the Carnegie Institution of Washington, D. C., under the general editorship of E. W. Parker. "H. H." was also in charge of waste in mining anthracite for the United States Geological Survey, when the Bureau of Mines was created. His work along this line was never completed because of the change in administration when the Mining Bureau was formed.

During the time that he was engaged in editorial work, Professor Stoek gave a number of special lectures on mining at Cornell University, Pennsylvania State College, Sheffield Scientific School and the Brooklyn Polytechnic Institute. On leaving *Mines and Minerals* in 1909, he again took up educational work, having been appointed Professor of Mining Engineering at the University of Illinois.

Since locating in Illinois, "H. H." has taken an active part in the development of first-aid and mine-rescue work. He is a member of the Illinois Mines Investigation Commission; secretary of the Rescue Station Commission; member of the First Aid Committee of the National Red Cross, and was special representative of Governor Deneen at the American Mining Congress last year. He is also a past president of the Coal Mining Institute of America, and in addition to his present duties as Professor of Mining, is engaged in an extensive coöperative investigation of the coal-mining industry of Illinois, in connection with the State Geological Survey and the United States Bureau of Mines.

During the past two or three years, Illinois has made more rapid progress in the matter of first-aid and mine-rescue work than any other state in the Union, and much of this advance has been due to the well directed efforts of Prof. Stoek.

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Of this issue of Coal Age, we will print 8000 copies. No copies will be sent free regularly. There will be no back numbers. The figures shown here each week represent live, net circulation.

This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

Contents

COAL AGE

The Hookworm

Every little while comes the suggestion that ankylostomiasis is likely to become chronic in American coal mines, as a result of the entire absence of sanitary precautions. There seems little danger of its general prevalence, however, until we begin to exploit coal beds much deeper than those which are worked at the present time.

We await with interest what the Bureau of Mines may have to say about the *ankylostoma duodenale,* the nematode which is colloquially known as the hookworm, or hairworm, and which is somewhat different from the hookworm of the South, though quite closely allied.

The Bureau and Marine Hospital Service of the United States have been investigating the matter, and state that "the hookworm has been found as a miners' disease in a number of different localities of the United States." "It is," the director of the bureau remarks, "important that the work of investigating the progress of the disease should be extended more rapidly, because of the fact that the health conditions, as well as the risk of accidents, may be influenced by conditions susceptible of easy improvement."

It is this extract from the report made to the President, which alone justifies the discussion of the disease in this coal journal, for the malady does not seem likely to menace the American coal worker, and should normally escape reference in these columns. The disease is the result of the ravages of a worm which infests the human intestines and feeds on the human blood. The female of the species lays some millions of eggs.

These eggs ungerminated pass out of the human body in the feces, being prevented from development by the internal heat of the digestive organs (96 deg. F.), and by the absence of air. The ova will not germinate at any temperature exceeding 86 deg. F., nor will they develop when they are excluded from the atmosphere.

According to a report made by Sir Cecil Hertslet to the British government, based apparently on observations by Dr. Herman, the ova of the ankylostoma may be transformed into worms if the temperature where the feces are deposited exceeds 57 or 59 deg., and is less than 86 deg. F.

Dr. Stiles, however, in the famous bulletin 10, issued by the Hygienic Laboratory, suggests that at the lower limit the action of germination is slow and feeble, for he says that: "At a temperature of 79 deg. F., the embryo may form and escape from the shell in 24 hours. Lower temperatures retard development, so that at 70 or 72 deg. F. the embryo may not escape for 36 to 40 hours." He has, however, nothing to say about the germination at such a low temperature as 57 or 59 deg. Fahrenheit.

A mine, therefore, which is warm is likely to favor the development of the germ. If, however, the mine is cooler and quite moist, it is probable that both coolness and moisture will destroy it. While yet an egg, or even in the first stage of its development, as a living worm, the growth of the ankylostoma is retarded by the presence of moisture; much water will actually kill the eggs. But in the second stage of its multiform life, it takes kindly to water, and the worms have been kept in that medium for 30 days by A. Looss, without loss of activity.

Hence, in a cool mine, where the fetal development is slow and the air moist enough to cause the feces to deform and flow, the environment for the germinating worm must be distinctly unfavorable, especially when the temperature lengthens the time of hatching, enough to permit the mass to deliquesce. And in a hot mine, like some of our deeper metal mines, dry as is an oven, the germ will be killed by the heat, and should it reach the second stage of development, it will be killed by drying up.

The danger is greatest, therefore, in mines of temperatures from 70 to 86 deg. F. The average drift mines are not usually so warm, unless they pass under unusually heavy cover. In several West

Virginia mines, even though steam is used in the intake to moisten the air, the heat of the workings does not anywhere exceed 59 deg., though the covering strata aggregate nearly 600 ft. But in shafts of the Middle West, temperatures rule high and records have been taken, showing 60 to 78 deg., and doubtless equally high temperatures may be found in the anthracite mines.

In these latter the disease may possibly take hold, but even there the risk is small, for it appears that the egg of the worm does not hatch out in the open air of England, Belgium, France or Germany, and temperatures there are as favorable as in the shafts of Illinois or northeastern Pennsylvania.

There the disease is present in the mines ready to spread to the surface. The eggs are continually coming to daylight, transported by a half dozen different media—water, coal, the clothes and bodies of the men and their feces, etc. Some of the habits, that of wearing clogs, should make the spread of the worm easy. Nevertheless, in northern Europe the ankylostoma is purely a miners' pest; it does not attack his family.

We can understand, perhaps, why the hookworm does not extend northward from the Carolinas, Georgia and Florida, because an exposure to 34 deg. F. for one or two days will destroy the ova. Consequently, the disease could only spread in the north through the mines, which it seemingly cannot invade. But in northern Europe, it already has made the mines its habitat. The workings act as winter incubators, and the whole of the out-of-doors will serve for hatcheries in the summer if the summer temperatures of those countries be favorable. That anemia, cachexia and pyrosis do not affect the outdoor workers of northern Europe must be because the conditions for incubation in those countries are not favorable enough that such incubation can generally take place even in the summer months.

From this fact we draw no little hope, confident that hookworm will not be a vocational disease of miners in any extended measure, but we still look forward with much interest to what will undoubtedly be the conservative statements of the Bureau and the Hospital Service. Our mines are getting deeper and therefore warmer, so perhaps this scourge is truly to be feared.

The Pittsburgh Rate Case Again

The coal operators have never before faced a more callous or stubborn attempt at usurping their rightful prerogatives than that exhibited in the stand taken by the railroads in the Pittsburgh-Lake rate case. While technically within the letter of the law, the skillful subterfuge by which the roads evaded complying with the manifest intent of the Commission's rulings, is so obvious as to warrant prompt and vigorous action by the government.

It is clearly evident that the carriers regard the efforts on the part of the coal industry to obtain some control over the markets as a presumption which they will oppose on every conceivable ground. The very magnitude of the case gives it a particular significance, also the fact that it will doubtless be quoted as a precedent in all future rulings of a like nature. For this reason the decision will be bitterly contested by the railroads.

Practically coincident with establishment of the new Pittsburgh rate, the carriers put in effect a lowered tariff on the West Virginia product which to all intent and purposes completely nullified the decision of the Commission. Thus the differential condemned by the Commission and that reëstablished by the railroads in lowering the rates from West Virginia were, respectively: Pocahontas and Tug River district, 33¼c. against 34c.; Thacker and Kenova district, 18¼c. against 19c.; Fairmont, 8¾c. against 12c. Not only were the findings of the Commission rendered void, but a still more pronounced differential against the Pittsburgh operators created.

That these machinations of the roads were premeditated and the way paved for their successful consummation is not to be questioned. Both the Norfolk & Western, and the Baltimore & Ohio, during the course of the original hearing, requested the Commission to sanction an increase in the rate prevailing at the time. This was apparently a mere sham since, after vigorously maintaining the necessity of such an advance. they not only declined to establish it, but the latter road went even further by making a reduction.

The Commission found, in its ruling in this case, that the carriers had established the then existing tariff "in order to let certain competing coal fields into the Lake trade," and when fixing the new differential said further:

> In arriving at this conclusion we are not unmindful of the fact that these rates may deprive the shippers from the Pocahontas and Thacker (Kenova) fields, along the line of the Norfolk & Western, of their present market.

It is thus clearly evident that the basic intent of the Commission's ruling was the establishment of a new differential. That they refrained from making this even greater may be ascribed partly to the testimony of the carrier's chief witness, who swore under oath that: "In his opinion, when that differential is fixed it will be observed until the lines in interest can get some permission from proper authorities for changing it." And partly to his statement that a conservative estimate of the tonnage that would be affected would be 60 million tons per annum, exclusive of that directly involved in the Boileau case.

If such testimony as this could be given any weight, the Commission displayed an entirely justifiable conservatism in the differential upon which they decided. But since subsequent developments have proved conclusively that this testimony is not to be relied upon, and the railroads have insolently ignored the decision of the Commission, it appears that the time has arrived when it should either justify its existence or be dissolved.

Under the Mines Act of Great Britain, the workmen are empowered from time to time to appoint two of their number, who are practical working miners, to inspect the mine. The persons so appointed must be allowed (accompanied by the manager or one or more officers of the company) to go to every part of the mine and inspect the shafts, levels, planes, working places, return airways, ventilating apparatus, old workings and machinery. Every facility must be afforded for the examination and a signed report of the result of the inspection has to be recorded in a book, kept at the mine for that purpose. Should the report state the existence or apprehended existence of any danger, the manager is required to cause a true copy of the same to be sent to the mine inspector of the district. This privilege is today being more generally taken advantage of by the men.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Standards in Coal Washings

I was very much pleased to note the comments in the May 25 issue of COAL AGE, referring to my article in *Mines and Minerals,* on "Standardization in Coal Washing."

I hope I will not be misunderstood in this matter as it was not my object in publishing those data to make the claim that my method of determining washery efficiencies was the only one that could be employed. I have made a careful study of this subject for a number of years and have long felt the need of some method of actually determining the efficiency of a coal washery. I have often heard the term "efficiency" used in connection with coal washing but have never read anything that would indicate, nor have I been able to get others to state, in just what sense they used this term. In fact, I have never known anyone to state that a 65% or a 90% efficiency had been obtained, but in the use of the term, it is always referred to as a "high" or a "low efficiency."

There are several reasons why I feel that my method is a good one. One is that, by the use of my formulas, every item of a test can be checked and nothing assumed. This in my opinion would indicate that the method is along the proper lines at least. Another is that, as you mention, the separations are made in an exactly similar manner to that which must be employed in the actual washing of the coal. There may be some rare cases where the refuse matter is lighter than the good coal but in such cases the float would be considered as refuse and the sink as coal. My formulas could still be used in such cases by rearranging the terms to suit the conditions. Other rare cases might be found where the refuse material and coal were of the same specific gravity, but that is just the point I wish to emphasize as the valuable part that the float test plays in checking up the work done by any washery. For is it not true that, were such a difficulty met in the float tests, and a separation of the impurities from the coal impossible, it would also be impossible to obtain a separation on any form of washing machine, since they all depend upon a difference in the specific gravities to make their separation?

Some claim that in making float tests a number of gravities should be used so that the coal sample will be separated into good coal, bone coal, slate, rock, etc. I have done this same thing at times though I cannot see that such data have any great value. In washing coal, one first determines just how high a percentage of ash can be permitted for the particular proposition in hand. For instance, in a coking proposition where 14% ash is absolutely the limit for the coke, and experiment has shown that an 11% ash coal will produce 14% ash in the coke, there is no object in producing a washed coal of a lower ash content than 11%. Of course, if a 12% ash coke will sell better or for a higher price, and the loss by refuse in producing a lower ash washed coal does not amount to more than the increased profit of the 12% coke over the 14%, then a 12% coke should be made and the coal washed to suit. It is therefore seen that one must first determine the *limit* of ash content before anything else is done and everything therefore is based upon that figure.

What must be known is, how much bone coal can be thrown with the low ash coal and not raise the ash content of the washed coal above the limit placed upon it. For instance, if the low ash coal (say everything below 1.35 sp. gr.) has an ash content of 8%, and the bone coal 15%, and our limit is 11%, how much of the 15% ash product can be mixed with the 8% ash coal to produce a final product having an 11% ash content?

By separating out all of these different grades as mentioned, and recording their percentages and their ash contents, such data could be calculated. But it is easier and quicker to simply run a series of float tests for the raw coal as suggested in my article and in this way determine at once just what specific gravity bath will produce a float coal of the desired ash content. This, then, is what I term the "permissible bath" and is used for all tests on that coal, or the refuse and washed coal from it.

There is just one point upon which I have been a little in doubt and have as yet been unable to find any satisfactory solution. As stated before, a limit must be placed on the ash content for every separate proposition and as this limit would vary to a considerable extent, it might seem to make it impossible to compare the results of the work performed by different plants on exactly the same basis. Still, I find that this does not make a very great difference and in fact I have about come to the conclusion that it has no effect at all as the efficiencies in every case are based upon the comparison between the actual separation as obtained by washing, and the perfect separation as obtained by the float test. This, I find, seems to eliminate the apparent error as, for instance, a jig of one type producing 60% efficiency on one coal as against a 70% efficiency of another type of jig on another coal, the latter will also only produce about a 60% efficiency on the coal the other machine is working on.

There is another item to which I wish to call particular attention. I have found that very few engineers make float tests of the washed coal, the refuse only being tested. It is very important that such tests be made on the washed coal also, for if there be any pieces of refuse matter, particularly pieces of the very high ash slates, etc., present in the washed coal, they tend to raise the ash content much more rapidly than would a greater quantity of lower ash bone coal. In coking propositions they also have a very detrimental effect on the coke which is not produced by a larger amount of the bone coals, as they act as heat absorbers instead of creating any heat in themselves and will cause greater cross-fractures and fingering of the coke. It is therefore desirable that there be no incombustible pieces in the washed coal and that the float tests of the washed coal should be taken into account in determining the total efficiency. Also, whenever there is any sink obtained from the permissible bath test of the washed coal, it will be found that the percentage of washed coal is lower than it should be, as determined by the permissible bath test of the raw coal.

I do not think I need add anything further to that portion of my paper treating upon the subject of loss of "good coal" in the refuse, or as to what constitutes "good coal." That which I have just discussed regarding the mixing of as much bone coal as possible with the low ash coals covers this matter fully, for, most certainly, any coal, whether bone or low ash, which was floated on the permissible bath in the raw coal tests is "good coal."

I hope those interested in this subject, and who care to take up the discussion in the columns of your journal, will first study carefully all the data presented in my paper and consider it from all angles, as I have found it a matter which cannot be decided upon hurriedly. I am most certainly willing and glad to

change my views if anyone brings forth a better method or will show wherein I am wrong. I do not consider a plain statement all that is sufficient, but think the reasons should be given and, if possible, a better way suggested. I hope my paper may result in bringing out some ideas that will facilitate the adoption of a standard method of calculating washery efficiencies and make it possible for all engaged in this branch of engineering to understand one another more clearly. The standardization of the form of report would also, I feel sure, greatly assist the coal-company officials to understand more thoroughly the work being done by their washeries and make it possible to more accurately compare these results with those of other companies.

G. R. DELAMATER,
Consulting Engineer.
2357 Cherry St., Denver, Colo.

Purification of Feed Water

I have noticed the following statements occurring in recent issues of COAL AGE; namely, in the last paragraph, p. 804, Mar. 30, " . . . . and the sulphates are precipitated by soda ash"; and again, in the second paragraph, p. 1002, May 11, "Moreover, the soda-ash solution, which removes the sulphates, chlorides, etc."

The author of these statements makes it appear that the sulphuric acid of the sulphates in the water treated, is precipitated by the soda ash as sodium sulphate, and thus readily removed from the feed water. My experience in the soda-ash treatment of mine water fails to corroborate these statements of your correspondent. In treating a permanent hard water with soda ash, the reaction may be expressed by the following simple equation:

$$RSO_4 + Na_2CO_3 = RCO_3 + Na_2SO_4$$

in which "R" represents the basic metals combined with acid. The resulting salts are carbonates of "R" and sulphate of sodium. The carbonates are precipitated and can be easily removed from the water by settlement or filtration; while Na_2SO_4 being a soluble salt, is not removed from the water by these methods. The soda-ash treatment simply causes a transformation of the sulphates of all other metals into sodium sulphate. The advantage in the process lies in the fact that sodium sulphate is easily soluble in water and does not form scale in the boiler. The hard scales formed on the plates and tubes of boilers consist chiefly of sulphate of lime, etc., which adhere very firmly to the boiler plates. The formation of such material in a boiler is detrimental to the economic operation of a plant, since it is a poor conductor of heat; and the rate of combustion must be increased, which causes overheating of the plates and tubes of the boilers.

Wilkes-Barre, Penn. H. H. L.

[The sulphuric acid existing as sulphates in mine water is best removed by treating the feed water with barium hydrate, $Ba(OH)_2$; or limewater (slaked lime) $Ca(OH)_2$; and the resulting barium or calcium sulphate is precipitated with the basic hydrates formed.—EDITOR.]

A Mine Fire Incident

The recent discussion on mine fires in COAL AGE calls to mind an incident that is of value, as showing the need of greater intelligence and experience on the part of mine officials.

At the close of the day's work, a miner fired a shot that presumably started a fire in room No. 19 off the 4th left-butt entry. The room was a double room, having two necks or openings, with a road on each side of the room, and was driven 175 ft., on a 2-per-cent. upgrade. There was a crosscut half way up, between rooms 18 and 19, and another on the opposite side, between rooms 19 and 20, about 60 or 70 ft. from the face of room 19 and in the face of room 20. The accompanying diagram or plan shows the position of the three rooms, Nos. 18, 19 and 20; the location of the fire marked *F*, at the face of room 19; direction of the air currents in the entries and rooms, indicated by the arrows; etc.

PLAN OF ROOMS, SHOWING LOCATION OF FIRE

The fire was not discovered until the fireboss, making his rounds the next morning, entered the 4th-left heading and found it so filled with smoke that he could not proceed. He retired at once to the 3d-left air course or entry and made his way through a manhole marked *H* in a nearby brattice, to the 4th-left heading. Seeing smoke coming out of room 19, he went up room 20, and looking through the crosscut at the face, discovered the seat of the fire, which was evidently beyond his control. Returning to the surface, a mile or more, he notified the mine foreman, who, with the mine engineer, went in at once, reaching the fire about 6 a.m.

After a brief consultation, they decided to flood room 19 by building a dam in the crosscut between 19 and 20, and another in the neck of room 19. This was Friday morning. Except for two or three entries on the return of the fire, the mine worked all day as usual. The foreman ordered cement and other material taken in to the fire, intending to build the dams of concrete made of cement and broken coal, egg and nut size. The work of getting the material in readiness took all day, and at six o'clock Friday evening, nothing had been accomplished in extinguishing the fire.

The heat thrown out by the burning coal was now intense, which caused a big cave at the face of room 19. For several days past, the miners in this room had thrown back their surplus coal in a pile. This coal was burning under the fallen roof, which covered it about 5 or 6 ft. deep. The mine foreman seemed at his wit's end to know what to do. The engineer and about a dozen men were there waiting for some one to tell them what to do.

Finally, the foreman sent for an old, experienced miner, who had worked before in putting out fires. This man came and looked at the fire and asked the foreman what his plan was for putting it out. The miner told the foreman at once he could not "drown out" the fire as he expected, because of the crosscuts beween rooms 18 and 19. The plan was, therefore, promptly abandoned, and the miner, being given charge, soon had things moving.

Men were now set to work propping the fallen roof. A brattice was carried up the neck of room 19, as far as possible, hoping to reach the crosscut, and thus form a return for the air current, to prevent it from passing over the fire. This proved successful and a canvas was hung then in the heading, between rooms 19 and 20, to throw the air up room 20, where it would return through the crosscut to the road in 19. This gave the men a fighting chance, enabling them to approach sufficiently close to the fire to do effective work. Soon a good stream of water was playing on the fire. Men relieved each other every 20 or 30 min. Progress was slow but sure. The fire was fought inch by inch till Saturday noon, when it was under control, and by Monday morning the fire was a thing of the past.

Republic, Ala. G. T. M.

H. B. Dixon has shown that an explosion is impossible in an absolutely dry atmosphere, and that mixtures of air and explosive gases require 5 per cent. of water vapor to produce the most violent effects.

Inquiries of General Interest

Questions are not answered unless accompanied by the name and address of the inquirer. This page is for you when stuck—use it

Squeeze in a 3-ft. Seam of Hard Bituminous Coal

I would like to obtain some information on the best method of working a 3-ft. seam of very hard coal, underlaid with from 6 to 14 in. of soft fireclay, which runs into a hard muck or clod. The cover overlying the coal varies from 40 to 300 ft. in thickness. Immediately above the coal is a hard slate overlaid with sandstone forming a hard cover that is difficult to break.

We are using the double-entry system. The rooms are driven as double rooms, having two necks to each room. There is a 20-ft. stump left between each neck or opening. The mine is an old one, having lots of worked-out territory. I wish to know if there is any way of stopping a squeeze in this mine when once started. I will be glad to give any further information if desired.

J. S. Freeman.

Corona, Ala.

A hard roof and soft bottom in coal mining are the most difficult conditions with which the miner must contend. A strong roof that does not break is a great temptation to drive wide rooms and the pillars left between them are often too weak to support the great weight thrown upon them by the extraction of the coal. To mine a seam of coal successfully, it is necessary to adopt and maintain a system of mining in accordance with the conditions as they exist. Practical experience in the district is always the best guide in determining the safe width of opening and the required thickness of pillars in room work.

In this case, assume the room necks are each 10 ft. wide, and the stumps between the necks being 20 ft. wide makes the clear width of the room 40 ft. For a hard bituminous coal 3 ft. thick, the strength of the pillars (tons per square foot) may be taken as, approximately,

$$S = 40\sqrt{\frac{w}{t}} = 40\sqrt{\frac{w}{3}}$$

The average weight of the strata is 160 lb. per cu.ft., which for a maximum depth of 300 ft. gives a roof pressure of

$$\frac{300 \times 160}{2000} = 24 \textit{ tons per sq.ft.}$$

By the taking out of the coal in the rooms, however, the pressure per square foot due to the weight resting on the pillars is increased in the ratio $\frac{w+o}{w}$ which makes the actual pressure on the pillars $24\ \frac{w+o}{w}$ tons per sq.ft.

The minimum width of pillar is then found by equating this value for the pressure on the pillars with the value for the strength of the pillars, S, found above; thus,

$$40\sqrt{\frac{w}{3}} = 24\,\frac{w+o}{w}$$

But, since $o = 40$ ft., we have, by reducing,

$$5\sqrt{\frac{w}{3}} = 3\,\frac{w+40}{w}$$

and

$$w = 1.08\left(\frac{w+40}{w}\right)^2$$

The value of w, in this equation, can only be found by trial. For example, try $w = 20$; then

$$\frac{w+40}{w} = \frac{20+40}{20} = 3$$

which, substituted in the last equation, gives

$$w = 1.08 \times 3^2 = 9.72$$

This being lower than the assumed value shows the true value of w is between 9.72 and 20. Therefore, try $w = 15$, then

$$\frac{w+40}{w} = \frac{15+40}{15} = \frac{11}{3}$$

and, again, substituting this value in the above equation, we have

$$w = 1.08\left(\frac{11}{3}\right)^2 = 14.5$$

The true value is therefore between 14.5 and 15; or, say the required width of pillar is 15 ft.

In this case, if *all* the entry stumps are 20 ft. wide, the room necks being 10 ft. wide, are driven on 30-ft. centers. This makes the width of the rooms 40 ft. and the width of pillars between the rooms 20 ft., which would certainly be ample, in this case.

If these assumptions are correct, the trouble from squeeze, mentioned by our correspondent, can only be the result of maintaining too large an open or abandoned area. The method employed is a good one. The hard roof would not permit longwall work, which but for this fact would be the plan to adopt.

Assuming the squeeze is under way, having obtained a good start, no amount of timbering will control or prevent its steady advance. The weight of the overburden is bound to travel forward until it meets a sufficient resistance for its support. A careful study of the mine map, on which should be marked exactly the affected area and the extent of the workings, will suggest the best plan to adopt in order to arrest or control the squeeze.

The plan adopted after studying the map, should consider: 1. The withdrawal of all standing timber in abandoned places. 2. A systematic drawing back of any room pillars that will divert or arrest the progress of the traveling weight. Experience is required to determine this. 3. It will be necessary to adopt means to break the roof in many places, by placing shots at suitable points in the roof. The effect of this plan will be to settle the weight on a solid bearing.

In this reply, we do not consider preventive measures, but have only outlined a method for the arrest of a squeeze already in progress. In this connection, the reply to the inquiry entitled "Methods To Be Adopted To Avoid Squeeze," Coal Age, Mar. 9, p. 719, will be of interest.

Early Coal Cutting Machinery

Can you tell me something about the early coal-cutting machines and the nature of their operations?

Du Bois, Penn. Mining Engineer.

Little seems to be known and to be on record relative to the early advances in the use of coal-cutting machines for undermining coal. The first patent appears to have been taken out in 1761 by Michael Menzies. He proposed to transmit power from an engine at the surface through a series of reach rods and chains passing over pulleys to a machine carrying a heavy pick, which was to undercut the coal. To drive these reach rods he proposed to use a "fire engine, a water miln, a wind miln, or a horse gin." By a fire engine he doubtless meant what we would now call a steam engine.

In the century following Menzies' invention more than a hundred patents were taken out having the same object. In one of the Lancashire collieries in 1847 a machine was erected by W. Story, of Gateshead. About that time or a little later the purely experimental stages of the history of "the iron man" may be said to end and the more practical stages begin.

First Machines Imitated the Miner

Fig. 1 shows an early form of coal-cutting machine. The illustration is

taken from Knight's American Mechanical Dictionary, Vol. 1, pages 580-581, published in 1877. Like many early illustrations it is in perspective and there is some difficulty in understanding the purpose and character of some of the parts illustrated. Consequently the reader will only be able to form a general estimate of the methods adopted for the effecting of results.

We quote the description verbatim from the aforesaid dictionary, in order to preserve certain quaint expressions and to illustrate some of the unreliable hopes which the early inventors held or desired to inspire in others:

"One form of the coal-cutting machine has an engine with a reciprocating piston driving a massive steel pick in any desired direction and at a very material saving in hewing or kirving. The motor-power is highly compressed air, condensed by the steam engine at the mouth of the pit and this elastic air is conveyed by slender pipes down the shaft and along the mines to the breast where the coal is being worked.

"The compressed air is pumped by the steam engine into a receiver at the pithead during the otherwise idle hours or by its surplus power when drawing up the coal or pumping out the water from the mine and is condensed to a tension of forty to fifty pounds to the square inch.

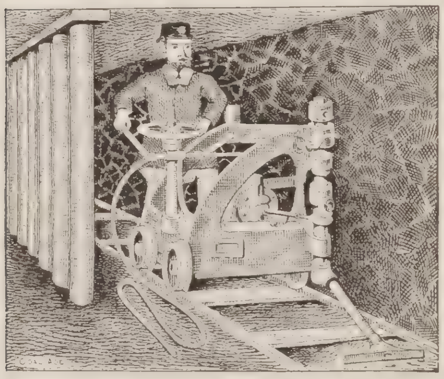


Fig. 1. An Early Coal Cutter

Air Released Is Expected to Ventilate Workings

"It is conducted in metallic pipes 4½ in. in diameter down to the bottom of the shaft and thence in pipes of smaller diameter to the workings, tubes of 1 or 1¼ inch caliber bringing it to the cylinder of the machine. This compressed air, when set free at each alternating stroke of the piston, imparts to the adjacent portions of the mine a pure dry, cool atmosphere, from a well known law of all air and gases that when expanded under relaxation of pressure they are relatively cool.

"The machine is supported by a cast metal frame of great solidity, and is of a size and weight proportioned to the coal to be cut. It is constructed to give the blow of the pick, either by the pull or push of the piston. The engine has an oscillating cylinder which has the merit of combining compactness of shape with but little complication of working parts.

"The machine rests upon flanged wheels and is propelled either backward or forward by a wheel and screw on a ratchet and pinion attached to one side of the engine. On the opposite side is a valve screw for regulating by hand the access of air to the engine. When working, the man seated upon the little stool in the rear of it moves the ratchet-screw connected with the gearing of the under-carriage, and thereby propels the whole machine along the little railway or tram laid parallel to the front of the coal seam, a small distance equal to the longitudinal nip or bite of the pick.

Machine is Required to Traverse Breast Thrice

"One machine, working 90 blows of the pick per min., discharges, of condensed air, about 100 cu.ft. per min., which immediately becomes 300 cu.ft. of cold air at the normal density and each machine is competent to supply from 12 to 15 per cent. of the ventilation required at the heading; the air being perfectly fresh, pure and cool and afforded precisely at the localities where the workmen are most in need of such atmosphere. When working at 120 picks per minute, the machine cuts an inch at each stroke 20 inches deep, 2½ inches wide; a second traverse deepens it to 30 inches and a third to 36 inches."

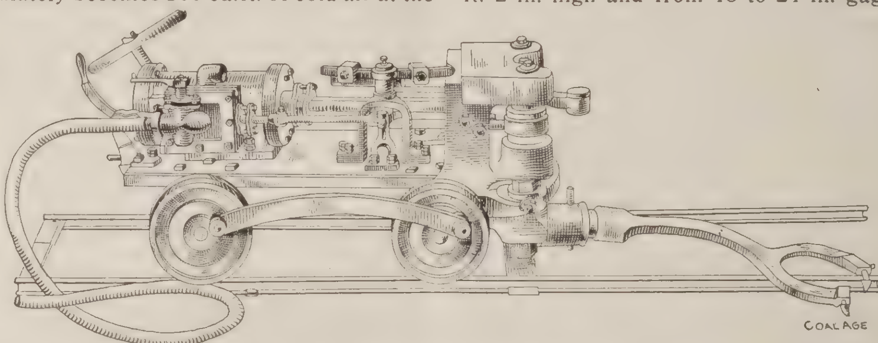


Fig. 2. The William Firth Side-striking Cutter

Firth's Machine Crosses Face But Once

In Fig. 2 is shown Wm. Firth's coal-cutting machine. He was a native of Sheffield, England. Like the preceding coal cutter, it appears to have been run in front of the face or breast of coal on a pair of rails and to cut on the side instead of on the end as with our modern punchers. Like all the successful early machines, it was operated by compressed air. At the rear end was placed a horizontal cylinder in which a piston reciprocated, the rod of which extended forward and operated a pair of bell cranks pivoted on two revolving spindles in the front of the machine.

These bell cranks each terminated in a socket provided for the insertion of a heavy pick. Each pick had two points, but instead of these being at either end of a straight bar, they were disposed on the end of what resembled the claw of a lobster, so that both could strike on the same coal face. They are so set, however, that one is cutting near the front of the cut and the other near the rear. Thus by one motion of the machine past the face, it is possible to cut to the full depth of 36 inches. It is clear that as the machine had two bell cranks and two revolving spindles it was possible to work the pick from either side, that is, either right or left handed.

Provisions for Moving Along Face

As in the machine previously illustrated, it was thought necessary to provide a miter wheel, shown at the back, for its propulsion in front of the face, and further in order to aid its progress, the four wheels were coupled in pairs on either side of the machine. The cutter was usually made about 4 ft. in length, 2 ft. 2 in. high and from 18 to 24 in. gage, and weighed about 1680 lb. It made about 60 to 90 strokes per min. and so cut from 10 to 20 yd. for a depth of 3 ft. in every hour; even at the lower rate of working, the machine cut 60 yd. in every shift of 6 hr., and the work was considered equivalent to that of 12 average men. The cut thus made was much similar to that made now by a chain machine, being 2 or 3 in. deep at the face and finishing to 1½ in. deep at the back.

Before the last machine was introduced a form of chain-cutting machine had been in use, invented by William Peace, in the Wigan district. This chain-cutter frame did not enter the coal by a sumping cut, as do our machines today. It was pivoted in such manner that it could be turned toward the face at an angle and when once it had made a quadrant cut in the coal it could be worked forward on the short-wall principle. Winstanley and Barker later invented a disk cutting machine; in working, this machine also made the first cut by the use of a swivel arrangement. The disc could be thrown around so as to be along the line of the track when making a sumping cut.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Interesting Questions

(Answered by Request)

Factors of Efficient Ventilation

Ques.—What are the chief factors necessary to secure efficient ventilation in mines?

Ans.—There are three chief factors that are essential for the efficient ventilation of every mine. 1. A sufficient quantity of air must be conducted into the mine to comply with the requirements of the state mining law. 2. The volume of air passing into the mine must be divided and distributed to the several districts of the mine in proportion to their several requirements. 3. All of the air entering the mine must be conducted to the working face by means of substantial stoppings, air-tight doors, air bridges, brattices, etc. It is important that the air current should be made to sweep all void or abandoned places and falls, with a velocity sufficient to carry away any gases that would otherwise accumulate at these points.

Water Gage *re* Horsepower

Ques.—If 10 hp. is producing a circulation of 60,000 cu.ft. of air, in a certain mine; what is the water gage?

Ans.—

$$H = \frac{Qp}{33{,}000};\ \text{and}\ p = \frac{33{,}000\,H}{Q}$$

Therefore, for the water gage, in this case, we have,

$$w.g. = \frac{p}{5.2} = \frac{33{,}000 \times 10}{5.2 \times 60{,}000} = 1.058\ in.$$

Ques.—If 10 hp. produces a certain water gage, in a given mine; what water gage will 25 hp. produce, in the same mine, under the same conditions?

Ans.—For the same conditions in the mine, the water gage varies as the square of the quantity of air in circulation, and the power varies as the cube of that quantity. Hence, for the same conditions in the mine, the square root of the water gage and the cube root of the power each vary as the quantity; or they vary alike, the one as the other.

In other words, the square root of the water-gage ratio is equal to the cube root of the power ratio. The question does not give the original water gage; and, for this reason, it is only possible to find in what ratio the increase of power, from 10 to 25 hp., will increase the water gage. Thus,

$$\sqrt{\frac{(w.g.)_2}{(w.g.)_1}} = \sqrt[3]{\frac{25}{10}} = \sqrt[3]{2.5} = 1.357$$

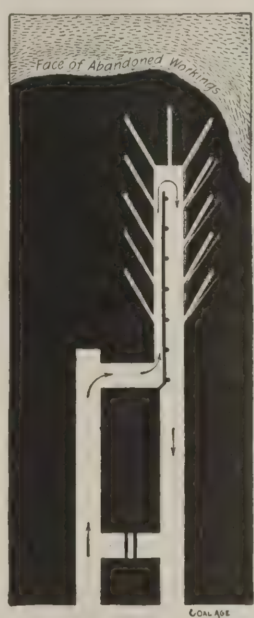
$$\frac{(w.g.)_2}{(w.g.)_1} = (1.357)^2 = 1.84$$

That is to say, increasing the power from 10 hp. to 25 hp. will increase the water gage 1.84 times.

Precautions Approaching Abandoned Workings

Ques. — Explain what precautions should be taken when approaching abandoned workings that may contain dangerous quantities of water or gas.

Ans.—In this case, no reliance should be placed on the mine maps although these may be made from accurate surveys. A slight error in the map or the survey might prove fatal. Only a single heading should be driven, not over 12 ft. wide. This must be ventilated by erecting a brattice to conduct the air forward to the face of the heading, as shown in the accompanying figure.



Heading Approaching Abandoned Workings

A borehole should be kept at least 20 ft. in advance of the face of the heading and flank holes should be drilled, at regular intervals, not more than 5 or 6 yd. apart, on each side of the entry. These flank holes should make an angle of about 30 deg. with the center line of the heading, as shown in the figure.

A sharp lookout should be kept for the first signs of water or gas. Plugs should be kept in readiness to stop the hole if it should suddenly break through into the old workings. Safety lamps, only, should be used. The heading should be well timbered.

Outbursts Of Gas

Ques.—What are the causes of sudden outbursts of gas when mining coal? How are they manifested and what precautions should be adopted in mines subject to such occurrences?

Ans.—Sudden outbursts of gas frequently occur in gaseous mines and are the result of the accumulation of gas under pressure, in pockets or foliations of the strata. As mining proceeds the strength of the walls or confining strata is insufficient to resist the great pressure of the gas, which finally bursts its bonds, throwing down tons of coal or roof in its effort to get free.

Outbursts are often heralded or their approach manifested by severe "poundings" or "knockings," which are sometimes heard for days in advance of the occurrence.

When mining under these conditions the precaution should be taken to sink large boreholes, from the surface, ahead of the workings, for the purpose of draining off the gas from the area soon to be worked. Holes are also bored in the face and ribs of entries to relieve the pressure of the gas on the coal. When the gas occurs in the roof or floor, holes are likewise put up in the roof or down in the floor of the seam, with good effect. Rooms and headings are driven less wide and are securely timbered as experience dictates.

Furnace or Fan Preferred

Ques.—When and under what circumstances are furnaces to be preferred to fans for ventilating purposes?

Ans.—Although a fan is always more reliable as a mine ventilator and requires less attention, in its daily operation, there are still some who prefer a furnace. The use of the furnace, however, should be restricted to the ventilation of small mines having shafts not less than 75 to 100 yd. deep, and producing no gas. Even then it is more economical and advantageous in many ways to replace the furnace with a good fan as early as the development of the mine will warrant making the change. In a nongaseous mine where the seam lies very deep, say 250 yd. below the surface the furnace is an efficient means of ventilation.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Navigation Co.'s Underground Hospital

The rescue and first-aid work in the anthracite region has the proper spirit. It is fostered and financed by the operating companies, but there is no question but what the men are interested and coöperating, and are willing to contribute to its development and support.

The fine underground hospital we illustrate here and on our front cover confirms this fact. The Lehigh Coal & Navigation Co. built the hospital, but the men spent $150 in the furnishing of it. It is situated 980 ft. below the surface in No. 8 shaft of the Coaldale colliery, near Lansford, Penn., and is excavated in the solid rock of one of the tunnels.

The upper illustration on the cover shows the outside view of the hospital. It is substantially built of concrete, and the approach is neatly paved with cement. The lower illustration is an interior view, the group consisting of the following, reading from right to left: Evan G. Evans, general foreman; James Harrington Young, company physician; Isaac M. Davis, mine inspector of the 17th anthracite district, and William E. Stickler, assistant mine foreman.

A Comparatively Germ-proof Room

The floor is covered with inlaid linoleum, the walls with Sanitas oilcloth paper and the ceiling with pale blue Sanitas paper. It is easy, therefore, to keep the room reasonably germ-free. The lighting is provided by 24 electric lights, strung along the vaulting line of the room and pendant from a chandelier in the center. The shelves alongside the medicine cabinet are of glass, supported by nickeled brackets. A stool and two couches with drop heads, all leather covered, are provided for the use of patients. There is also a Morris chair. The walls are hung with five Red Cross charts, showing the various parts of the human body. Set in the base of the couch on the left is a drawer, in which splints are kept.

Interior of Underground Hospital, Lehigh Coal and Navigation Co.

The illustration on this page shows the electric radiator and a copper boiler for preparing hot water. To the right are a porcelain washstand and sanitary bucket. The shelf above the washstand is of ¼-in. plate glass, with nickeled brackets, and is provided with absorbent cotton, witch-hazel, sweet spirits of ammonia, liquid soap, cocaine and peroxide of hydrogen. Below will be noted the hair clippers and shears for removing hair near scalp wounds, also bandage shears and large nickel tweezers for removing splinters.

Stretchers and Blankets

To those who have seen stretchers and blankets laid on the tipple rafters, or in malodorous sheds, the little stretcher closet in the left corner of the room will be of pleasing interest. Even this closet is lined with Sanitas paper. The blankets are hung from nickeled holders, shown on the left-hand side of the illustration. In this manner they are aired and better fitted for use than if rolled up and put in some dark corner.

The man administering the spirits of ammonia is John F. Boyle, the captain of the first-aid team at the Pittsburg meet. Seated in the chair is Harry Lewis, who furnished the information from which this article is prepared. Care is taken to produce a circulation of air through the room. A register 8x12 in. is set on the left of the door. This admits air to the room near the floor. A register situated near the springing line of the ceiling is connected with the return, and by means of this the air escapes.

This hospital certainly does credit to the "Old Company," and the men in shaft No. 8. The latter aver that from one end of the anthracite region to the other there is not to be found a better equipped hospital.

The Davy Lamp

The following is an interesting excerpt from a letter written in 1815 by Sir Humphrey Davy to Dr. Gray and the Rev. J. Hodgin: "Atmospheric air, when rendered impure by the combustion of a candle, but in which the candle will still burn, will not explode the gas from the mines. When a lamp or candle is made to burn in a close vessel, having apertures above and below, an explosive mixture of gas admitted merely enlarges the light, and gradually extinguishes it without explosion. Again, the gas mixed in any proportion with common air will not explode in small tubes, the diameter of which is less than one-eighth inch, or even a larger tube, if there is a mechanical force urging the gas through the tube. . . I have never received so much pleasure from the result of any of my chemical labors, for I trust the cause of humanity will gain something by them."

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission has made an important award in the case of Meeker & Co. vs. the Lehigh Valley R.R. Co. This is an application of the decision arrived at some time ago on the general merits of the case. The Commission now says:

In our original report we found that the rates charged the complainant for the transportation of anthracite coal from the Wyoming region in Pennsylvania to Perth Amboy, N. J., during the period from Nov. 1, 1900, to Aug. 1, 1901, were unjustly discriminatory and in violation of Section 2 of the act, to the extent that they exceeded the rates contemporaneously charged the Lehigh Valley Coal Co. under the contract then in effect between that company and defendant; and we further found that the rates in effect from Aug. 1, 1901, to July 17, 1907, were unreasonable to the extent that they exceeded rates of $1.40 per gross ton on prepared sizes, $1.30 on pea, and $1.15 on buckwheat.

On the basis of its conclusions in the former report and upon consideration of the evidence adduced at the hearing upon the question of reparation, the commission now finds that the complainant suffered damage to the extent of $11,009.33 during 1900 and 1901 and to the extent of $58,236.45 from 1901 to 1907. The complainant is therefore awarded the above amounts together with accrued interest, making a total of approximately $100,000.

Privately Owned Coal Depots for the Panama Canal

The coal question has figured considerably during the past in the hearings before the Senate Committee on Interoceanic Canals, which is now working on a revision of the canal bill passed by the House, for submission to the Senate. The committee has been strongly urged to permit the establishment of private depots in the Canal zone for the sale of coal, on a commercial basis. There is evident a considerable disposition to permit the establishment of such depots, but none to abandon the idea of the governmental sale of coal, or to limit the government to the supplying of naval and other ships belonging to the public. Whatever liberty is granted to the private individuals who wish to sell coal in the Canal zone, will be given with the understanding that the government is to continue to compete in furnishing this material.

Facts and figures have also been laid before the committee with reference to the probable effect of the trade in coal on the development of coastwise business for American ships. B. H. Baker, of Baltimore, asserted that if railroad-owned ships could be prohibited from going through the canal, there would be a great growth of coastwise business, making a demand for coal which would move, he claimed, in large quantities from the terminus of the Virginian Railway to the eastern gateway of the canal. This coal, he asserted further, would move in American vessels. This was presented as an additional argument against allowing railroad-owned ships, specifically those of the Pacific Mail Steamship Co., to go through the waterway.

Alabama

Birmingham—A meeting of the merger committee, in charge of the proposed consolidation of the Alabama Coal & Iron Co. and the Southern Iron Co., was held in New York, May 23. It was expected that some decisive step would then be taken, but so far no definite announcement has been made.

Coal dealers and operators from Tennessee, Alabama, Georgia, Mississippi and Louisiana met in conference here recently in an effort to reach a better mutual understanding on a number of matters affecting the trade. The questions of car-load weights and points of weighing were discussed.

Montgomery—A proposed ordinance, prohibiting the use of any coal other than anthracite within the city limits, is meeting with determined opposition on the part of local coal men and large consumers.

Colorado

Denver—At the Leyden coal mine, a Moffat property, lying 17 miles from Denver on the line of the tramway, the shafts have been lined with concrete and the whole mine made as nearly fireproof as possible. This work has been done at an expense of some $300,000 and was undertaken largely because of a disastrous fire two years ago in which 10 men lost their lives. The output of the mine is now 500 tons a day and will be increased to 1000 tons.

The Denver & Rio Grande R.R. and the Colorado & Southern Ry. have been ordered by the Interstate Commerce Commission to file before July 20, regulations to govern the ratings of coal mines on their lines in Huerfano and Las Animas Counties, and to provide for an equitable distribution of coal cars. The order was made on complaint of the Colorado Coal Traffic Association, members of which alleged the roads unjustly discriminated against certain coal operators.

Illinois

Hillsboro—Options on 1400 acres of coal land near Donnellson were recently transferred to Frank P. Blair, of Chicago, president of the Shoal Creek Coal Co., and it is understood that these options will be taken up by June 1. It is not known as yet just what the intentions of the Shoal Creek company are with regard to this property.

The Hillsboro Coal Co. is securing options on about 2000 acres of coal land in the vicinity of Fillmore. It is understood that the coal is to be held for development sometime in the future and that a mine will be opened, probably near Fillmore.

Benld—As a result of the riot at Benld recently, the coal operators of the fifth and ninth Illinois districts have named a committee to meet with representatives of the labor organizations to demand the establishment of a state constabulary.

Springfield—Initial steps have been taken in the transfer of the Barclay Coal Co.'s plant to a new corporation to be composed of prominent Springfield men. The new corporation will take over all leases held by the Barclay company.

Marissa—A thousand tons of coal, stored at the Advance mine of the Egyptian Coal & Mining Co., caught fire recently from spontaneous combustion, and after several days' labor the fire was checked, but it is estimated that 300 tons of the coal was consumed. The coal was stored close to the tipple, and only by strenuous work was the plant saved from destruction.

Streator—The new agreement between Illinois coal operators and miners was signed May 17, but the settlement has had little bearing on the reopening of the mines, a great number of which remain closed down, owing to dullness of the market. A revival of trade is expected if the Indiana miners continue to hold out against the proposed agreement in that state.

Indiana

Terre Haute—Acceptance of a tentative agreement for a two-year contract, and reference of the weekly pay question to the miners for a referendum vote, ended, on May 24, the stormiest joint conference in the history of Indiana miners and operators. The subcommittee reported to the special meeting of the joint conference that an agreement had been reached on all matters, except the contention of the miners for a weekly pay. It was decided to leave the question to a referendum vote. For the third time within a week, the wage-scale committee reported back to the joint conference its inability to reach an agreement, or even a basis for a settlement. John P. White, international president, made a forcible speech, explaining in detail his position in relation to the Indiana mine workers' demand for the weekly pay, and explained to the miners' delegates that the vote meant either a return to work without the weekly pay and with the other concessions granted, or a strike. A vote was ordered in all the locals of the district for May 27, to decide this question finally. If the miners vote to accept the wage agreement without this provision, the mines will resume work June 3.

The miners in many localities feel so strongly on the subject of a weekly pay and the radical element among them has wrought the men to such a pitch that they recently burned in effigy President White and other officers of the national union, who are urging them to accept an agreement which provides for a semi-monthly pay, as at present. If the referendum vote fails to ratify the proposed agreement, a strike will be in force in Indiana.

Vincennes—The Knox Coal Co., of Bicknell, on May 24, sold its mine and all holdings near Bicknell to the Worth-Huskey Coal Co., of Chicago, for $50,000.

Linton—The Forschner Coal Co. has purchased the Sponsler mine from the United Fourth Vein Coal Co., and will work the coal that can be taken out of the shaft and strip the coal that is too near the top to be mined. The company has invested $30,000 in stripping machinery, and the dirt taken off the coal will be shipped to Chicago for use in filling up the lake front.

Iowa

Des Moines—Miners of district No. 13, United Mine Workers, in convention here May 18, refused to accept the wage scale agreement, submitted by the subcommittee of operators and miners. The convention adjourned after refusing its scale committee another chance to confer with the operators. The delegates voted to submit the proposition to a referendum vote of the mine workers.

Kentucky

Van Lear—The mines of the Consolidation Coal Co. at this place have been closed for some time on account of a strike. Trouble arose over an attempt at organization of the miners and the appointment of a check weighman.

Madisonville—Because of the delay in making payments on the 50,000 acres of coal rights recently purchased from farmers in this vicinity by a French syndicate, threats are being made that the deal will be called off. The syndicate, represented by William Lynch, of Dawson Springs, closed the deal for coal rights in what is known as the Beulah fields, at a price of $10 an acre. Payments have been slow and irregular, and hence the dissatisfaction.

Louisville—The Leahy Coal Co., Dougherty & Lanning and the Asher Coal Co. have been merged and taken in by the Southern Coal & Coke Co. The Asher plant which was taken over is one of most uptodate coal elevators in the country, and the largest in the South. As a result of this purchase, the output of the Southern company's mines in the Jellico district of Tennessee will be greatly increased, it is said. The transaction has been pending for some time.

The Cincinnati, Licking Valley & Virginia R.R. has filed articles of incorporation with the Railroad Commission of Kentucky. The company is incorporated with $80,000 capital stock. J. B. Walker, of Birmingham, Ala., is principal stockholder. The railroad company will build a line from Cynthiana, Ky., into the coal fields to the eastern part of the state, following the valley of the Licking River.

Harlan—The extension of the Louisville & Nashville RR. Co., from Harlan to the mining properties in that vicinity, has been completed and a number of important new producers are now shipping. The Clover Fork Coal Co. has begun production, and the Harlan Town Coal Co. will be ready to ship within two weeks. The Harlan Coal Mining Co., which recently let contracts for its equipment, will not be ready to begin operations until early in the fall.

Barbourville—The Interstate Coal Co., of Barbourville, which has been buying a great deal of property in the Brush Creek field of Knox County, has paid $250,000 for the 4000 acres of coal land of the Cumberland Coal Co. The property has three large mines in operation and others are to be opened. George L. Carter, who controls the Interstate Coal Co., has made investments of over $1,000,000 in the Brush Creek field.

Middlesboro—The Fork Ridge Coal & Coke Co., of which C. S. McManus is president, has just installed two Montgomery washers at its mines. The Winona Coal & Coke Co., which is controlled by the same interests, is installing a washer plant made by the American Concentrator Co. A 300-ton Montgomery washer has been installed at the mine of the Columbia Coal Co., of Gronty County. The washer is electrically operated. The capacity of the mine is 350 tons a day.

Missouri

Kansas City—An arbitrator to settle disputes between the coal miners and operators of the Southwestern district, was selected, May 15, by the general committee that for three weeks had been threshing out the terms of a new 2-year contract.

Montana

Great Falls—The annual convention of district No. 27, United Mine Workers, which district includes Montana, will be held in Great Falls, beginning Aug. 10. This convention will decide on the wage scale to be demanded under the next agreement. It is expected that it will be attended by about 100 delegates from the miners' unions.

Ohio

Hamden—The Superior Coal Co., operating a group of mines in Jackson County, is in a receiver's hands, but the business of the company will be continued. On May 18, the Knickerbocker Trust Co., of New York, filed suit to foreclose a mortgage to the amount of $193,000. Mr. Hersloff, of New York, has been appointed receiver, pending foreclosure proceedings. The company owns 8800 acres of coal lands and 4000 acres of mineral rights, near Wellston, Coalton and Jackson, with office in Jackson.

Coshocton—Seventy-five men at the Morgan Run colliery, recently went on strike in sympathy for the mine mules. The men stated that they did not think that the mules received proper treatment and said that they would remain on strike until assured that the mules would be humanely treated.

Columbus—Some dissatisfaction is felt by machine miners over the fact that the 4c. increase granted under the Cleveland wage settlement will, with the exception of a small fraction, go to the loaders. It was this point that protracted the session of the Hocking subdistrict joint convention, which adjourned recently after a ten days' stormy session. The operators were in favor of a larger share going to the machine men.

The Pomeroy Coal Co., of Columbus, has been incorporated with an authorized capital stock of $50,000, to take over the property of a company of the same name, which was chartered under the laws of West Virginia. The property consists of

600 acres of coal lands at Hobson, in the Pomeroy Bend field and is one of the best mines in that district. The product of the company will be handled through the Maynard Coal Co., of Columbus.

Zanesville—The Saltillo Coal Co., which has operations at Saltillo, recently sustained the loss of a large power house by fire. The company suspects that an incendiary is responsible for the loss. The plant will be rebuilt.

Crooksville—With the resumption of work at the two largest mines in the Crooksville district, May 22, the coal trade in this part of the state took on renewed activity. Practically every mine in the district is now at work and steady operation is predicted.

Pennsylvania

Bituminous

Pittsburgh—An investigating committee, consisting of three members of the international executive board United Mine Workers, met here, May 25, to investigate the affairs of district No. 5. It is charged that the abrupt adjournment of the convention, Apr. 17, was illegal and Francis Feehan, district president, is threatened with impeachment by supporters of Michael Halapy, a rival candidate for the presidency.

It is rumored that the Pennsylvania R.R. may undertake the acquisition of the Buffalo & Susquehanna R.R. and the construction of 30 miles of connecting track. This would provide a route from Punxsutawney to Pittsburgh, 30 miles shorter than any existing line and would open up a large area of virgin coal territory. One of the largest coal operations in the section is located at Sagamore, and it has developed that the Buffalo & Susquehanna Coal Co. has under lease nearly all the accessible coal for a distance of about 16 miles south of Sagamore.

Johnstown—The Wilmore Coal Co., which is the land-holding concern of the Berwind-White Coal Mining Co., has purchased about 300 acres of land in Crab Valley, about 10 miles from Windber and it is understood that coal will be mined on the property and a tipple built. Rumor also has it that a railroad connection will be built across the Allegheny Mountain, through the Kinzey gap.

Undeveloped coal lands in the Jenner region are rapidly being optioned and it is believed that the agents are working in the interests of the Western Maryland R.R. Coal land in Milford, Black, Middlecreek and Upper Turkeyfoot Townships is being bought. The securing of options by agents of the Western Maryland has been interpreted by property owners in that district to mean that the road is contemplating the extension of their tracks from Rockwood. In case the branch is built, the connection with the main line will probably be made at Rockwood, and will extend through the Glade Run district.

Dubois—The Logan Coal Co., of Beaverdale, has just completed a large fan at its No. 4 mine and added additional territory, which will mean a larger output. The company has also added about 800 acres to the No. 2 mine, and improvements will be made.

Anthracite

Scranton—Practically every mine in the anthracite region resumed operations Wednesday morning, May 22, the mine workers reporting for work in accordance with the order of the United Mine Workers of America, calling off the seven weeks' suspension. Scarcity of labor confronted the mine bosses, and while the collieries are operating, it was stated that the mines would not come near producing the normal amount of coal for some time to come. The scarcity exists chiefly among miners and laborers. So far as company work is concerned, there is no appreciable lack of men and boys.

Wilkes-Barre—Hundreds of miners have arrived here from western Pennsylvania, whence they journeyed when the anthracite mine suspension began. They were attracted home by the announcement that the hard-coal mines have resumed operation.

The fight of the Ridgewood Coal Co. against the Lehigh Valley R.R. Co., because of the railroad's failure to provide switching facilities at the Ridgewood property, at Newport, Luzerne County, assumed the form of a $500,000 lawsuit, May 23. The case was threshed out before a commissioner for the Interstate Commerce Commission a year ago. The coal company complained that the railroad company had refused to install a switch connecting the plant with the main line of the Lehigh Valley, and, further, that the road refused to permit the coal to be carted by team across its tracks. The Interstate Commerce Commission decided in favor of the coal company and ordered the Lehigh Valley to install the switch.

Hazleton—The men at the strippings of J. H. Dugan & Co., who went on strike recently, returned to work, May 24, when a 5½ per cent. wage increase was granted. The nine-hour shift was refused. The employees at the strippings of Benjamin & Co., at Harleigh, went out, May 24, for a 10 per cent. advance and a nine-hour day. Work has been resumed at the Janesville colliery of the Lehigh Valley Coal Co., where the men struck, May 22, because of the failure of 12 of their number to join the union. The miners at the collieries of the Lehigh & Wilkes-Barre Coal Co. gave notice recently, that if the nonunionists at those operations did not become identified with the United Mine Workers, all would go on strike.

Rhode Island

Portsmouth—The Rhode Island Coal Co.'s property was sold at a receiver's sale at Newport, May 17, for $50,000, to Robert G. Hay, of Boston, secretary of the old company. His was the only bid. It is the intention of the stockholders to reorganize under the name of the Portsmouth Coal Co., with a capital of $800,000, and the board of directors of the reorganized company will probably consist of Robert M. Burnett, H. M. Whitney, W. H. Joyce, W. F. Carlin and Joseph Weeks, all of Boston. William F. Dodge, mining engineer, estimates that on an output of 120,000 tons per annum the profits should be $124,760, equivalent to 15½ per cent. on $800,000 capital.

West Virginia

Charleston—By the formation of the Standard Fuel Co., of this city, capitalized at $7,000,000, the gas interests of Charles W. Swisher, including the Swisher Oil Co.; oil and gas property in the New Straitsville district of Ohio, and in Ritchie and other counties in this state, were taken over. In addition to these interests it is reported that the oil and gas and some coal interests of the Chilton, MacCorkle & Chilton firm, including those of United States Senator Chilton, are also in the combination. It is also reported that considerable Philadelphia capital is brought into the combination.

Wheeling—The miners' convention, which had held meetings in this city during the preceding week for the purpose of trying to settle the differences with the operators of the Fifth Ohio subdistrict, went into session again, May 20, to take up charges preferred against President John Moore by two of the locals represented at the convention.

Bluefield—It is generally reported that the Greeno and Bruce mines, located a short distance from Coeburn, have changed ownership. It is thought the mines will become part of the Mingo Hollow Coal & Coke Co.'s operations.

Great Britain

London—Four men are known to have been killed and many injured, May 18, in a mine explosion near Newport, in Monmouthshire. There was an unconfirmed report that 18 persons had been killed.

The Federation of Miners adopted resolutions, May 22, declaring that under the decisions of the minimum-wage boards in many districts, especially in South Wales, the men are unable to make even living wages. The federation demands that Premier Asquith at once call on parliament to amend the law to remedy the defects already apparent.

Personals

Edgar Kudlick, consulting mining engineer of the Lehigh Valley Coal Co., was recently a visitor in New York.

F. W. Wiegand has been appointed shipping agent of the Davis Coal & Coke Co. with headquarters at Cumberland, Md.

W. B. Geary has resigned his position with the H. C. Frick Coke Co. to become superintendent of the Elm Grove plant of the W. J. Rainey Coke Co.

John Steele, of Alma, Kan., has been chosen by the operators and miners of the Southwestern district as arbitrator in all disputes which may arise in this field.

W. E. Hartman, of Joliet, Ill., recently delivered a lecture on "Byproducts of Coke Ovens" before a meeting of the Engineers Society of Western Pennsylvania in Pittsburgh.

James Needham, president of the St. Paul Coal Co., the coal-mining subsidiary of the Chicago, Milwaukee & Puget Sound R.R., has left for an extended business trip to Montana.

William Z. Price, mining engineer, with the Tennessee Coal, Iron & R.R. Co., has resigned his position at Birmingham, Ala., to accept a similar position with the Pittsburgh Coal Co. at Pittsburgh.

W. C. Perry has been appointed chief engineer of the Davis Coal & Coke Co. with headquarters at Cumberland, Md. Mr. Perry is a Western man who has been in the employ of the company for a number of years.

F. R. Wadleigh, fuel engineer and assistant general manager of the Chesapeake & Ohio Coal & Coke Co., recently visited Akron, Ohio, where he was interested in the demonstration of a new chain-grate stoker for coking coals.

C. J. Johnson, until recently division engineer of the Blockton Coal Mine division of the Tennessee Coal, Iron & R.R. Co., has been appointed assistant superintendent of that division with headquarters at Blockton, effective June 1.

Frank Peabody, of Chicago, president of the Peabody Coal Co., in company with W. L. Ross, vice-president of the Chicago & Alton R.R., recently visited a number of mining properties, in which he is interested, in the vicinity of Springfield, Ill.

H. S. Mervin, of Columbus, Ohio, has been elected secretary-treasurer of the New Pittsburgh Coal Co. to fill the vacancy caused by the death recently of Harry R. Beeson. Mr. Mervin has been with the company for 10 years and has been auditor since 1906. James A. Rundio has been appointed general sales agent, and W. D. Morse has been made auditor.

Obituary

Clarence S. Whitney, prominently identified with the coal business of Kansas City, Mo., for the past 25 years and lately affiliated with the Gray-Bryan Coal Co., died, May 15, at his home in that city. Mr. Whitney was born in Clinton, N. Y., in 1850.

Allen H. Horton, aged 58, for a number of years general manager for the Pittsburgh Coal Co. and widely known in coal and navigation circles throughout the Great Lakes region, died, May 21, at Solon Springs, Wis., where he had gone in quest of health. Maj. Horton lived for a number of years in Buffalo, N. Y., where he was connected with the Lehigh Valley Coal Co. From there he went to West Superior, Wis., as general manager of the new Lehigh Coal & Iron Co. and later became vice-president of the Youghiogheny & Lehigh Coal Co., in St. Paul. He leaves a widow and one son

Publications Received

FIRST ANNUAL REPORT, U. S. BUREAU OF MINES. Joseph A. Holmes, director. 57 pp., 6x9 in., illus. Government Printing Office, Washington, D. C.

LOCOMOTIVE DRAFTING AND ITS RELATION TO FUEL CONSUMPTION. By H. B. MacFarland. 85 pp., 6x9 in., illus. The International Railway Fuel Association, Chicago.

AN INVESTIGATION OF THE COALS OF CANADA. By J. B. Porter, R. J. Durley and special staff. Vol. I, 233 pp., 6½x10 in., illus., 62 plates, 31 drawings, 5 maps. $1. Government Printing Bureau, Ottawa.

This is the first of six volumes which will embody the report of investigations that have been carried on since 1906, under the direction of the Mines Branch of the Canadian Geological Survey. The work was conducted in the laboratories of McGill University, by Dr. Porter, head of the mining department, and a specially selected staff. The following subjects are covered in Vol. I: The coal fields of Canada; collecting coal samples; sampling in the testing plant and laboratory; coal washing; and the manufacture and testing of coke.

Trade Catalogs

The Manhattan Drilling Co., New York. Pamphlet. The Dobbins core drill. 20 pp., 6x9 in., illus.

The "S-C" Regulator Co., Fostoria, Ohio. Pamphlet. 24 pp., 6x9 in., illus. Descriptive of "S-C" boiler feed-water regulators.

The Goulds Manufacturing Co., Seneca Falls, N. Y. Bulletin No. 110. Single Stage, Double Suction Centrifugal Pumps. 16 pages, 7¾x10 in., illustrated

Ingersoll-Rand Co., 11 Broadway, New York. Bulletin, form 7004. 12 pp., 6x9 in., illus. This catalog is descriptive of Cameron steam pumps. It shows the different styles manufactured and gives tables of sizes and capacities, together with prices.

Construction News

Brockwayville, Penn.—The McKnight Coal Co. is planning to make improvements and install additional equipment.

Duquoin, Ill.—The Majestic mine is receiving figures on an electrical plant and other improvements, to cost about $25,000.

Marion, Ill.—The Scranton Big Muddy Coal Co. is receiving bids for new boilers, and also for an electrical plant to replace the air plant now in operation.

Connellsville, Penn.—The Unity Connellsville Coke Co. is taking bids on the construction of 20 new ovens. Contract will be awarded in the near future.

Birmingham—The Queen Quality Coal Co., recently incorporated, will develop 240 acres of coal land and will require equipment. Simon Levy, Birmingham, is president and treasurer.

Marquette, Mich.—The Pittsburgh Coal Co. has acquired the George Kemp coal dock at the Soo and is reported to contemplate increasing its capacity to 40,000 tons at an expense of about $100,000.

Johnstown, Penn.—The Wilmore Coal Co.—a Berwind-White subsidiary—has purchased 300 acres of land near Reitz, in the Crab Valley, and it is reported that a mine will be opened and a large tipple built.

Christopher, Ill.—The Christopher Coal Mining Co., composed of a number of former officials of the Zeigler District Colliery Co., is to sink a new mine two miles from this place. Work will commence within the next week or two.

Marion, Ill.—The St. Louis Coal & Coke Co., of St. Louis, has bought the White Ash mine of the defunct Standard Collieries Co. It is understood that the new owners will spend several thousand dollars in improving the mine and the washer.

Knoxville, Iowa—The Anderson Coal Co., of Des Moines, is preparing to sink a new shaft on coal property in East Knoxville township, four miles from here. A spur track is being extended from Flagler to the new shaft, a distance of one mile, by the Rock Island R.R.

Dubois, Penn.—The Beaver Run Coal Co., of Beaverdale, will make a second opening on its property and equip the new mine with electric motor haulage and electric cutting machines. A ventilating fan is being installed. The workings will have a capacity of 1000 tons daily.

Duluth, Minn.—The Pittsburgh Coal Co. has awarded a contract to the Barnett & Record Co. to extend its No. 5 coal dock at Allouez Bay, 1200 ft., which will give it a total length of 3500 ft. by 450 ft. wide. It will then have a storage capacity of one million tons and be the biggest coal dock in the Duluth-Superior harbor. The estimated expenditure is $300,000.

Ridgway, Penn.—The Hyde-Murphy Co., of this place, has been awarded the contracts for the construction of three mining towns in Indiana County. One is with the Jefferson & Clearfield Coal & Iron Co. for the erection of 50 modern houses at Jacksonville. Another is for the erection of 75 houses at Lucerne, for the Rochester & Pittsburg Coal & Iron Co., and the third is for the erection of 50 houses at Yatesboro for the Cowanshannoc Coal & Iron Co. New mines will be opened at those places.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

During the past week, new anthracite circulars have been announced at most points, showing advances ranging from 15c. to 50c. per ton. These have brought forth a number of strong protests from the public, and the demand is not so brisk as was expected, consumers believing that little can be gained by storing at the new prices.

Quotations in the Eastern bituminous markets are nominally being held, but there are well defined rumors of cutting and orders are generally scarce all along the line. Reports of a labor shortage at the mines, necessitating a curtailment in production, is the most encouraging feature in the trade at the present time. With anthracite again coming in, the soft coals will have to stand on their own merits and have settled down to the customary summer lethargy.

Mines in the Pittsburgh district are only working 60 to 65 per cent. capacity, orders being light and mostly on Lake business, with few contracts being renewed. The Lake shipping is now on in full blast, and as a result, there is considerable activity in the Ohio fields; the opening was late this season, and the operators are now endeavoring to catch up. While business continues good in the West Virginia fields, there has been a decided easing off in the strong demand and heavy movement which have been in effect there.

The resumption of work in the Kentucky fields has weakened the spot market in Alabama, but it is still fairly strong and more active than at this time last year. The Middle Western trade is in a peculiar position. The long shutdown at the Indiana mines has resulted in an acute shortage at some points, while the St. Louis market, on the other hand, is being flooded with a heavy over-production, as a result of which coal is being freely offered at prices less than the cost of production.

Boston, Mass.

In the Eastern market there is no real change from a week ago. Pocahontas and New River prices are being normally held, but there are well defined rumors of low figures being quoted to place spot coal. Such business has enabled a few shippers to dump coal that was standing at the piers and so relieve the operators of any threatened embargo. The outlook on contract is no brighter, and all the agencies are becoming anxious. A few consignment cargoes at Providence and Portland have helped spread the idea among buyers that trade is to be slack through the summer, while a reported shortage of labor in West Virginia is the most favorable news heard this week.

The Pennsylvania shippers are combing over the market and few are pretending to get any advance over last year's prices. Georges Creek has slowed down along the line. The rush for anthracite for the present, and orders are scarce all will tend to curtail the tidewater movement of Georges Creek for a month or two anyway. All-rail trade is better in tone, and for the higher grades there is steady demand.

There is much comment over the new anthracite circular just given out by the companies. With the 25c. general advance and the loss of two months' shipments, the dealers stand to pay a 45c. greater opening price than in April last year, with not a good prospect of getting much June coal at that. The Boston retailers announced spring prices effective May 27 as follows:

Broken	$6.75
Egg	7.25
Stove	7.50
Chestnut	7.75
Pea	5.75
Franklin	8.75
Shamokin	7.75

These are 50c. higher than last year's summer prices on domestic sizes. There will doubtless be criticism from the public, when the actual advance to the mine workers is generally understood to be so small. The first shipments are expected to leave Philadelphia soon after June 1.

Wholesale prices on bituminous are as follows:

Clearfields, f.o.b. mine	$1.10 @ $.35
Somersets, f.o.b mine	1.20 @ 1.35
Georges Creek, f.o.b. Baltimore	2.70 @ 2.80
Pocahontas, New River, f.o.b. Hampton Roads	2.70 or less
Pocahontas, New River, f.o.b. cars Providence	3.35 @ 3.50
Pocahontas, New River, f.o.b. cars, Boston	3.45 @ 3.60

New York

Anthracite—Some of the anthracite companies have announced their new circular, effective June 1, during the past week. These show a nominal increase of 25c. a ton on egg, stove, chestnut and pea, the last being one of the steam sizes which it was thought would not be affected. Buckwheat Nos. 1, 2 and 3 remain unchanged.

The grades advanced represent 60 per cent. of the production, and amount to a net gain of approximately 15c. per ton. The present schedule is not meeting with much approval from either consumers or the companies, and has not yet been adopted bv a number of the more important selling concerns.

We quote the new prices 25c. higher on the four sizes mentioned, as follows:

Broken	$4.50
Egg and stove	5.25
Chestnut	5.50
Pea	3.50
Buckwheat	2.75
Rice	2.25
Barley	1.75

Bituminous—The bituminous market is slow and the next month or two will see little outside of the routine business being done. The trade is still feeling the effects of the heavy storing done previous to the strike, although conditions are not far from normal for this period of the year.

The movement is confined entirely to contracts, and there is little call for spot coal, on which low figures are being quoted. The arrivals are, however, quite heavy, and with rumors of a labor shortage at the mines, there is a general good feeling among the producers. We continue to quote prevailing prices as follows:

West Virginia steam	$2.35
Ordinary grades, Pennsylvania	2.45
Fair grades, Pennsylvania	2.55@2.65
Good grades, Pennsylvania	2.70@2.80
Best Miller, Pennsylvania	3.00
Georges Creek	3.15

Pittsburgh

Bituminous—The coal market continues very slow, demand being far from expectations. While manufacturers are fairly busy and using almost the normal quantity of coal, their purchases are relatively light, indicating heavier stocking than was estimated prior to the suspension. The mines are running slightly better, but chiefly on coal to fill regular contracts in the Lake trade; there has not, however, been as much new buying as was expected in this branch. Operations are estimated at between 60 and 65 per cent. of full capacity and at some mines there is difficulty in securing men. We repeat former quotations, although they are largely nominal: Mine-run and nut, $1.22½; ¾-in., $1.32½; 1¼-in., $1.47½; slack, 82½c., per ton at mine, Pittsburgh district.

Connellsville Coke—Connellsville furnace coke for second half delivery has sold at $2.50, the highest price for more

than two years, and the price which a few weeks ago operators were hoping they would get but which they did not expect until considerable cheaper coke had been sold. The $2.50 sale was a contract for 12,000 tons a month over the second half. Previous contracts reported in the past few weeks for second half were two for 10,000 tons a month each, at $2.35, and one for 6000 tons a month at $2.40.

The operators are now all asking $2.50, but consumers are slow to take hold. Contracts made thus far involve about 38,000 tons a month, but there is still not far from 150,000 tons a month to be covered, against contracts which expire June 30. There are, of course, a number of contracts made for the whole year, as well as many term contracts running for a period of years.

A curious feature is that foundry coke has not advanced in consonance with furnace coke, good grades being offered for the year beginning July 1 at all the way from $2.35 to $2.50, though some operators hold their coke at $2.75 or higher.

Prompt furnace coke has eased off, and can readily be had at $2.25, while some odd lots have been sold at less. The decline is due to a temporarily good supply resulting from several furnaces unexpectedly blowing out. With this decline in prompt it will be harder for producers to sell at $2.50 for second half. We quote: Prompt furnace $2.25; contract furnace, $2.50; prompt foundry, $2.35@2.50; contract foundry, $2.35@2.50.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending May 11 at 398,956 tons, a decrease of 3000 tons, and shipments at 4385 cars to Pittsburgh, 6248 cars to points west and 1309 cars to points east, a total of 11,942 cars, a decrease of 49 cars.

Philadelphia, Penn.

As was predicted, the prices sent out by the anthracite operators saddled all of the increase that the miners will receive on three sizes, namely, stove, chestnut and pea, the prices for this market in the line trade now being as follows:

Broken (on contract)	$3.00
Egg	3.75
Stove	4.00
Chestnut	4.15
Pea	2.50
Buckwheat	1.50
Rice	0.85

On egg, stove and chestnut, there is a concession of 30c. per ton on any shipment made during the month of June. The increase noted above is 25c. on stove, 15c. on chestnut and 50c. on pea. The large increase on pea size is, no doubt, due to the fact that there is a steadily growing market for this size, particularly in this vicinity. Many householders use it for domestic purposes, and as it is understood that the output of this size is growing less, owing to improved methods of mining, and the natural offspring of a curtailed output, coupled with a heavy demand, is a higher price. The contract price of broken, which was advanced the first of the year at tidewater, still remains at the same figure of $3 for line business. The relative difference between stove and chestnut has been reduced to 15c. instead of 25c., as was the case all of last season. The prices of buckwheat and rice have not been changed in any way. At tidewater, there has been an advance of 25c. on all sizes.

The demand for coal is not as brisk as might be expected. Dealers report that there is slight increase, but the fact that there is so little to be saved by laying in stocks now, as against the fall, has caused many to postpone purchases until later. Retail prices are $6.75 for egg, $7 for stove and $7.25 for chestnut.

Buffalo, N. Y.

If the anthracite miners had stayed out longer it would eventually have had some effect on bituminous prices, but there is hard-coal enough so that all other fuels will have to stand on their own merits in the future. As a rule the bituminous dealers are not very hopeful. One of the operators says that he has made up his mind to lose money for three months or so.

There is no relief promised from the tidewater district. Reports from the market agree that it is "plugged full" of coal and promises to remain in that condition, perhaps all summer. Only a few operators here get into that market, but it affects the trade as a whole. There is not much coal unsold on track here, but it is said that there is considerable at various points in Canada.

The regular prices on bituminous hold, but they cannot be called strong, at $2.57½ for Pittsburgh three-quarter, $2.47½ for mine-run and $2.10 for slack. Coke is also rather weak at $4.50 for best Connellsville foundry. Furnaces in this district are running only moderately, some of them being idle.

The announcement of a general advance of 25c. in anthracite has resulted in much adverse comment, as it more than covers the increased pay to the miners so the consumer comes in for the whole of it, together with a small bonus to the operator. A supply is already on the way, though there has been no particular demand for it during the suspension.

As to the Lake trade all effort will now be made to keep the fleet busy till the lost ground is regained. If the Eastern demand is not large there will soon be a record-breaking activity on the lakes, for the trade is already nearly 20 per cent. behind last season to date. Some of the anthracite companies can make big spurts in mining, but not all of them. Tonnage has been taken at 30c. to the principal Lake Michigan ports, a small reduction from former seasons, and the same to Lake Superior ports.

Baltimore, Md.

Every vestige of the strike of the coal handlers in Baltimore has disappeared, and normal conditions now prevail at all of the railroad piers. While the settlement of differences between the coal handlers and their employers was a thing much to be desired, it has not brought about any marked improvement in the local market, so far as the demand is concerned. The market during the past week was heavy to say the least, and, consequently, prices were low.

For the past two or three weeks, there has not been the consumption that the trade expected at this time of the year, and not a few of the Baltimore operators are feeling the effects. Many mills, which are usually good customers, are now being operated on short time, and this is being reflected in the coal market.

Five steamers arrived in Baltimore during the week to load coal for Alexandria, Egypt. In all, about 22,000 tons of the product will be forwarded to that country.

President Bushrod M. Watts, of the Baltimore Coal Exchange, made an announcement during the week to the effect that the winter prices for anthracite would, in all likelihood, be maintained throughout the summer. The rates for the ensuing year will not be definitely fixed here until after June 1, but it is believed by the consumers here that the operators intend to keep up the winter prices and local retailers will be compelled to follow suit. Every year during the summer months there has been a reduction of 50c. on hard coal, but, according to Mr. Watts, this low price will not prevail this year.

Cleveland, Ohio

The market for steam coal still remains quiet, and dealers are buying very little domestic coal for stocking purposes; outside of renewing contracts, operators and jobbers are not doing much. Prices on No. 8 coal have dropped from 7½ to 10c. per ton, slack selling at 55c., mine-run, 90c. and ¾-in., $1. As Lake production increases, the price seems to go lower, unless there is a concerted movement to hold it back from the market by track shortage.

Shipments of coal for the Lake trade have been quite large, but the supply of tonnage is far in excess of the demand, and the boats are delayed in loading.

Vessels are waiting at most of the docks, and in some cases have to make two ports to fill out cargoes. There will be a little hard coal next week, but it will be June 10 before there is much demand for tonnage in that trade.

Columbus, Ohio

The situation in Ohio is improving as the season progresses and activity now prevails in every branch of the coal trade with the exception of domestic. Prices are ruling firm and everyone engaged in the coal business is looking forward to a rather prosperous season. Since the mines have resumed operations, there has been considerable improvement in general business conditions which is being reflected upon the coal trade.

The opening of navigation was delayed because of ice in the Soo but now the season is on in full blast. The activity in the ore trade is aiding in a better movement of coal and the chartering of boats is going on actively. Some little trouble in the lake trade was caused earlier in the season by the decrease of 10c. a ton made by one of the largest shippers but the effects of this are rapidly passing away. The docks are now taking coal better and there is every prospect for an active trade during the entire season. Ohio lake shippers are preparing to ship even a larger tonnage than in 1911.

Railroad fuel contracts are the next thing to attract the attention of operators. Many of the larger railroad contracts will be renewed soon and there is some lively bidding. Operators hope to have more than a 5c. increase on these.

There is a fair demand for fine coal and a large amount of it is being made in connection with the lake trade. Prices on that grade are ruling firm.

Prices which prevail in Ohio fields are:

Hocking Valley	
Domestic Lump	$1.50
¾-in	1.35
Nut	1.15
Mine-run	1.15
Nut, pea and slack	0.80
Coarse slack	0.60
Pittsburgh No. 8	
¾-in	1.30
Mine-run	1.05
Coarse slack	0.65
Pomeroy Bend	
Domestic lump	$1.50
¾-in	1.35
Mine-run	1.15
Nut, pea and slack	0.75
Coarse slack	0.55
Kanawha	
Domestic lump	1.50
¾-in	1.30
Mine-run	1.10
Nut, pea and slack	0.60
Coarse slack	0.50

Hampton Roads, Va.

The market at Hampton Roads during the past week has been quieter than at any time since the first of the year, but there has been a fair loading at the three ports every day. Shippers are now feeling the effects of the heavy stocking in anticipation of the coal strike during April. The greater portion of the movement now is on old contracts, but it is predicted that the situation on new contracts will shortly adjust itself. The prevailing price at Hampton Roads is now $2.70.

An interesting feature of the past week is the returns on coal from Hampton Roads to Boston for the first quarter of 1912. The total tonnage during the first quarter of 1911 was 212,568 tons, as compared with 430,248 tons this year, or an increase of over 100 per cent. This goes to show there was considerable activity at Hampton Roads, and the impetus thus far gained is sure to hold up at this port throughout the balance of the year.

Charleston, W. Va.

It is now practically certain that the month of May will see the heaviest production in the history of the Kanawha valley and likewise be the banner month in the number of tons shipped from West Virginia over the Chesapeake & Ohio. Cars have been plentiful, and the mines have been taking advantage of the opportunity. On the Chesapeake & Ohio the movement has been excellent, due to the borrowing of a number of engines from other roads. Along the Kanawha & Michigan, however, hundreds of T. & O. C. cars, already loaded, may be found crowding the sidings, awaiting movement to the lakes.

Prices have remained firm for some time, and are what operators declare to be good, considering the extremely low rate that obtained before the first of the year.

A number of the companies, owing to the good prices now prevailing, have signed the scale and are now in partial operation. These include the mines, about twenty in all, that did not sign the agreement some time ago in the Kanawha district.

Birmingham, Ala.

The Birmingham coal market continues fairly strong, though spot shipments are off. Resumption of work in the Kentucky fields is responsible for this.

One of the most favorable features in this trade is the growing tendency on the part of the railroads to substitute coal for the crude oil which they have been using. The advanced prices on oil, and the difficulty which is being experienced in getting a constant supply, has led the railroad officials to regard Alabama coal as less expensive and more reliable.

One of the adverse features of recent days has been the announced determination of a leading Southern railroad to confine itself to Kentucky coal exclusively, whereas it has been a consumer of considerable Alabama coal. In spite of this, there is probably more Alabama coal being sold for railroad use now than ever before. Improved facilities for loading coal to bunkers are also being rapidly perfected at New Orleans. During the past few days, the movement to river points and beyond has improved.

Indianapolis, Ind.

This has been a strenuous week in the Indiana market. Comparatively few mines have been working and long lines of cars have remained idle on the sidings. The public-service companies have, by dint of economy, secured enough coal to keep going, but this condition cannot last long.

Interest is concentrated on the joint conference being held at Terre Haute, and the prospects for a general resumption are much brighter than a week ago. The demand for a weekly pay, as provided in a statute enacted by the last legislature, which is of doubtful legality, has been holding thousands of miners in idleness; they are influenced by the radical element, who declare that they will never consent to an agreement that does not provide for a weekly pay. Now that the question is to be voted on, there are those who greatly fear that the vote will be adverse to waiving the weekly pay law.

St. Louis, Mo.

The Illinois mines still continue to open up, and the local market is almost stagnant. It seems to be a contest to see who can lose the most money in the shortest space of time, and all this in view of the fact that the fifth and ninth district operators have an organization and ought to know what their coal is costing them. The price of Standard lump has gone down to 80c. and mine-run is practically the same. The Carterville operators are getting a living price for their coal, but there are indications that they too will lose control of their market.

Nearly every railroad in East St. Louis has coal on track undisposed of, and this condition will probably continue from this time until early fall. Operators in the central portion of Illinois are shipping some coal to Indiana, on account of the shut down there.

The market is as follows:

Carterville	
6-in. lump	$1.25 @ 1.35
3x6 egg	1.25 @ 1.35
Nut	1.20 @ 1.30
Screenings	1.05 @ 1.10
Mine-run	1.00 @ 1.00
Standard	
2-in. lump	$0.80 @ 0.90
Mine run	0.80 @ 0.90
Screenings	0.85 @ 0.95

Minneapolis—St. Paul

It is rather hard to determine the sentiment of the market at present, with conditions dull and backward, as they have been for some weeks past. The prospects are very good, but they are almost wholly anticipatory, based upon the new crop, and the result is that little is being done in advance of present needs.

Contracting with steam users for the season is progressing very slowly; hardly any of the buyers are willing to take up the subject, because during the past two years contracts have proved to be less attractive than spot buying.

The advance of 25c. a ton on anthracite will have a tendency to stall the movement from the docks until later in the summer, as dealers and consumers will not be given any inducement to buy now.

Prices to dealers and steam users are being quoted as follows:

Youghiogheny	
Lump and stove	$3.40
Dock run	3.10
Screenings	2.40
Hocking	
Stove and nut	3.40
Dock run	3.00
Franklin County	
Lump, egg and nut	1.50
Mine-run	1.20
Screening	1.15
Carterville	
Lump and egg	1.50
No. 1 washed	$1.60@1.70
No. 2 washed	1.40@1.50
Harrisburg	
Domestic lump and egg	1.50
Steam lump	1.40
Mine-run	1.20
Screenings	$1.10@1.15
Springfield	
Domestic lump	1.50
Steam lump	1.25
Mine-run	1.15
Screenings	1.10

Portland, Ore.

Just now there is practically no demand for coal, excepting such as is required by the railroads and manufacturing establishments, which fluctuates very little. The weather has been warm except for a few days of rain, and indications are that from now on there will be little business for some time.

This is the time of year when thoughtful people begin to order coal and wood for the winter, but dealers say that prices are too high at present to induce people to buy at this time; hence there is no business in storage coal. Australian freights are prohibitive, and there seems no inclination to reduce domestic-coal values as yet.

Until prices are shaded, dealers look for very little advance business for future wants. The usual reduction on storage coal here is $1 per ton, but dealers say they have to pay too much to justify this cut. How soon it can be done, they seem unable to predict. If present high freights from Australia continue, the domestic product will have very little opposition from that direction the coming fall.

Production and Transportation Statistics

Norfolk & Western Ry.

The following is a statement of the commercial and company coal from mines on the N. & W. Ry., for the month of April, in short tons:

From	Commercial	Company
Pocahontas	1,124,850	112,178
Tug River	160,394	43,895
Thacker	160,688	56,128
Kenova	66,021	8,807
Clinch Valley	119,616	10,978
Total	1,631,569	231,986

Tonnage from the West Virginia mines was as follows, in short tons:

From	Tipple Coal	Total Coal
Pocahontas	20,291	1,192,069
Tug River	4,607	204,289
Thacker	4,726	216,816
Kenova	6,547	74,828
Total	36,171	1,688,002

Note.—Total shipments of coke, originating entirely in the Pocahontas field, amounted to 100,906 tons as compared with 128,816 tons in March.

Chesapeake & Ohio Ry.

The following is a statement of the coal and coke traffic over the lines of the C. & O. Ry. for February and March, and the nine months ending Mar. 31, 1912, in short tons:

Destination	February	March	9 Months
Tidewater	299,459	487,236	3,092,449
East	190,655	198,472	1,671,276
West	971,416	805,017	8,261,891
Total	1,461,539	1,490,725	13,025,616
Coke	17,180	22,932	170,548
From Connections			
Bituminous	17,650	20,060	173,950
Anthracite	4,742	3,330	29,976

Southwestern Tonnage

The Southwestern Interstate Coal Operators' Association has issued the following comparative statement of tonnage for January:

State	1911	1912	Increase
Missouri	248,159	281,453	33,294
Kansas	462,624	537,928	75,304
Arkansas	143,445	155,666	12,221
Oklahoma	251,411	348,982	97,571
Totals	1,105,639	1,324,029	218,390

Foreign Markets

Great Britain

Colliery outputs continue exceptionally heavy, and, as tonnage is still very slow in arriving, there are fears of pit stoppages. Prices have receded further, and are approximately as follows:

Best Welsh Steam Coal	$4.44
Seconds	4.26
Thirds	3.96
Best Dry Coals	4.32
Best Monmouthshire	3.90
Seconds	3.72
Best Cardiff Small Coal	2.28
Seconds	2.22

Prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those of Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days, less 2½%.

The following is a comparative statement of the British fuel exports for April, 1911-12, with the total for the first four months of the current year:

Grade	April 1911	April 1912	4 mos. 1912
Anthracite	168,668	29,793	587,797
Steam	3,576,763	1,086,312	10,132,535
Gas	761,890	266,486	2,205,484
Household	105,811	45,654	344,888
Other sorts	234,749	66,326	696,939
Total	4,847,881	1,494,571	13,967,643

Financial Notes

The Pittsburgh & Erie Coal Co. gives notice that, pursuant to the terms of the mortgage, dated May 1, 1905, the trustee will receive sealed proposals up to Apr. 29 for the sale to it of bonds as described sufficient to make the sum of $13,387.03. The right is reserved to reject any or all tenders.

The following are the cash dividends paid by six of the large hard-coalers during the past 12 years:

Delaware, Lackawanna & Western	$57,500,500
Central R.R. of New Jersey	27,436,800
Delaware & Hudson	39,008,000
Lehigh Valley	23,450,473
Reading	44,100,000
Lehigh Coal & Navigation	13,775,000
	$205,270,773

The Pittsburgh Coal Co. has $27,071,800 preferred stock outstanding out of a total authorized issue of $32,000,000. Dividends are cumulative up to 7%, but the stock has not received the full rate to which it is entitled since the early part of 1905. Dividends were suspended from that year up to the close of 1909, but in 1910 and 1911 disbursements were at the rate of 5% per annum. Back dividend now amounts to approximately 36½%.

During the last 12 years more than 700,000,000 tons of coal have been mined from the properties of the principal anthracite companies and during the same period the aggregate value of these same companies has increased more than threefold. The Lackawanna is looked upon as a phenomenon, but it has increased only a little more than threefold, while Reading has increased sixfold and Lehigh Valley ninefold. The Central Railroad of New Jersey shows almost a threefold increase. The only new money put into any of these corporations is $20,000,000 to the Lehigh Valley and something over $2,000,000 into the Lehigh Coal & Navigation Co.

The United States Smelting, Refining & Mining Co. has issued $10,000,000 6% five-year collateral trust gold notes of the Utah Co., guaranteed principal and interest by the United States Smelting, Refining & Mining Co. The notes are dated Apr. 1, 1912, and are due April 1, 1917, and may be called on or after Apr. 1, 1915, at 101 and accrued interest. The notes will be secured by collateral representing entire ownership of the new railroad and interests in the coal properties. The guarantor company has no mortgage or floating debt and has only $4,000,000 of funded debt, and on Dec. 31, 1911, had net working capital of $7,641,511. Its average net profits for the last six years were nearly 4½ times the interest charges on this issue.

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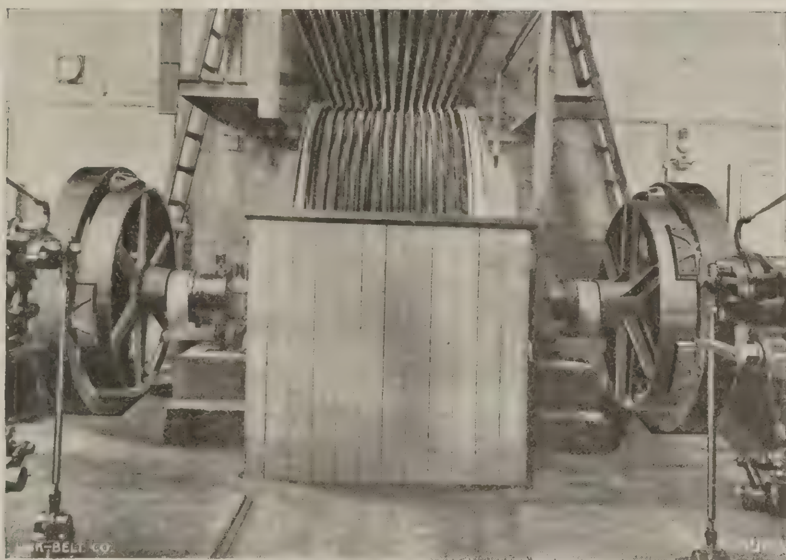

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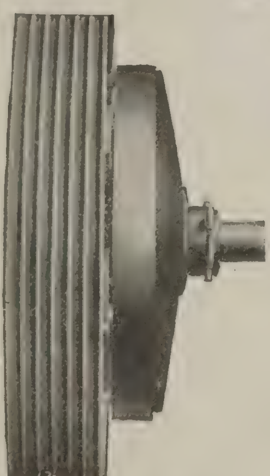

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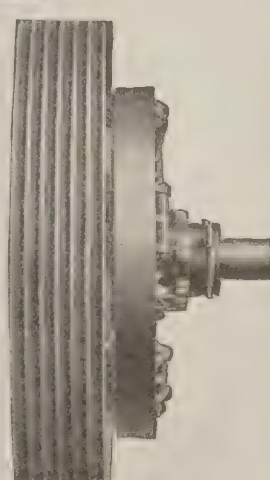

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Classified Index to Articles Advertised

COAL AGE

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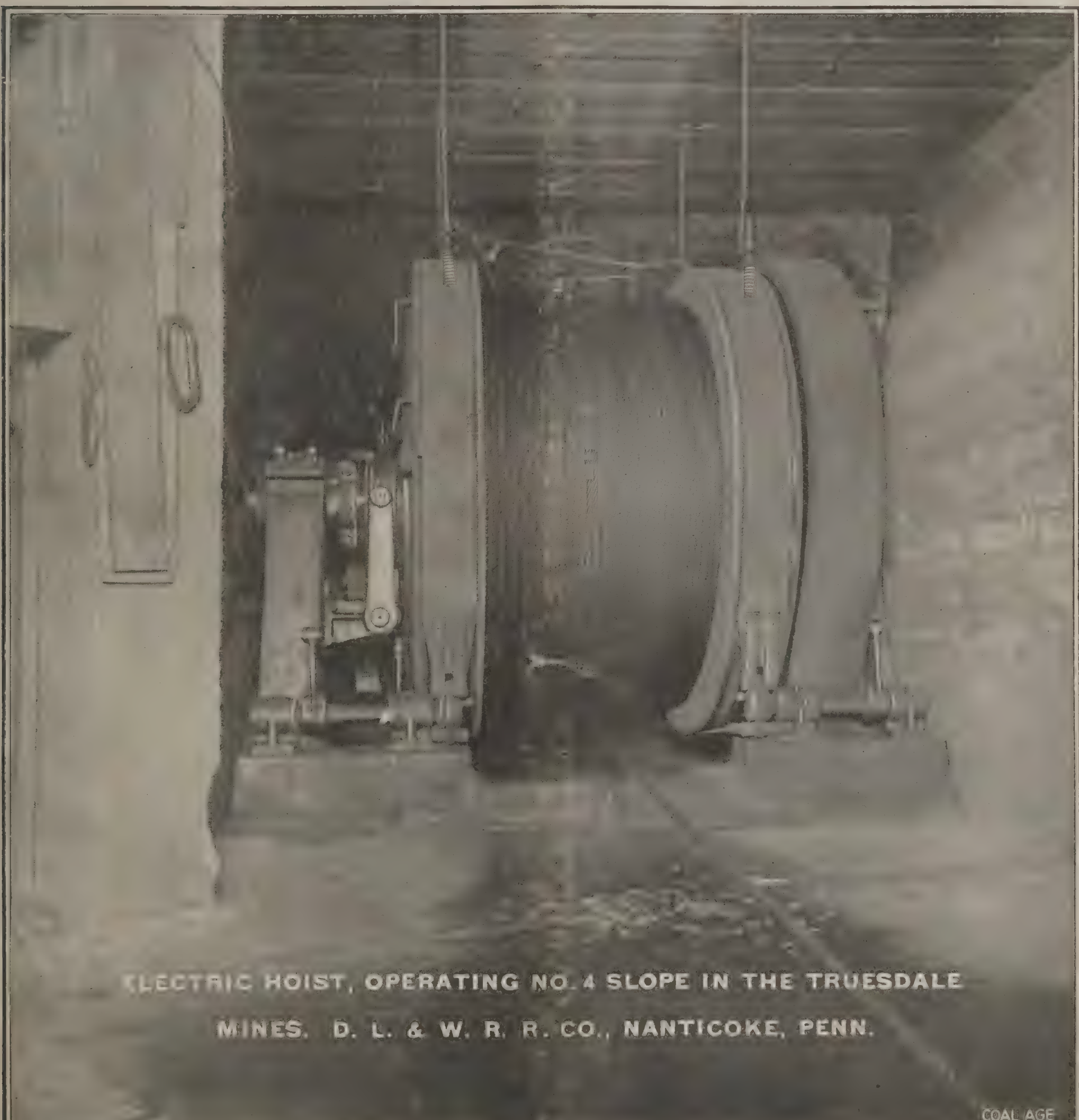

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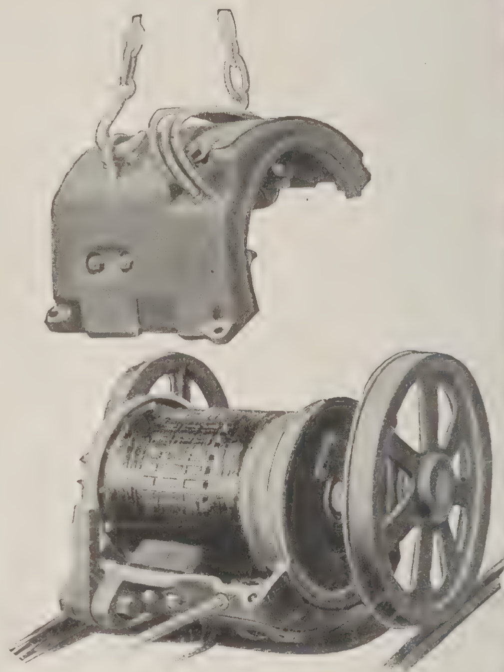

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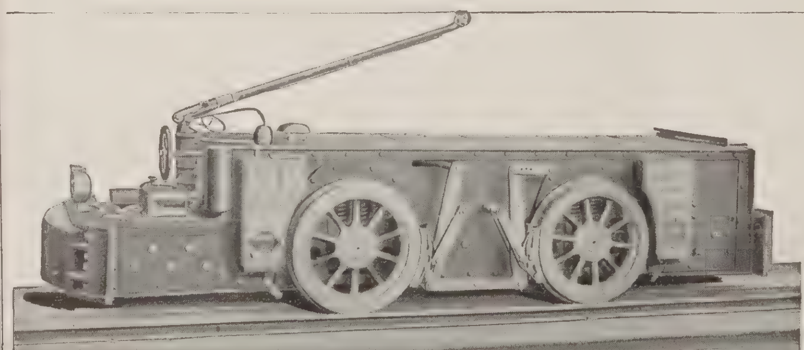

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COAL AGE

Vol. 1 NEW YORK, JUNE 8, 1912 No. 35

LAST week we had a few words to say concerning the desirability of scientific management as compared with rule-of-thumb methods. Continuing along the same line, we do not wish anyone to infer that we believe any single panacea exists for all labor troubles. Lazy, inefficient, selfish and cruel people will always be with us, and as a result we cannot hope to eliminate all poverty and unhappiness.

Scientific management consists in a combination of four great principles: *First*, the development of a true science, or, in other words, the substitution of a science for the individual judgment of the workman; *second*, the scientific selection of the workman; *third*, his scientific education and development; *fourth*, intimate friendly co-operation between management and men.

The problem of any management is to obtain the best initiative of every workman, and to accomplish this end, the company must give some *special incentive* to its men. The inducements generally offered are higher wages, hope of promotion, shorter hours and better surroundings. Under the most modern type of "task" management, personal initiative (hard work and good-will) is obtained by developing a science for each element of a man's work, by teaching, co-operating and sharing responsibility.

In order to perfect a system of scientific management, a company must spend some money in studying the various kinds of work. For instance, careful research has shown that a first-class laborer can be under load only 42 per cent. of the time and should be free from load 58 per cent. of the day. When carrying a heavy weight, the muscle tissues are in process of degeneration, and frequent periods of rest are required for the blood to restore these tissues.

The average manager would question whether there is any science in the work of shoveling coal, but a little thought and analysis will prove that definite laws can be formulated for this type of simple labor. There is a given shovel-load at which a man will do his biggest day's work. One investigator discovered that a first-class man will shovel a larger tonnage per day with a 21 lb. load than with a greater or less load on his shovel. It is evident that the load will vary three or four pounds, but highest efficiency is obtained when the size of shovel used accommodates an average of about 21 lb. of the material being handled.

One company after making a careful and extended investigation of this simple problem of shoveling, and after a study of all motions and the elimination of each unnecessary movement on the part of the men, selected less than 200 competent laborers, who regularly did the work formerly accomplished by 500 men working on their own responsibility with varied tools of their own selection. The fewer number of men received higher individual wages than when they worked under the old rule-of-thumb system.

It must be understood that a plan of scientific management can only be effected by selecting and commencing with one likely individual; other laborers are experimented with later and taught to perform their tasks according to definite rules, which eliminate every unnecessary motion and intelligently recognize the laws of human endurance. When workmen are herded into large gangs, instead of being treated as separate individuals, a loss of ambition and initiative is sure to result, and individual efficiency falls below the level of the worst man in the gang.

When scientific study was applied to bricklaying, the new methods raised the speed of work from 120 to 350 bricks per man per hour. The idea on the part of some union men that restriction of output is a benefit to the trade is erroneous. It should be plain to all that deliberate loafing inevitably results in making every laborer pay higher rent, and in addition drives trade away from the locality where the restrictive measures are in force. The high percentage of unemployed in England is due largely to the action of British workmen in deliberately restricting their output.

The average man will go slowly if, instead of being given a task, he is told to do as much as he can. No workman has authority to make other men co-operate with him to do work faster. It is only through *enforced* standardization of methods, *enforced* adoption of the best implements, and *enforced* co-operation, that higher efficiency can be secured. From two to four years should be consumed in making the change to scientific management, and in coal mining, the added prosperity that would result to operator and miner would be tremendous.

The Roslyn, Washington, Coal Field

By Joseph Daniels*

This is the second and concluding article on the Roslyn field, and discusses principally the methods of working. The room-and-pillar system is used exclusively, and coal is handled in the rooms by means of both chutes and gravity planes. The Washington wage-scale is given, together with some interesting notes on costs.

The room-and-pillar method of mining is the only system used in this field. One of the early mine inspectors' reports mentions that the longwall method was tried at one of the Cle Elum mines, but the experiment was not continued; it was also attempted in the Roslyn field, but abandoned there as well. No mining machines are in general use, although experiments are now being made with the Radialaxe puncher.

Methods of Working

The mines are usually opened with double slopes and entries, the cap rock being brushed to a sufficient height to obtain good headroom, about 5 ft. 6 in. above the rail. Slopes are driven from 10 to 14 ft. wide and the entries 9 ft. with 30-ft. pillars between. In some cases, the entries are driven 14 ft. wide and brushed for a width of 9 ft., the brushing being gobbed in the entry; the air course is not usually brushed.

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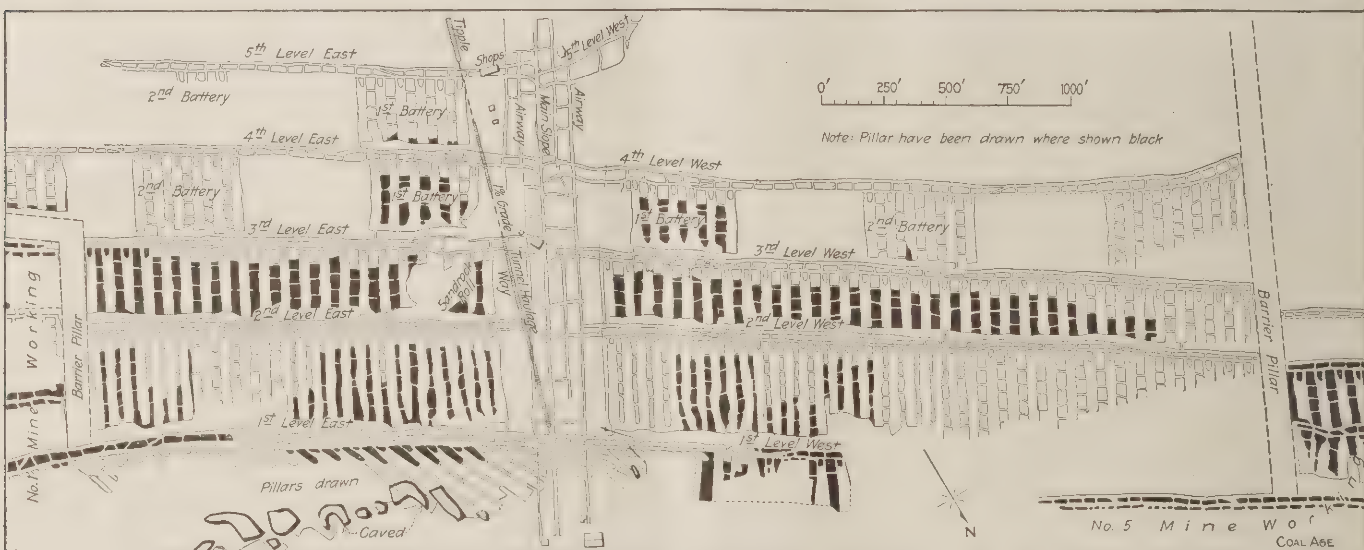
due to the difference of cover or other local conditions.

Crosscuts are driven 6 ft. wide and on 60-ft. centers. Room necks are usually brushed. In single rooms the gob is use wherever the roof is particularly weak. In this system, every alternate 12 rooms are left in as barrier pillars. The pillars in each room are drawn on the retreat back to the gangway; then the blocks are mined and robbed, beginning on the inside. The disadvantage of this method is that it ties up a great deal of coal and requires considerable dead work.

Insufficient pillars and a soft, shaly bottom rock have caused squeezes in some of the older sections. Where pillar coal is being recovered, a skip 10 ft. wide is taken along the room and pillar stumps for a roadway, and portions of the pillars are then removed on the advance up to the limit of safe working and the remainder taken out on the retreat.

Coal is mined by undercutting, shearing and shooting from the solid. The mining is done either in the bottom coal above the floor, in the middle coal and



Map of the Northwestern Improvement Co.'s Roslyn Mine No. 7, at Cle Elum, Wash.

Barrier pillars, 100 ft. wide, are established between adjacent mines, and strong chain pillars left to support the entries and slopes. The slope haulageway is usually made the intake and the air course the return. Some mines having three slopes, use the third either as a manway or an auxiliary return.

Room necks are driven 8 ft. wide, 40 ft. long, and both single and double rooms are used. The double rooms are 40 ft. wide, and have two room necks with a 24-ft. pillar between. Pillars between adjoining double rooms are 30 to 40 ft. wide; the general methods of working are clearly shown in the accompanying map. Single rooms under light cover are driven 24 ft. wide and have 20-ft. pillars. There are occasional variations from these general dimensions, packed on one rib and in double rooms it is placed in the center, back of the pillar stumps. For room timbers, 6-in. props are generally used throughout the district, and these are usually spaced 4 ft. 6 in. in each direction. Little timber is required along the entries.

Pillars of from 30 to 50 ft. in width are left between the face of the room and the next entry above. When the roof conditions will permit, rooms are driven up to the limit and the pillars immediately drawn back to the entry stump, which is left until the entry is finished. It is often necessary, however, to leave the pillars standing.

Retreating System

A modification of this method, known as the "battery and block" system, is in parting of the seam, or in the top coal. Occasionally the coal is sheared in the rooms, but this is confined more particularly to the entries. Shooting from the solid is practiced, although the method is not in general favor. Black powder, fired by squib, and Monobel No. 3, fired by fuse and cap, are most generally used. In some of the mines shot lighters are employed, but as a general rule, each miner fires his own shots.

Room Workings

The steepest dip in the field is 30 deg., while the average lowest is about 10 deg. Coal will run in chutes on the higher pitches, and this method is employed when possible. The chutes are of steel plate, 2 ft. wide, in convenient lengths, and are carried in a straight

line from the center of the room necks up to the face. The chutes extend out to the entry, permitting the cars to be loaded directly. "Bucking" the coal is sometimes necessary. Four men usually work in a double room, two on each side.

On the lighter pitches, the cars are taken up to the face of the room by a gravity-plane arrangement. The track along the entry is laid with the low side rail slightly below the other, in order that the cars may ordinarily pass the room switches, which have fixed points. Cars are switched into the rooms by simply forcing the wheels to take a turnout on the high rail. Just inside the neck of the room is another frog and switch with movable latches. One track is carried straight up along the rib and the other parallels it at a distance of 5-ft. centers. These rails above the latches are usually of wood 4x4 in. in cross-section, laid on ties spaced 5 ft. apart.

Near the face of the room, a wheel post is set, to which is fastened a 12-in. sheave. The rope is given a turn around the sheave and one end connected to the load at the face, and the other to the empty at the bottom of the room. In this way the full car going down brings up the empty. The sheave is usually spragged by means of a wooden pin, and there are few runaways. The descending car always throws the latches, so that the next car will take the right track. Excess rope is coiled up and lengthened as required. Instead of having two tracks in each room neck of a double room, one track may be laid in each room and the rope passed over two sheaves at the face of the double room. This also requires a reversed or back switch on the main entry.

View Showing Underground Haulage Turnout

Platform at Bottom of Chute

Ventilation and Lighting

The hill workings are usually free from gas and dust, but the dip workings in many cases have both. Several explosions and local fires have occurred in the past. All mines are ventilated by surface fans, assisted in some cases by underground "boosters." Many different types of fans are in use, both steam and electric.

The main haulageway in the slope mines is usually the intake, and the air is split at each entry, passing to the face by way of the top entry, and back to the return by way of the bottom entry or air course. Brick and wood stoppings are used, and overcasts are of wood, brick or concrete. In some of the mines, spraying is employed to lessen the dangers due to dust, and in one of the properties exhaust steam is turned into the intake. Slopes and entries are usually kept well cleaned.

Open lights are used wherever possible. The acetylene lamp is in high favor and seems to be displacing the oil lamp. Wolf safety lamps are used in gaseous workings, and electric lights to a limited extent at landings, pump rooms and the like.

Electricity is used entirely for signaling. In one of the mines, a return system is employed, in which hoisting signals ring at each level simultaneously with those in the engine room. Many of the mines have installed telephones.

As a rule, the mines are not very wet and electric pumps of the centrifugal and plunger types are most commonly used. These are generally run in relays on 500 volts, direct current.

Surface Equipment

The surface equipment at most of the mines is very simple. The boiler and engine house, office, shop, and powder house, together with a simple tipple, make up the usual arrangement. The power plant, steel headframe, and tipple at the Roslyn shaft are the most pretentious structures in the entire district. Timber construction and housing of galvanized iron are uniformly used throughout the district.

The machinery and equipment are without exception uptodate and efficient. The N. W. I. Co.'s plant at Roslyn furnishes light and power for the mines in the upper part of the field; secondary plants, coupled in parallel with this at the lower end, supply the light and power around Cle Elum. Practically all of the tipple machinery in the field is electrically driven, and in a great many cases electric hoists are in use.

Coal is shipped to market as it comes from the mine without any further preparation than screening. Some picking is done in the mine whenever sulphur balls are found. The coal mined by the Northwestern Improvement Co. is used by the Northern Pacific locomotives and is not even screened before loading. The other mines in the district which supply the outside markets, screen the coal. Three types of car dumps are in use, the pushback or horn dump, the crossover, and the cradle. Some car pushers and return cars hauls are used and only one plant, the Beekman, has shaking screens; all the others have the usual stationary bar screens. The prepared sizes are run-of-mine, lump, steam and egg, and the sizes of these grades vary.

The rock and waste which come to the tipple, are usually dumped into rock chutes and loaded into 3-ton side-dump cars which are hoisted by a rope over a bull wheel at the top of the rock pile where a tripper automatically opens the car doors and discharges the material.

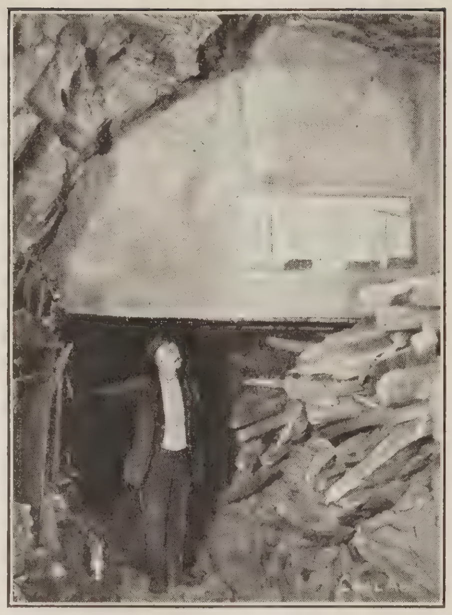
Labor

The labor around the mines is made up of English and Scotch miners, together with Italian and other Southern European races. In the early days of the district negroes were brought in to break a strike and since then there has always been a fair proportion of these among the mine workers. The miners are organized under the jurisdiction of the United Mine Workers of America, and are now working under the terms of a 2-year agreement which expires in September, 1912. In 1910, there were 1687 men employed on inside work and 300 on outside work at the various mines in the field. Ten fatal and 48

nonfatal accidents occurred during the year.

The mining towns through the field are cleaner than those commonly seen in other parts of the country. Many of the men own their own homes, and there are no dry houses at the mines although one is maintained at the Y. M. C. A. building in Roslyn. This institution is supported by both the company and the men. The miners also maintain a hospital and staff of doctors. In the past, the company has adjusted all damage claims directly with the men but under the new liability law in the state, they now contribute a certain amount which is used to pay out injury and death benefits.

The Northwestern Improvement Co. and the Roslyn Fuel Co. each maintain rescue apparatus and rescue squads. The former has six and the latter three sets of Draeger apparatus. At the first aid meet at Pittsburg last fall, exhibitions were given by a squad sent by the Northwestern Improvement Co.



Concrete Overcast with Explosion Door

Wage Scale

The scale of wages paid in the field is fixed by the agreement between the workers and the operators. Miners, timbermen, and tracklayers are paid $3.80, shot lighters, $3.95, motormen, drivers and rope riders, $3.35, engineers and cagers, $3.40 and helpers $3.15. The rates for contract workers per long ton are 92c. for chute work, 95c. for ordinary room work where the cap rock is left up, $1.02 where 12 in. or less of cap rock is taken down, and $1.05 where more than 12 in. of cap rock is removed. Yardage prices paid for driving entries 14 ft. wide are $1.85 when the cap rock is left up, and $2.90 when brushed; 8-ft. entries are $3.40 per yd. Slope sinking is $3.70 and crosscuts in rooms $1.15 per yard.

The average cost of production for coal delivered on cars at the tipple is probably between $1.15 and $1.25 per ton, including all operating expenses except coal royalty, depreciation and overhead charges. The average value of the coal at the tipple is in the vicinity of $2.50, the average figure for all mines in the state in 1910 being $2.57½.

The Roslyn district is at present the largest and most consistent producer in the state. In the older workings, pillar coal is being recovered, and in the new mines, the improved methods are yielding increased percentages. In addition to this, there are many hundreds of acres of virgin coal awaiting development. It is safe to predict that the Roslyn field will continue to be the leading producer in Washington for many years to come.

West Virginia Mining Accidents

By F. C. Cornet*

A presentation of some interesting and comprehensive data regarding accidents in the West Virginia mines. The author concurs with Chief Inspector Laing in the view that safety will be obtained only by constant and close supervision. As compared with the Belgian mines he is of the opinion that the West Virginia operations are much the safer.

Statistics published by the State Mine Department show that during the fiscal year ended June 30, 1910, the average daily tonnage for each man employed inside was 4.21 long tons. Taking the whole United States, the corresponding average is 3.25 tons.

During the period considered there were killed inside the West Virginia mines, 56 men out of each 10,000 employed, as compared with 38 for the whole country. In Belgium, where the average daily output per man is one-half ton, they kill only 10 men out of each 10,000 employed.

From a long personal experience in both countries, considerng natural conditions alone, I am of opinion that the coal mines of West Virginia are immensely safer than the Belgian mines, which have the deserved, if unenviable, reputation of being the most dangerous in the world.

From the figures given above some would be inclined to deduct that, fatalities being less numerous where the average tonnage is smallest, the larger number of fatalities is the result of a greater rush in getting coal out. Nothing would be further from the truth. From personal experience I know that our West Virginia miners do not exert themselves harder to get out 4.21 tons of coal per day than do their Belgian brothers who produce only one-half ton.

*Mining engineer, Charleston, W. Va. Note—Abstract of paper read before the West Virginia Mining Institute.

The reason why they get out more coal on this side of the Atlantic depends 75 per cent. on better natural conditions, and 25 per cent. on the Belgians; for safety reasons, their laws prohibit using mechanical devices and appliances, without which most of our West Virginia mines could not be operated at all, notwithstanding their incomparably better natural conditions.

Accidents Caused by Falls

As in all other coal-mining countries, the largest number of fatalities in West Virginia is caused by falls of slate and coal. During the fiscal year ending with June, 1910, out of a total of 307 men killed inside, 215, or 39 out of each 10,000, were killed under falls.

This bad showing is hard to explain otherwise than by the victims' own carelessness, which accident reports bear out. It cannot be said that the mines where these accidents occurred had bad roofs. In fact, nearly all of said mines were reported as having fair roofs. Nor were the majority of those killed by falls green men; only 75 fall victims are reported as having had less than five years' experience in coal mines, while 94 had an experience varying from five to 40 years. Forty-six were so little known to the mine officials and others that the amount of experience they had could not be ascertained. I do not think I will be far wrong if I assume that one-half of these men had less than five years' experience, and the other half more than five years. That would make a total of 98 men killed who had less than five years' experience, and 117 who had not more than five years. Do not these figures show that greenness, or ignorance of mine work, is not at the bottom of the trouble?

Insufficient supervision on the part of mine officials and absence of discipline on the miners' side—the latter being a direct result of the former—are responsible for at least 75 per cent. of the deaths by falls. I fully agree with John Laing, chief of the mining department of

the state of West Virginia, who, in his report for the year ending June 30, 1910, states that operators should supervise their mine closely and every minute, day and night. Do not let anything escape observation and enforce rigid discipline.

The trouble is that in many mines too much is expected from the foreman. In the large mines it is seldom that the foreman has enough assistants to properly cover and police the workings. I have known mines where it was a physical impossibility for the foreman, no matter how good a walker he was, to see every place, on an average, more than once a week.

Foremen, as a rule, mean well, and are perfectly alive to their responsibilities. As a rule, also, they are handicapped by a lack of assistants. They should have enough assistants not only to inspect every place once a day, but oftener if necessary; that is, if safety to the men demands it. Safety, sometimes, may demand that an assistant foreman be left permanently for some length of time at one place or another in order to insure the carrying out of some order of the foreman.

It is all very well to say that if a man obeys orders only when watched by another he ought to be discharged; but it is a fact that very few men nowadays will allow themselves to be moved by fear of being discharged. Men are scarce. Nobody knows it better than the men themselves, unless it be the mine foreman. If a man is discharged he gathers up his tools and walks to the nearest mine, often a short distance away, where the foreman will be glad to give him a job without asking questions.

Haulage Accidents

During the year ended June 30, 1910, there were 56 fatal accidents from mine cars and motors. This is a large number, being equivalent to 10 out of every 10,000 employed. In this case, also, an examination of the accident reports shows conclusively that most of the casualties are due to the victims' own carelessness.

This carelessness, no doubt, was aggravated by insufficient supervision. It is the same old story we have discussed previously. In this case we see miners riding to work or going home in cars or on motors, trapper boys jumping between two cars of a fast-moving trip in order to get a ride outside and reach home sooner. We see motormen and drivers driving at reckless speed, and also drivers riding on the front of cars, their legs swinging on one side and forgetful of the fact that it is on that side that there are a few places where the car clears the ribs by one-sixteenth of an inch, or less.

Are not these things familiar to many of us? Of course, there should never be any such tight places for drivers, or anybody else, to be caught in. That shows negligence on the foreman's part. It is a fact, however, that many such tight places could easily be found in many mines. There is no excuse for them. Manways, wherever practicable at all, should be provided. Where the operator has not provided any, and the men must use the haulage as a traveling way, the law should always be complied with, and regular refuges, duly whitewashed, provided. There are still haulages used as traveling ways on both sides of which the gob of many years lies piled several feet high, making escape difficult for those who happen to meet a trip in such a place.

There is also too much wildcatting of cars. It is not only a dangerous practice, but a costly one. In many instances it could be dispensed with to the pecuniary benefit of the operator, not to say anything of safety. Not only would it save life, but it would soon pay for itself in reduced wear and tear on the cars—the car wheels principally—cut down track repairs; and less coal would be lost from the cars. This coal, if not gathered daily—which is seldom done—is soon ground to dust and, in many mines, becomes a permanent source of great danger. There cannot be doubt in anyone's mind, after reading the accident reports, that the majority of haulage accidents are caused by the victim's own carelessness.

Electrocutions

During the year ended with the month of June, 1910, a total of 18 men were killed by electricity. Of these 15 were killed by a voltage exceeding 500, while only three were killed by a current not exceeding 250 volts. Not more than one-fifth of the mines in the state carry the higher voltage. They caused, however, five-sixths of the electrocutions, as against one-sixth chargeable against the lower voltage. In his interesting report for the year ending with June, 1910, Mr. Laing, calling attention to the subject, writes as follows:

> An electric current carried in a mine exceeding 300 volts is unnecessarily dangerous to life and limb, and no pecuniary consideration should ever be offered in extenuation of perpetuating methods that have resulted in such a sacrifice of human life.

The figures given above certainly justify Mr. Laing in his views. There are, however, several ways by which the fatalities from electricity could be notably reduced, and they apply to any kind of voltage, high or low. The trolley wires, very often, are not installed properly, the idea being too often to economize on the first cost without thinking of the future cost of maintenance. The wire is either too low or not far enough to one side of the track, no matter whether the road is a traveling way or not—which it often is. The hangers are often too far apart, and the wire sags too much.

The mines having manways are at a decided advantage when electricity is a factor. In such mines the men have no business near the trolley wires. When any kind of electric wire, no matter what the voltage or purpose, is run along a manway it should be protected by a durable shield made of boards running parallel with the wire.

Manway or not, all miners should be cautioned against carrying any auger or bar of any kind on their shoulders when in the vicinity of a wire, unless protected by wooden shield as just mentioned. It does not make any difference if the wire is insulated, because the best insulation does not keep in a mine.

The motors should always be kept in prime condition. This is practicable, and will go a long way toward avoiding dangerous, even fatal, shocks; for it will save the motorman many an occasion of tinkering with his motor, which too many motormen have a tendency to do, under pretense of effecting repairs.

With the wires and motors in perfect shape many causes of mortal and other shocks will be eliminated. There will also be fewer causes of short-circuitings or grounds. All this is perfectly practicable, and is the best paying way of dealing with electricity in coal mines; at least it is my experience.

Miners should never be allowed to ride on cars going to or returning from work. A man getting on or off a car on the wire side is very likely to receive a shock. Where there are no traveling ways, the men having to travel on the electric road, the wire should always be on the opposite side from the refuge holes. The place should also be well drained; for if the road is wet, or simply muddy, the men trying to dodge bad spots may come in contact with the wire.

Gas and Dust Explosions

With the exception of one solitary death from a gas explosion, the year ending June 30, 1910, so far as gas and dust are concerned, was a very fortunate one, following, as it did, two most disastrous years, during which 518 miners were killed by explosions of those two dangerous agents. These explosions had stirred public opinion to a high pitch. Then, for a whole year, the operators' vigilance, assisted by the untiring efforts and devotion to duty of the whole Department of Mines, were successful in keeping down the monsters. These, however, soon broke loose again in different parts of the state, each time making numerous victims.

For a period of 14 years, ending with June, 1910, explosions of gas killed 128 miners, while those dust-killed were 484. Comparing these figures with the number of men working inside, only 2.43 miners out of each 10,000 were killed by gas during the period considered, while 9.23

out of each 10,000 were killed by dust explosions.

It is readily seen that dust is by far the more dangerous agent, in a ratio of nearly four to one. Gas and dust taken together, during this 14-year period, were responsible for a total of 612 deaths, a proportion of 11.63 victims for each 10,000 employed inside the mines—much less than were killed by falls, but a great many more than are killed from all causes in the coal mines of Belgium. The latter are often 4000 ft. deep, and sometimes deeper. They depend for their coal on seams averaging hardly 2 ft. in thickness. These seams are sometimes as thin as 12 in. As a rule, the seams are faulty and pitch strongly. Sometimes they are vertical, or even inverted. Most of these seams are extremely gaseous. With very few exceptions all are dry, and an abundance of dust is a constant source of great danger.

In West Virginia we work on the room-and-pillar system, insuring ventilation from place to place by means of crosscuts, the maximum distance between crosscuts being fixed by law at 80 ft. If there is enough air in circulation and there is a crosscut right at the face that room may be what is called ventilated, but its face will not be swept in its entirety by the ventilating current. The corner of the room further removed from the crosscut will hardly be touched by the air, as is easy to ascertain experimentally.

Ventilation

If the seam liberates gas in any quantity a sweeping of the whole face by the ventilating current is the only thing that will remove gas in a positive manner. However, I am disposed, for an instant, to admit that when the crosscut is at the face the place is, for all practical purposes, sufficiently ventilated; but suppose the crosscut is 10 or 15 ft. behind the face? Then, I contend that, if the place liberates gas, it is not safe any more, no matter how much air runs through the last crosscut.

The weakest point about our ventilating system, is that, in a case when there is gas at the face, we depend on a fireboss to discover it. He may discover it in time, and condemn the place pending the building of a brattice; but, as our fireboss is a human being, he may err. He may not discover anything; he may even omit to visit the place, thinking that, since there has never been any gas found in it there is no use inspecting it any more, and pass the place as safe. The miner will walk into it a few moments later and ignite the gas. The chances are he will not live to tell about it. If there is dust lying around, the conditions are favorable for an explosion that may involve the whole mine and kill all the men in it.

Our ventilation system involves the sending of a man, or several men, to visit all the places to see if they are safe before the miners go to work. Ventilation in order to be safe must be positive, automatic, and sweep all faces as they advance, regardless of any inspection or brattice. With our room-and-pillar system such ventilation is not practicable.

In our best ventilated mines there is always a possibility of a place filling up with gas from the face down to the last crosscut. A body of gas thus formed may get ignited in the place itself, or it may reach the other places beyond, being carried there by the air current, and be ignited at any point. The body of gas may be large enough to cause considerable damage by itself if exploded; but if the explosion is propagated by dust, results may be a great deal worse. Automatic, positive ventilation would not allow of the formation of such bodies of gas. It removes the gas, particle by particle, as it comes out of the coal, sweeping it away, too much diluted to do any harm. With our present system of ventilation gas may be present in a gaseous mine at all times in some part or other of the workings.

Gaseous Mines

In a gaseous mine there is always present the great danger of small amounts of explosive gaseous mixtures getting ignited, from one cause or another. It does not take much gas to create, by explosion, such a big commotion as will be felt strongly in remote parts of a mine, raising clouds of dust in a hundred places.

A gas explosion, even of small proportions, may thus not only raise hundreds of dust clouds, but ignite as well the nearest of them. The inflammation, then, will run from dust cloud to dust cloud, creating a rapid succession of explosions, wrecking and killing everything in its path.

We may succeed, in our mines, to reduce the danger from gas and dust to a minimum, but we shall never be able to free them so completely of both these elements of danger as to be justified in disregarding them entirely. After taking all precautionary measures against gas and dust, it will be just as important to take such measures as will banish all causes of inflammation of either gas or dust.

In mines generating gas in appreciable quantity there is no place for naked lights. Electricity should not be used near the faces. All places should be cut by machine, in order to reduce to a minimum the chances of solid shooting.

Nothing but approved safety explosives should be used, bearing in mind that the safest of explosives ceases to be safe when more than its charge limit is used in one hole. This is too often forgotten by miners.

It should never be permitted to fire more than one shot at a time. When several shots are fired together, or in rapid succession, it is easy to understand that gas might be liberated and dust raised by the first shot and ignited by the next, even when safety powder is used.

Notes on Shooting

By all means the use of fine coal should be rigidly prohibited for tamping purposes. Before shooting the place should be tested for gas. When a mine is only dusty, and not gaseous, there is no danger from the ordinary naked lights, such as used by miners; nor is there much danger from electricity.

Of course, all places should be cut by machine, and solid shooting strictly prohibited. Explosives and shooting rules, the same as in gaseous mines, as described above. All these recommendations to minimize danger from gas and dust will go amiss if not carried out to the letter.

Miners, if left to themselves, have a tendency to revert to some more familiar explosive, like black powder. The miners would also be prevented from using too large quantities of explosive in one hole. This is an important thing, as the so called safety explosives are not safe if more than their charge limit is fired in one hole. We have all noticed the tendency of the average West Virginia miner to use absolutely too much explosive in his shots. That would not do with safety powder.

No large quantity of explosive should be carried by any one man, and no quantity of explosive, no matter how small, should ever be hidden away in a receptable, such as a box or a can. It would be well to remember that the most disastrous mine explosion in history, the dust explosion at Courrières, France, four or five years ago, was started by the accidental explosion of less than 2 lb. of a safety explosive, called "Favier," which had been hidden in a ventilation pipe of galvanized iron 20 in. in diameter. In this case there was no gas at all to help the explosion at the start; but there was dust aplenty. That dust explosion at Courrières killed more than a thousand men.

It will be remarked that I have not insisted on the ways and means of keeping down gas and dust. That is pretty well understood by all coal-mining men in our state. What is not so well understood, I believe, is the importance, just as great, of keeping out of our mines all causes of inflammation of gas and dust, even after we have done all that can possibly be done otherwise to remove danger from both sources. On this I have insisted at some length.

Points in Mine Ventilation

By J. T. Beard*

A multiplicity of theories involving some popular fallacies in mining textbooks. Misconception in regard to the diffusion of gases in mines. The limit of diffusion of gases. Detection of carbon monoxide in mines not made by observing lamp flame. Mistaken relation of pressure and power by early writers. Manometric efficiency, a useless term in comparing fans.

What we do not know about mine ventilation would perhaps make a larger book than the facts we know. It is often bewildering to find how limited is our knowledge of actual facts relating to coal mines and we are simply lost in the multiplicity of theories that are urged to account for the clearly observed phenomena of mining. Some of these theories are based on sound scientific principles while many others are pure speculation, having no foundation other than exist in one's imagination. While some of these theories, though useless, are equally harmless, others lead to dangerous practices in the mines that are not infrequently responsible for the loss of lives and property.

So great is the horror of mine disasters in which the mine may become a living tomb, that men charged with the responsibility of mining operations are often willing to accept and too prone to adopt any theory that has a semblance of plausibility. The present paper will confine itself to a brief discussion of a few of the fallacies that have crept into our knowledge of mine gases and the practice of mine ventilation. Mining textbooks are largely responsible for many of our misconceptions with respect to mine gases. They describe the physical properties of the gases commonly found in mines. The properties described, however, are those of the pure gas, such as methane or marsh gas, carbon dioxide, hydrogen sulphide, etc., as determined in the laboratory. Inasmuch as these gases never, we may say, occur pure in the mine, but are mixed in various proportions and diluted more or less than normal percentage of oxygen, it is easy to see that the mixed and generally diluted gases of the mine will possess properties that often differ widely from those described in the books. Too much emphasis has been placed on these physical properties and not enough on the behavior of the gas or gases in the mine.

Diffusion of Gases

The question of the diffusion of gases furnishes a striking example of the misconception that often exists in the practical mind, growing out of the failure of textbooks to properly treat the behavior of gases in mines. In these books diffusion is described as a rapid and intimate mixing of two or more gases. This is true, but the definition is not complete unless it states that the mixing is *uniform and in fixed proportions.* We often confuse *diffusion* with *mixing,* whereas the two processes are widely different. Gases *mix* together *in any proportion* and the mixture is not uniform, except as diffusion tends to make it so after a brief time. Diffusion, on the other hand, acts according to a fixed law, which is stated as follows: The rate of the diffusion of each gas is inversely proportional to the square root of its density.

[Note—Paper read before Summer Meeting, West Virginia Coal Mining Institute, Charleston, W. Va., June 6, 1912.]

This law of diffusion gives a definite mixture of the gases, providing the diffusion is complete and no other action occurs tending to mix the gases. It is interesting to know, in respect to the diffusion of marsh gas and air, that the specific gravity of marsh gas (CH_4) being 0.559, its square root is 0.748, or, say ¾, which makes the inverse ratio, in that case, $^4/_3$ and shows that the diffusion of marsh gas into air would produce a mixture consisting of four volumes of gas to three volumes of air. This mixture would have a specific gravity of

4 vol. CH_4,	relative weight, $4 \times 0.559 =$	2.236
3 vol. air,	relative weight, $3 \times 1.0 =$	3.0
7 vol. mixture, relative weight,		5.236

$$sp.gr. = \frac{5.236}{7} = 0.748$$

This mixture would be very "sharp" since it contains

$$\frac{4 \times 100}{7} = 57 + \textit{per cent.}\ CH_4$$

Its specific gravity being less than one, if undisturbed, it would collect at the roof, or at the face of a steep pitch.

The practical point to be noticed is that when marsh gas issues from the roof strata or from the coal face on a steep pitch, it is possible for this mixture to form and be mistaken for pure marsh gas. The question is often asked, "If the diffusion of gas is rapid, how is it that "sharp" gas is frequently found at the roof while the air below is practically free from gas; why does not this gas diffuse and fill the entry?"

To answer this question from a mining standpoint, it is necessary to remember that the very fact that there is a thin layer of gas at the roof and practically no indication of gas below, shows a uniform or undisturbed condition of the atmosphere. It is also necessary to note that as diffusion advances the density of the mixed air and gas rapidly approaches that of air; and when this point is reached further diffusion ceases. In plain language, the pure gas issuing from the strata is so rapidly diluted with air that diffusion practically ceases a short distance from the point of issue. The action is continuous for a depth below the roof, depending on the quantity of gas given off per minute, per lineal foot of entry, and the volume of air passing in the entry. The point to be borne in mind is that with a certain emission of gas from the roof per lineal foot of entry and a certain volume of air in circulation, diffusion is most rapid close to the roof and decreases in rapidity downward, each successive layer of air containing a less and less percentage of gas as the density rapidly approaches that of air when diffusion practically ceases.

Indications of Presence of Carbon Monoxide in Mine Air

In describing the effect of carbon monoxide on flame all textbooks mention particularly the increased brightness and the lengthening of the flame, due to the presence of this gas. It has been suggested, very properly, that this statement is misleading and may be the cause of many a miner losing his life in the attempt to rescue others after an explosion. This is true. It would be fatal to enter an atmosphere more or less charged with afterdamp, and depend for safety on the indications of the flame of a safety lamp.

It is true that a lamp flame is visibly lengthened and brightened in an atmosphere charged with the fine dust of an inflammable coal, which, in contact with the flame of a lamp, generates carbon monoxide that is burned at once on the surface of the flame to carbon dioxide. In this case, however, the gas is not present in the air, but is generated by the burning of the dust in contact with the flame. The same indications occurring in an atmosphere of afterdamp free from dust, would be accompanied with surely fatal results.

When it is remembered that carbon monoxide has the widest explosive range of any gas except hydrogen and that its lowest explosive limit is marked by a percentage of only 13 per cent., and its inflammable limit is still lower, probably less than 2 per cent., while ½ of 1 per cent. of this gas is fatal to life, it will be seen that it would certainly be fatal to depend on any indications of the flame of a lamp to warn one of the presence of this gas in the mine air, because the

indications would be observed too late, if at all.

Some surprise may be expressed that miners have been burned by this gas collected behind a standing shot when they have thrust a lamp into a crevice behind the coal to examine the effect of a shot, and yet have not been killed by the poisonous qualities of the gas. This is due, however, to the rapid diffusion of the gas exhausting itself a short distance away, by the equalizing of the densities of the gas and air, as previously explained. The percentage of gas falls below the fatal mark, a short distance from the place where it is formed.

Pressure and Power in Ventilation

In the early history of mining, ventilation was secured wholly by natural means or by the furnace. The basis of calculation was the motive column or ventilating pressure due to the difference in temperature of the upcast and downcast shafts. Little was said of the power producing ventilation. Later, when centrifugal fans came into general use as mine ventilators it was seen that either the power applied to the fan shaft, or the net power on the air, was the true basis of calculation.

The early writers on mine ventilation, Atkinson and Fairley, were good as far as they went; they were indeed remarkable for their clearness and simplicity. But as the theory and practice of ventilation became better known it was found that the old rule, *"Pressure varies as the square of the quantity of air in circulation"* was only true when speaking of a given mine or airway. But, when speaking of a constant power, the pressure varies inversely as the quantity of air circulated. For example, to double the quantity of air in an airway will require four times the pressure; but in order to obtain double the quantity of air with the same power, the pressure must be reduced to one-half the original pressure.

There are other important points that the early writers did not explain. They failed to give the mine its proper value and to make clear the fact that it is the mine resistance that establishes and determines the pressure, which the ventilator creates. The same fan run at the same speed and consuming the same power will yield a different quantity and pressure operating on different mines Keeping the power on the fan shaft constant, and turning the fan at practically a constant speed, as the pressure against which the fan operates is increased, the quantity of air is decreased; and *vice versa,* a decrease of pressure gives an increase in the quantity of air delivered.

If this is true it is plain that what has been termed the "manometric efficiency" of a fan does not describe the fan; because it is the ratio of the actual pressure developed to the theoretical pressure as determined by the formula.

For pressure, in pounds per square foot,

$$w.g. = \frac{12 \times 1.2}{1000} \; \frac{u^2}{g}$$

For water gage, in inches,

$$p = 0.002\, u^2$$

in which u = tip speed of fan (ft. per sec.).

If the mine resistance determines the actual pressure then the manometric efficiency describes the efficiency of that particular fan working at that particular mine and no other. At another mine, the same fan would show a different manometric efficiency. The term is, therefore, useless in comparing fans to determine the best type of construction. Fans must be compared on a basis of power, which determines the mechanical efficiency of the fan. This term properly describes the fan, being independent of the mine or the resistance against which the fan is operated.

There are numerous other points relating to fan ventilation that are being studied and revised today. Among these may be mentioned tandem fan installations, high-speed fans, the effect of short-circuiting the air on the speed of the fan; etc. Each of these questions furnishes ample opportunity for discussion that cannot fail to be instructive and to interest all who have mines to ventilate. The discussion of such matters as these often brings to light fallacies that have become deeply imbedded in the mind and which are hard to efface.

Only a few weeks ago one of the leading technical journals of England filled two of its columns in an attempt to prove that the cutting out of the mine resistance, by opening the doors at the top of the upcast shaft would cause the fan to run faster. It is needless to say the argument was based on a fallacy and, of course, proved to be a fallacy.

A short time previous, another fallacy appeared in one of the leading mining technical journals in this country, in the answer to a question asking for the discharge of a 4-in. siphon line rising 17 ft. in 800 ft. and then falling 75 ft. in 300 ft., giving it an effective head of $75 - 17 = 58$ ft., the entire length of the siphon being 1100 ft. One answer gave the discharge as 259 gal. per min., while another made it only 179 gal. per min. The fact is that this pipe would simply run dry in a short time because the atmospheric pressure would only cause a flow of 130 gal. per min. in the 800 ft. of 4-in. pipe, rising 17 ft., while the 300 ft. of 4-in. pipe, falling 75 ft., would discharge 330 gal. per min. under gravity.

This and other illustrations that could be given show the need of a more thorough knowledge of conditions before attempting to work out problems of this nature. The conditions affecting all mining problems are multitudinous and their consideration is important. It is the neglect to properly consider the conditions affecting a problem, that causes the frequent disagreement between theory and practice.

The Carbide Lamp in Mining

One erroneous idea, much needing correction, has become quite prevalent in regard to the carbide lamp. It is often asserted that this lamp will burn in an atmosphere of carbon dioxide (CO_2); that it is not dependent for its combustion on the oxygen of the air; and this argument has been used to press the claims of this lamp for mining purposes. These statements are both of them wrong. The lamp will *not* burn in an atmosphere of pure carbon dioxide; and it *is* dependent for its combustion on the oxygen of the air.

This is readily seen by writing the equations showing the reactions that take place; first, in the generation of acetylene gas from calcium carbide by the addition of a little water; and, second, in the combustion of the acetylene gas in air, forming carbon dioxide and water vapor; thus,

$$\underset{\text{Calcium Carbide}}{CaC_2} + \underset{\text{Water}}{2H_2O} = \underset{\text{Calcium Hydrate}}{Ca(OH)_2} + \underset{\text{Acetylene}}{C_2H_2}$$

$$\underset{\text{Acetylene}}{2C_2H_2} + \underset{\text{Oxygen}}{5O_2} = \underset{\text{Carbon Dioxide}}{4CO_2} + \underset{\text{Water Vapor}}{2H_2O}$$

It is readily understood that the acetylene gas generated in this lamp by the action of water on calcium carbide requires oxygen for its combustion and it can get this oxygen from no other source than the air.

What has led to the statement that the carbide lamp will continue to burn in an atmosphere of carbon dioxide is the fact, observed in mining, that the carbide lamp is not extinguished in blackdamp when other lights fail to burn. This is true; the carbide flame, like the hydrogen flame, is more tenacious than other flames. The hydrogen flame requires 4 times as large a percentage of CO_2 in the air for its extinction, as is necessary to extinguish an ordinary light; and the acetylene flame of the carbide lamp is similar in this respect.

It is a common mistake among mining men, who generally know better, to call blackdamp, carbon dioxide, whereas the blackdamp of mines is a variable mixture of air and extinctive gases consisting largely of carbon dioxide. It is possible for the carbide lamp to burn in this mixture because the mixture contains some available oxygen that supports the combustion. In this respect blackdamp is very different from an atmosphere of carbon dioxide, which contains no free or available oxygen. The carbide lamp, or any other flame dependent on oxygen for its combustion, would be extinguished in pure carbon dioxide.

In this connection, it is important to remember that the carbide lamp will burn in an atmosphere containing over 50 per

cent. CO_2, while 18 per cent. of this gas in the mine air may produce fatal results when breathed a short time. On this account, the carbide lamp is not a safe lamp to use in mine workings generating much blackdamp, any more than the electric lamp is safe in mines generating marsh gas. The lamp does not give sufficient warning of the danger to which the mine worker is exposed. The first intimation he has of the danger comes in the effects produced by the gas on his system; and these may prove fatal before he is found and removed.

I have tried in this brief way, to point out a few of the flagrant errors that exist both in the too generally accepted theories of mining as well as in the minds and practice of many good mining men. If the discussion of these points serves to impress the several fallacies on our minds, the paper will have accomplished its purpose.

Successful Store Management, in Relation to Coal Mining Communities

By Charles H. Lantz*

In nearly all mining communities will be found what is commonly called the "company store." This is a store owned by the mining company, or by a separate company with interlocking directors, organized and conducted to serve the employees of the operating company. The "company store" is almost as necessary from an operating standpoint as the mechanical equipment required for the production of coal, because a mining company without a store is often without men to work the mines.

It is hard to find a class of men who are more open hearted, generous and liberal than those working in and around mines, and their liberality is often to their own detriment, for in times of slack work or other reverses they are not financially able to meet their needs. Nearly every miner knows from experience how difficult it is to enter a community, served only by independent stores. He finds that credit is refused him on account of his being a stranger, and also because irresponsible persons in the past have failed to liquidate their obligations. While independent stores, as a rule, are liberal with their credit, they must at least confine it to people with whom they are acquainted.

In entering a community served by a company store the mine worker is advanced the amount necessary to purchase tools, or is at least told where these can be borrowed until such time as he is able to purchase them. The amount necessary for his maintenance can be drawn daily from his wages, and if married he can purchase the necessary furniture for housekeeping by means of small monthly payments and at no increase in the original price. He is made to feel at home in the store, is treated courteously and helped to know his fellow workers, for there is no other place where the men meet more frequently than in the company store.

In answer to the question: Does he pay more for these advantages and privileges than if it was not necessary for him to obtain them? I would say that in the case of a well managed company he does not. The successful store company must serve its patrons properly, and in order to do this must have a policy of conserving and improving its facilities for the economical handling of business.

The successful company has good credit whereby it purchases all merchandise at the most advantageous figures. It has a system of credits whereby the losses are almost *nil*, and the customers are not required to pay for the bad debts of other patrons. It sells only the best of merchandise; otherwise it would not be a successful company, and for the same reason, it uses standard weights and measures, giving as much as it can, instead of as little as it can, for the dollar. It has a volume of business that turns the stock rapidly, always insuring fresh merchandise, and at the same time reducing the selling cost. This allows the company to obtain a smaller profit than its competitors on individual sales and still make a good showing.

In a community where there are a number of stores of various kinds, which of necessity reduce the volume of business that each can obtain, with attendant increase in expenses, it is not reasonable to expect that the patrons of such independent stores can get the service, quality or just treatment that they receive at the hands of the successful company store.

It is not claimed that capital will be invested except with the expectation of profit, for profit making is the basis of individual and national prosperity. In organizing the store company, the holding company has a right to obtain revenue from it, but by using economical methods, the store can be made the source of such revenue, and at the same time distribute its merchandise to the advantage of the citizens of the community which it serves.

Since both the mining company and the store company are striving for one end—the success of the companies as a whole, without which the community must of necessity suffer, there should be a pleasant and coöperative spirit shown between employees of both departments. Loyalty to the company of which they are a part is essential to their mutual success.

The store company that serves the community faithfully and efficiently, cannot help but be successful and will eliminate all adverse criticism. By a study of the form and methods of the successful companies it will be found that they adhere to a just and equitable policy which not only reflects credit upon themselves but assures a peaceable and satisfied community.

*General manager, Buxton & Landstreet Co., Thomas, W. Va.

Note—Paper read before the West Virginia Coal Mining Institute, Charleston, W. Va., June 6, 1912.

New Geologic Map of Southwestern Pennsylvania

In the extreme southwestern part of Pennsylvania lies an extensive area which is rich in deposits of coal, oil and gas. About 1500 square miles of this region have been mapped by the Geological Survey, the latest contribution to this work being Geologic Folio No. 180, by M. J. Munn. This contains maps and a description of the Claysville quadrangle.

The Claysville quadrangle covers a part of the western portion of Washington County and a small area in the northern part of Greene County. It is underlain by the valuable Pittsburg coal bed, from which the greater part of the coking coal of southwestern Pennsylvania has come.

The geologic maps of this folio show in great detail the position or the "dip" of this coal bed in the entire quadrangle and the depth below the surface at which it may be found. It is believed by coal men that a large portion of the coal in this bed within the Claysville quadrangle has coking qualities.

Other coal beds overlying the Pittsburg coal are exposed at the surface over a large portion of the Claysville quadrangle. These beds, though of poorer quality and in places much thinner than the Pittsburg, may eventually become valuable as the better beds are exhausted. The coal beds of the quadrangle are estimated by the Geological Survey to contain 1,150,000,000 short tons.

West Virginia Examinations

The department of mines, of West Virginia, under the direction of Chief Mine Inspector John Laing, will hold examinations for certificates of competency for mine foremen and firebosses, at the following named places and dates: Welch, July 10 and 11; Glen Jean, July 17 and 18; Elkins, July 24 and 25; Fairmont, July 31 and Aug. 1; Logan, Aug. 7 and 8; Charleston, Aug. 14 and 15.

It is hoped that all mine foremen and firebosses, who are holding positions on the recommendation of their district inspectors, and have not yet secured certificates, will avail themselves of this opportunity, as they will not be allowed to hold these positions after this series of examinations. All others aspiring to the position of mine foreman or fireboss are also invited to take the examinations.

A Ventilating System without Doors

By H. J. Nelms*

The general use of doors in modern mines is gradually being dispensed with, and overcasts used instead. Many systems of mining have been devised to accomplish this, and the one here described embodies some unique and economical features.

*Castle Shannon, Penn.

Where mines generate large quantities of gas, the ventilation is usually the hardest problem to solve. The plan here shown is used in some districts and has been found practicable. It will be noted that no doors are used, the different splits being made by overcasts.

The customary practice in most mines using the three-entry system is to make the middle face entry the haulage road, the one next to the rooms the intake airway, and the other the return. By this system a door is required at all butts, and there are so many reasons why doors are objectionable that a ventilation plan, by which they can be eliminated, is most desirable.

Referring to the accompanying plan, it will be seen that the first and second entries are the intake airways and the third the return. The first butt entry is turned off the middle face entry at 90 deg. and connected with the first face entry by a 45-deg. slant. The second butt is turned square off the third face entry.

Method of Splitting the Air

The air coming in the first and middle face entries is split at the intersection with the first butt, a portion going in the butt entries and the remainder continuing in the main entry. The air enters the first butt entry under the overcast at the intersection of the first butt with the third face entry, travels to the face through the rooms off the butt entry and returns out the second butt to the third face entry. Here it meets the main return from the inside and passes out to the fan.

It is, of course usually necessary to put in regulators on the second butt entry. These latter are usually driven quite wide, about 14-ft., so that the velocity of the air is comparatively low, and much of the explosive dust is deposited. Since the second butt is never used as a traveling way, it may be sprinkled as much as desired, which will greatly decrease the possibility of a dust explosion.

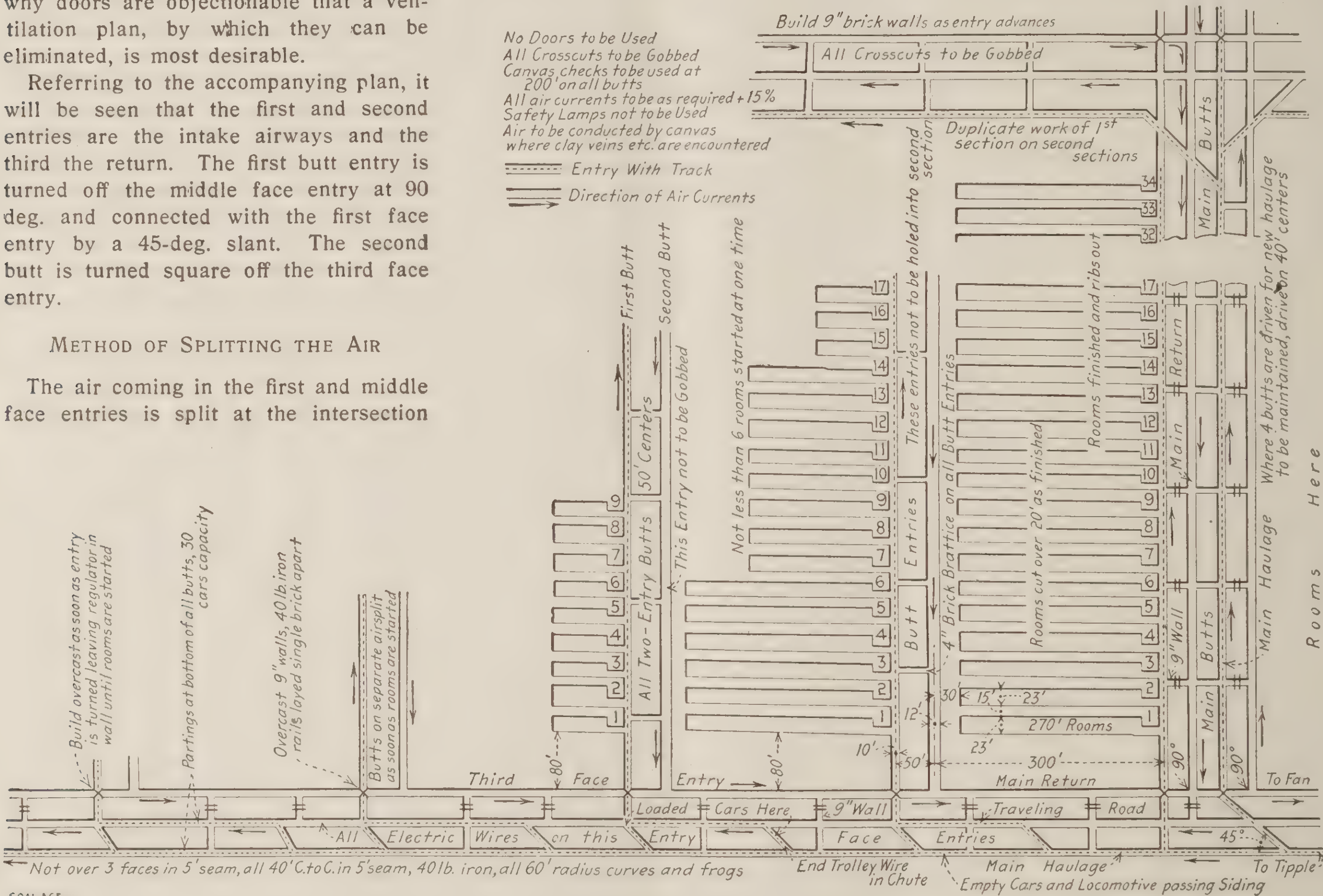
Haulage

The first face entry is made the main haulageway and, at the connection with each butt, a parting is established having a capacity of about 30 cars, which is about the heaviest trip the motors can haul. The motor usually takes 15 cars from two different entries thus leaving this number standing on each parting. The motor going in with the trip runs in on the side track of the butt entry requiring empties, drops 15 cars and then proceeds to the next where the remainder of the trip is left. Coming out it picks up the loads by backing in to the parting in the middle face entry.

Removing the Pillars

The pillars are best removed by cutting crosscuts through the room pillars about 12-ft. wide and leaving a stump of about 5-ft. of coal next to the gob. The stump is taken out as pick coal and this cuts that down to about 60 per cent.; it can usually be mined with little or no shooting.

While this general system of working may appear very expensive at first glance, it has been found highly economical in the end.



Plan of a 2-, 3- and 4-Entry System of Working in which the Necessity of Doors Is Eliminated

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Ventilation has come to be one of the most important factors in the cost of the production of coal, as the energy of the miners depends in a great measure upon the purity of the air they breathe. Danger from gas explosions is also minimized by adequate air currents. Neglect of ventilation is a standing invitation to increased cost of production.

Central Station Power for Coal Mines

By Graham Bright

Mr. Bright takes as an example, a typical coal-mining installation and figures the comparative costs of central-station and locally generated power, showing the possible saving which may be effected by use of the former. A valuable discussion of data and methods for determining power costs.

Note—Paper presented at meeting of the American Institute of Electrical Engineers, Pittsburgh, Penn., Apr. 25, 1912.

In considering the application of central station power to coal mines the operator of today is sometimes at a loss to know just what saving will be effected, and for the following reasons: First, he believes that he is producing power at a fairly low cost, due to cheap fuel, simple apparatus and low cost of buildings; second, not knowing approximately what his present costs are in detail, he is at first unable to see the saving, if any, as compared with a definite rate per kw-hr. for central station power; third, the use of central station energy often requires the purchasing of new apparatus, and the selling of the present generating apparatus under unfavorable conditions.

In regard to the first reason, the cost of fuel is, of course, low at the mine, but its value should be figured at the price that could be obtained for it if sold. The water question, however, is often a serious one, and bad water in many cases occasions heavy expense for repairs. The boilers, engines and generators as a rule are the simplest and cheapest obtainable, there being little incentive to obtain high economy at a mine power plant. Reliability is the first requisite, and with the class of skilled help obtainable about a mine, this reliability can be obtained only with the simplest kind of apparatus. The buildings are generally of the cheaper forms of construction, and often have inadequate illumination, in which case the equipment does not receive the care it should.

In regard to the second reason, a certain rate per kw-hr. for power from a central station is not always an indication to the average operator as to what his total cost for power and his saving will be.

In regard to the third reason, in order to utilize central station energy it is usually necessary to purchase motors to replace the fan, hoist and compressor engines, and to purchase synchronous converters or motor-generator sets to replace the generators and engines driving them. The boilers, engines, pumps, old generators and piping must be sold and it is rather difficult to get much more than scrap value for these, if they have been in use for several years. If the proper depreciation on the old apparatus has been charged off each year, the value carried on the books should not be very high. The difference between the value of the old apparatus and the salvage obtained for it must be charged off, or the entire value of the old apparatus must be charged off and the value of the new apparatus put on the books as the difference between the cost of the new apparatus and the salvage obtained for the old. To provide for this change, new capital is required, and the members of the average board of directors must be assured of adequate returns before they will permit the expenditure of this new capital.

Method of Determining Comparative Costs for Power

The purpose of this paper is to show a method of determining the cost of power at an average coal mine with its own power plant, and what the cost would be if central station energy were purchased at some definite rate per kw.-hr. The values assumed are only approximate, as it is the method that is to be shown rather than actual values.

We will suppose that we are investigating a shaft mine, having the following list of power apparatus:

TABLE I. POWER EQUIPMENT

4 return tubular boilers, 18 ft. by 72 in. Steam pressure, 90 lb.
2 boiler feed pumps.
1 deep well pump.
1 feed water heater.
1 double balanced steam hoist. Max. hp. of engine, 400.
1 ventilating fan. Horse power of engine, 50.
2 high-speed 150-hp. engines for generators
2 100-kw. 500-volt d.-c. belted generators.
1 10-hp. engine for machine shop.
1 10-hp. engine for screen.
1 25-hp. engine for elevator.
1 5-hp. engine for coal conveyor to boiler room.
2 steam pumps at bottom of shaft, 10 hp. each.

The motors operated from the generators will have a combined capacity of about 500 hp. The generators will be operated about 20 hours per day, the time depending upon the amount of electric pumping to be done. Some of the coal cutting frequently is done at night, which tends to improve the load factor on the generators, the lights and pump load being, as a rule, a small percentage of the capacity of one generator. The hoist will operate 8 hours per day, with an occasional trip at night, or on non-working days. The fan will operate 24 hours per day. The tipple engines will work 8 hours per day, and the steam pumps and coal conveyor will work intermittently.

The mine under consideration has an average output of 1100 tons per day, and operates on an average 18 days per month all the year round. On days that the mine does not operate, one generator must be run to supply power for the pumps, lights and locomotives doing special work.

The operating force will consist of the following:

TABLE II. OPERATING FORCE

1 day engineer for the hoist.
1 day engineer for the electric plant.
1 night engineer for the electric plant.
1 day fireman.
1 day fireman's helper for wheeling ashes and helping around boiler room.
1 night fireman.

The wages of extra repairmen will be included in the upkeep and repair charges.

The amount of coal used under the boilers will be about 500 tons per month, and this coal being slack, or a mixture of nut, pea and slack, its value will be about 50c. per ton. In some plants it is necessary to use run-of-mine under the boilers, in which case the value is considerably higher.

Costs Figured on Monthly Basis

To obtain the cost of power per kw.-hr., it is, of course, necessary to first find out how many kilowatt-hours per day or per month are being produced. It is best to figure the costs on a monthly or yearly basis, in order to take into account the time lost when the mine is not operating. The cost per ton output for power will depend somewhat on the number of days per month or per year the mine operates, since a number of the items of expense go on just the same whether the mine operates or not. In this paper the costs will be figured on a monthly basis, taking the working days as the average per month for a year.

When obtaining the total kilowatt-hours, the load factor should be determined at the same time, since the rate of charge by the central station often depends upon the load factor. The load factor should be figured on the total five-minute, or some other short-time, peak rather than on the capacity of existing machines, since the engines and generators installed are often much larger than necessary, and their capacity is seldom reached by even momentary peaks.

The electrical kilowatt-hours, momentary and five-minute peak loads can easily be obtained by placing a watt-hour meter and graphic recording wattmeter or ammeter in the circuit of the generators for a 24-hour run, both for a working and a non-working day. The power developed by the steam engines driving fans, hoists, etc., is more difficult to obtain. If possible, these engines should be indicated, and from the cycle of operation, the horsepower-hours or kilowatt-hours can be computed for a working and

TABLE III. CAPACITY, KW-HR. AND LOAD FACTORS.

Machines	Five-min. peak	Capacity in kw.-hr., 24 hr.	Actual kw.-hr. for 24 hr.	Capacity in kw.-hr., 30 days	Actual kw.-hr. for 30 days
Generators	150	4,800	800	144,000	19,200
Fan	40	960	680	28,800	18,000
Hoist	60	1,440	336	43,200	6,080
Elevator	20	480	160	14,400	2,880
Screen	5	120	40	3,600	720
Machine shop	5	120	40	3,600	1,200
Conveyor	1	24	8	720	160
Pumps	12	288	120	8,640	2,400
Total	293	8,232	2,184	246,960	50,640

Load factor for 24-hr. working day = 26.6 per cent.
Load factor for 30 days = 20.6 per cent.

non-working day. Where it is not possible to use an indicator, the power taken by the fan engine may be calculated approximately from the size and speed of the engine, steam pressure, size and speed of fan, air pressure, and volume of air in cu.ft. per min. The power required by the hoist can be figured from the work being done and checked by the size and speed of the engine and the steam pressure. It is best to place the information in tabular form, so that ready comparison may be made.

Peak Load on Generators Less than Capacity

Table II shows the method of obtaining the total kilowatt-hours per month and the load factor.

In the first column are listed the various machines that are developing power. The second column gives the five-minute peak load for each machine. It will be noticed that for the generators this peak is less than the capacity, but this is almost universally the case in mine power plants. The fan engine runs at one speed during 10 hours of a working day, and at a speed requiring about one-half as much power for the remaining 14 hours, and for 24 hours of a non-working day.

The hoist has a peak load of about 300 kw. for five seconds, followed by a load of about 150 kw. for five seconds. The average time required for each trip will be about 52 sec., but for intervals of several minutes, this time may be as low as 35 to 38 sec. The five-minute peak is the average kilowatts for five minutes, with the hoist working at its maximum speed. At the average speed, this peak will be about 42 kilowatts.

The third column shows the capacity in kilowatt-hours of each machine if it works 24 hours. The fourth column indicates the actual kilowatt-hours during a 24-hour working day. The ratio of column 4 to column 3 designates the load factor for a 24-hour working day. Column 5 shows the capacity in kilowatt-hours for 30 days, 24 hours per day. Column 6 shows the actual kilowatt-hours for 30 days. This column is made up of the figures of column 4 for 18 days, plus the kilowatt-hours for 12 non-working days. The ratio between the values of column 6 and column 5 gives the load factor for 30 days. The load factor of a mine plant depends largely on the amount of fan and pump load, and may vary from 13 to 40 per cent.

Table IV shows the elements entering into the assumed installation together with the possible savings in these elements when power is purchased.

The interest, depreciation, repairs and upkeep are indicated for each part of the power plant. No saving is figured on the engine building, since it will probably be used for the new motor-generator and switchboard. This apparatus should be so placed that the hoist engineer can look after its operation during the day. For the night shift, a man can be obtained for about $60 per month.

Generators Selected for Peak Rather Than Average Load

In some cases where the generators are modern it may be advisable to retain these generators and purchase motors to drive them. As a rule, the average load on a mine generator is very much below its rated capacity. The peak loads are, however, rather high, so that the generators are really selected in regard to the peak rather than the average load. The type of load curve obtained on a mine generator is shown in some graphic charts in the paper, in the March proceedings of the Institute of Electrical Engineers, entitled "Central Station Power in Coal Mines," by W. A. Thomas. The older types of machines will not stand

TABLE IV. COST BASED ON ONE MONTH OF 30 DAYS.

Items Included in Cost		Total present cost	Amt. saved with purchased power
Three engineers at $85.00		$255.00	*$110.00
Two firemen at $75.00		150.00	150.00
One helper at $50.00		50.00	50.00
500 tons of coal at 50c per ton		250.00	250.00
Oil, waste and packing		50.00	40.00
Boilers:			
Cost, including stack	$4,000.00		
Feed pumps	200.00		
Setting and foundation	800.00		
Feed water heater	400.00		
	$5,400.00		
Interest at 5 per cent		22.50	22.50
Depreciation 7 per cent		31.50	31.50
Repairs and upkeep		50.00	50.00
Insurance		10.00	10.00
Boiler Building:			
Cost $2,000			
Interest at 5 per cent		8.35	8.35
Depreciation at 5 per cent		8.35	8.35
Upkeep and repairs		5.00	5.00
Engines:			
Cost Two generator engines	$3,000.00		
Hoist engine	1,500.00		
Fan engine	600.00		
Elevator engine	200.00		
Screen engine	150.00		
Conveyor engine	100.00		
Pumps	400.00		
Machine shop engine	150.00		
	$6,100.00		
Interest at 5 per cent		25.40	25.40
Depreciation at 6 per cent		30.50	30.50
Upkeep and repairs		30.00	30.00
Building:			
Cost $2,500			
Interest at 5 per cent		10.40	
Depreciation at 5 per cent		10.40	
Upkeep and repairs		5.00	
Piping:			
Cost $1,500			
Interest at 5 per cent		6.25	6.25
Depreciation at 7 per cent		8.75	8.75
Upkeep and repairs		15.00	15.00
Generator, switchboard and wiring:			
Cost $2,460			
Interest at 5 per cent		11.00	11.00
Depreciation at 5 per cent		11.00	11.00
Upkeep and repairs		15.00	15.00
Superintendence		25.00	
Taxes at 1 per cent. of valuation (assessment 90 per cent.)		15.00	7.50
Liability insurance at $1.33 per $100		6.05	4.15
Overhead		50.00	
Total cost		$1,165.45	$900.25
Fixed charges		284.40	
Operating expenses		881.05	

*Provides for attendance at $145 per month.

peak loads much beyond their rated capacity, and even if they would, the engines are seldom in condition to take care of these loads. This characteristic of the engines is really a blessing in disguise for the generators. A modern commutating pole generator driven by an induction or synchronous motor can be purchased to give 100 per cent. overload for short periods with little or no drop in speed and with good commutation. The retaining of the old generator would require a foundation for the motor, a belt, a coupling and probably an extension to the building. The total cost would about equal the cost of a new motor-generator set, while the latter will be a much more satisfactory combination. Synchronous converters are also used instead of motor-generator sets, depending upon the local conditions.

Other Charges

The item "superintendence" includes that part of the salaries of the master mechanic and superintendent chargeable to the production of power at the mine in question.

TABLE V. COST OF NEW EQUIPMENT

1 150-kw. motor-generator set	$2,800.00
1 switchboard	150.00
1 75-hp. induction motor with starter for fan	950.00
1 250-hp. induction motor with control for hoist	2,500.00
1 30-hp. induction motor with starter for elevator	400.00
1 10-hp. induction motor with starter for machine shop	170.00
1 10-hp. induction motor with starter for screen	170.00
2 10-hp. motor-driven pumps	650.00
Installing, including foundation, wiring and buildings	1,000.00
Total cost	$8,790.00

Taxes are figured at 1 per cent. per year, on an assessment of 90 per cent. of the valuation.

Liability insurance is figured on the payroll.

"Overhead" includes that part of the salary of the officers and clerks of the company and of the office expenses chargeable to the production of power, and should be the same proportion of the total overhead charge that the cost of power is of the total cost of production.

The total cost per month is $1,165.45, of which $284.40 is a fixed charge and $881.05 the operating expense. The saving per month with purchased power is $900.25. Since the total number of kilowatt-hours per month is 50,640, the total cost of power per kilowatt-hour is $0.023. The saving with purchased power will be $0.0178 per kilowatt-hour. The difference between these values, or $0.0052, is the common cost per kilowatt-hour, which will exist in either case.

Cost of New Equipment

In Table V is given a list and cost of the new equipment which must be purchased in order to utilize central station energy. Motors are provided to replace the present steam engines. All motors are alternating-current motors, and can be operated at any time, independently of the supply of direct current. In some cases it may be preferable to supply a direct-current motor for the hoist, in which event a larger motor generator is required. This increase may be in the form of a larger generator or of two generators driven by one large motor. One of the generators would be used for the direct-current supply for the mine and the other, with special control, for the hoist. If possible, the old hoist should be sold complete and an entire new electric hoist installed. In the present case, an alternating-current motor will be substituted for the steam engine at the hoist. A variable-speed alternating-current motor will be supplied for the fan. In many cases air compressors are used to supply air for punchers and pumps. It might be advisable to do away with air compressors entirely, and install electric cutters and motor-driven pumps, as the efficiency of the air system with its usual leaks is very low. However, in gaseous mines, it is sometimes considered dangerous to operate electrical apparatus, in which case a motor-driven compressor should be furnished.

TABLE VI. SALVAGE ON OLD EQUIPMENT

4 boilers with stacks		$400.00
2 feed pumps and water heater		90.00
2 150-hp. generator engines		600.00
2 100-kw. generators with belts and switchboard		600.00
Engine part of hoist		50.00
1 elevator engine		50.00
1 fan engine		75.00
1 screen engine		25.00
1 machine shop engine		25.00
1 conveyor and engine		30.00
2 steam pumps		50.00
Piping		50.00
Total salvage		$2,045.00
Total net cost		6,745.00
Interest at 5 per cent for 1 month	$28.00	
Depreciation at 5 per cent for 1 month	28.00	
Upkeep and repairs	15.00	
Total	$71.00	
Operating and fixed charges per kw.-hr. for new equipment		$0.0014

One thousand dollars has been allowed in Table V for the installation of the new apparatus. This should be ample to provide for foundations, alterations in building, wiring and mechanical application. The total cost is $8790.

In Table VI is shown the probable salvage that could be obtained for the old apparatus. These estimates should be kept rather low, since it is sometimes difficult to get good prices for old machinery. The total salvage amounts to $2045. The net cost of new equipment will, therefore, be $6745. The interest, depreciation, upkeep and repairs on the new equipment will amount to $71 per month. This is at the rate of $0.0014 per kilowatt-hour.

Specific Costs and Savings

In Table VII some specific costs and savings are given. The total cost of power per kilowatt-hour, saving per kilowatt-hour with purchased power, and the common cost in either case, as before mentioned, are first shown. If the common cost is added to the cost per kilowatt-hour with new equipment, we have $0.0066 as the total cost per kilowatt-hour with purchased power exclusive of the charge of the central station. If this value of $0.0066 is subtracted from the total cost per kilowatt-hour of $0.023, $0.0164 is obtained as the central-station charge which would make the total cost of power the same as at present. In other words, if the central-station rate were $0.0164 per kilowatt-hour, the total cost of power would be the same as at present. Any rate below $0.0164 will, therefore, represent a clear saving. At a rate of $0.0125 per kilowatt-hour, the saving would be $0.0039 per kilowatt-hour, or $2375 per year, which is a saving of 35.3 per cent. over all charges on the new investment. At this rate, the change would pay for itself in less than three years. At a rate of $0.01 per kilowatt-hour, the saving would be $3980, or 57.8 per cent. At this rate, the change would pay for itself in less than two years.

TABLE VII. COSTS

Total cost per kw.-hr. for power	$0.023
Saving per kw.-hr. if power is purchased	0.0178
Common cost, in either case, per kw.-hr.	$0.0052
Net operating and fixed charges per kw.-hr. for new equipment	0.0014
Total cost per kw.-hr. with purchased power, exclusive of central station charge	$0.0066
Charge per kw.-hr. by central station which would balance present cost	0.0164
Saving per year at central station rate of $0.0125 per kw.-hr.	$2375
Percentage profit on net investment of $6,745	35.3 per cent.
Saving per year at central station rate of $0.01 per kw.-hr.	$3890
Percentage profit on net investment	57.8 per cent.
Present cost per kw. capacity (5-minute peak) per year for fixed charges	$11.65
Present cost per kw.-hr. for operating expenses	0.0174
Total cost per kw.-hr. with purchased power at $0.0125 per kw.-hr.	0.0191
Total cost per kw.-hr. with purchased power at $0.01 per kw.-hr.	0.0166

A coal operator will readily understand that in his isolated plant he will have certain fixed charges which will be practically the same whether his plant operates or not. His power cost can be divided into fixed charges and operating costs. A central station supplying power

TABLE VIII. GENERAL DATA

Average working days per month	18	
Electrical kilowatt-hours per working day	800	
Electrical kilowatt-hours per non-working day	400	
Total steam and electric kilowatt-hours per working day	2,184	
Total steam and electric kilowatt-hours per non-working day	944	
Maximum electrical kilowatt demand, momentary peak	180	
Maximum electrical kilowatt demand, five-minute peak	150	
Maximum total steam and electric kilowatt demand, momentary peak	450	
Maximum total steam and electric kilowatt demand, five-minute peak	293	
Capacity of generators	200	
Total kilowatt-hours per month	50,640	
Kilowatt-hours per ton output, based on 19,800 tons per month		2.56
Present total cost of power per kilowatt-hour		0.0234
Present cost per ton output for power		0.0588
Cost per ton output for power with central station energy at $0.0125 per kilowatt-hour		0.0489
Cost per ton output for power with central station energy at $0.01 per kilowatt-hour		0.0425

for his mine will also have a certain part of its total cost as fixed charges. In many cases the fixed charges of the central station will be less than those incurred by the operator. The logical basis upon which to charge for central-station power would therefore be a certain fixed charge per kilowatt capacity of substation or kilowatt demand, plus a rate per kilowatt-hour which will be equivalent to the operating expense. In the present case, if the fixed charge were made $12 per year per kilowatt demand on a five-minute peak basis, the charge per kilowatt-hour would be $0.0067 to make the total cost equivalent to $0.0125 per kilowatt-hour. With the fixed charge system the total cost per kilowatt-hour decreases with the amount of power used. This is an incentive for the operator to extend the use of power as much as possible.

There are certain advantages that central-station power has over isolated plants that cannot be measured in dollars and cents, and in most cases, even when the fixed charge is the same as the operator would have in his own plant and the charge per kilowatt-hour is equal to his own operating expense, it would still be greatly to his advantage to purchase central-station power.

In Table VIII is given some general information in regard to the plant under consideration, showing the results of the tests and investigations, which should be made at a mine. The momentary and five-minute electrical peaks are obtained from the graphic records. These load curves are very interesting and show clearly the extremely fluctuating nature of the load, as well as the low average demand. The maximum momentary electrical load is often less than the continuous capacity of the generators. A modern commutating-pole generator of 100-kw. capacity would easily take care of the load where two 100-kw. old-type machines are used at present. A 150-kw. generator has been figured on to allow for the additional load of the pumps when changed to electric, and also to provide for future extensions. The information given in Table VIII will serve as a guide for the central station in determining the capacity of its lines, transformers, meters, switches, etc. The power required is 2.56 kilowatt-hours per ton mined. Since the cost per kilowatt-hour is $0.0234, the present total cost of power per ton mined will be $0.0588.

Conclusions

Summarizing the above information, the following reasons are given to prove the advisability of a mine's purchasing central-station energy rather than generating its own power.

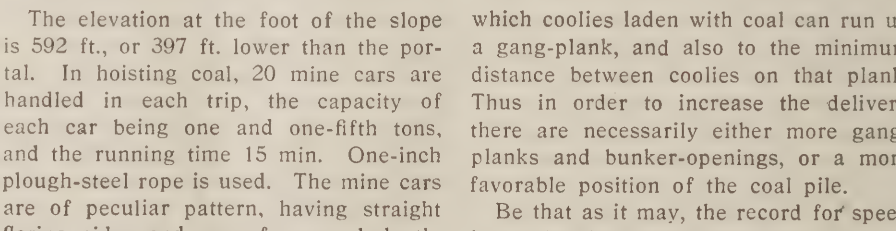
1. Lower cost of operation.
2. Worry and care of power plant removed. The legitimate business of a coal operator is to mine and ship coal, and he should not try to carry on another business of so different a nature, at the same time. The efficiency of his plant will be greatly increased if he can spend his entire time in looking after the mining and shipping of the coal.
3. Reliability, which means greater production.
4. Much less expense involved in shutting down mine.
5. Capital needed for new power plant can be used for new development.
6. Increased output and additional power can be obtained quickly with small increase in capital.
7. Increase of production on account of increase of efficiency, due to ample power at all times.
8. No change in speed of fan and pumps due to steam pressure falling occasionally.

About the only disadvantage is that additional capital is often required with which to purchase new apparatus, but when the large returns in the shape of decreased operating expenses are shown, this capital is not difficult to obtain.

Safety Device for Slope Car

By A. W. Evans*

The Rockwood slope of the Roan Iron Co., at Rockwood, Tenn., is located on the eastern escarpment of Waldens Ridge, at an elevation of 989 ft. above mean tide, and is driven through the conglomerate of the coal measures for a distance of 400 or 500 ft., until it intersects the Sewanee seam of coal, running thence, with the full dip of the seam, to its terminus, a distance of 4050 feet.



Safety Device for Man Car on Inclined Plane

The elevation at the foot of the slope is 592 ft., or 397 ft. lower than the portal. In hoisting coal, 20 mine cars are handled in each trip, the capacity of each car being one and one-fifth tons, and the running time 15 min. One-inch plough-steel rope is used. The mine cars are of peculiar pattern, having straight flaring sides and are of unusual depth. No one working in the mines is allowed to ride the loaded or empty trips, as the slope is tortuous in its ascent. Mr. William Richards, the superintendent, designed the car shown in Fig. 1, to convey the men to and from the working places.

In details of construction, the car is very simple, as will be noticed from the sketch. Double clevis hitchings are used. The feature deserving special mention is the device for catching the cars in case of the rope breaking or the hitchings giving away. This safety appliance is constructed of 1½-in. round iron, and bent as shown. When hoisting, the device is thrown back toward the rear of the car and drags the surface of the slope between the rails. Mr. Richards states that the catch is positive in its action. The bearings for the 1½-in. rod are located at the points where it passes through the sides of the car and are reinforced with 3x3-in. angle iron, which also serves to hold the sides in an upright position and to reinforce the car longitudinally.

*Brushy Mountain Coal Mines, Petros, Tenn.

The Record in Ship Coaling

There are those who assert that the average Asiatic laborer is not the most rapid and industrious in the world; but any naval officer who has had to go through with the disagreeable and dirty operation of ship-coaling, can confidently state that there are occasions and conditions, when there is little left to be desired in the way of rapidity of movement on the part of the coolie.

Up to a recent date the maximum rate of ship-coaling, was about 50 tons per hour. In November, 1905, however, the record was set at 92 and in February of 1906 even this record was surpassed by 8 tons per hour, bringing the average up to double that which was considered fair a few years ago.

It must be remarked in this connection that there is a limit to the space at which coolies laden with coal can run up a gang-plank, and also to the minimum distance between coolies on that plank. Thus in order to increase the delivery there are necessarily either more gang-planks and bunker-openings, or a more favorable position of the coal pile.

Be that as it may, the record for speed in coaling has again been raised by the British ship of war "Terrible," on which 1150 gross tons were brought and stowed away in 7½ hours—which figures out to about 150 tons per hour; in this case there were 8 bunker openings. During the liveliest time of this coaling the rate was 180 tons per hour.

Feeding Device for Tipple Screens

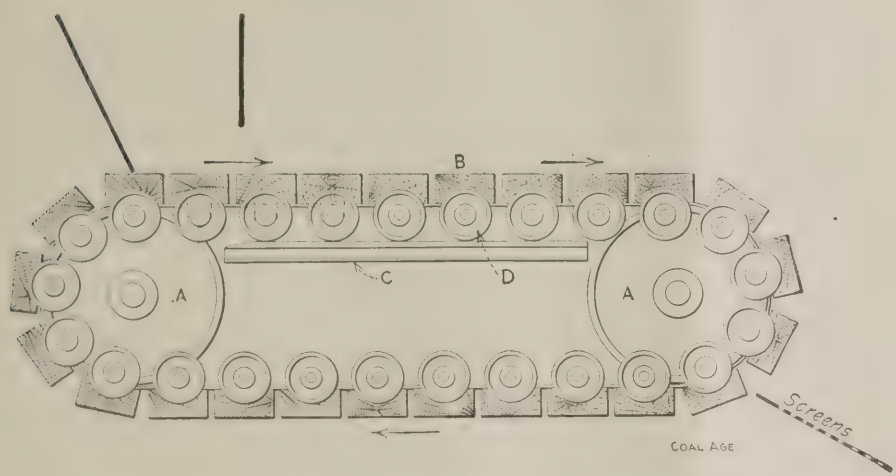
There are many coal-mining plants at which, on account of the lack of necessary tipple height, it is impracticable to have bar screens of sufficient length to properly screen the coal. In any case, one of the principal difficulties encountered in screening coal is the fact that where it is dumped directly from the mine cars onto the screens, the material passes down with a rush in large masses, carrying with it an undue proportion of small sizes and slack.

At the mine of the Carr Wood & Coal Co., near Lytle, Tex., the device shown in the accompanying sketch was devised by Mr. Carr to obviate this difficulty. The extra amount of power required to operate the attachment is so slight that it may be ignored. The mine cars dump in the usual manner, but the coal, instead of falling directly onto the screen bars, goes into a hopper, beneath the bottom of which passes a moving belt, constructed as hereafter described. This belt, being in continuous motion, conveys the coal from beneath the hopper, and delivers it upon the screens at uniform rate.

The apparatus has proved wholly satisfactory and is constructed as follows: The drums *A* may be made of any convenient material, and connected, preferably by sprocket and chain to the motive power. They should be approximately 3 ft. long, or extend at least 3 in. each side of the hopper bottom, and be placed not less than 4 or 5 ft. center to center, parallel and horizontal.

The belt consists of an endless strip of heavy canvas, brattice cloth or other available material, whose width equals the length of the rollers. To this cloth belt are attached, on the outside, wooden strips *B*, 2x4 in. by 3 ft. long, placed side by side to form a continuous circuit around both drums. The whole is made sufficiently tight to revolve when the drums are placed in motion.

Between the drums, on the upper path of the belt, should be placed a short section *C* of mine rail to provide a track for the small wheels *D*, placed on the ends of each strip *B* and thus prevent sagging of the belt from the weight of coal in the hopper. It is obvious that after passing over the forward roller *A* on the return run these wheels need no support until again reaching the upper portion of the circuit. The strips *B* may be placed loosely, side by side, forming a transversely rigid, but longitudinally flexible support for the belt.



TRAVELING BAND FEEDER FOR TIPPLE SCREENS

A simple slot and screw adjustment of the axle of one of the rollers *A*, is provided for loosening and tightening the belt. The whole apparatus may readily be constructed at any mining plant and with friable coals, or tipples having short or steep screens, will readily pay for itself.

Coal Land Development in Southern Utah

A coal-land and railroad transaction involving ten million dollars is being consummated by William G. Sharp, president of the United States Smelting, Refining & Mining Co. The coal properties are in Emery County, Utah, and the projected railroad is to be built from Provo to Mohrland, which is in the heart of the coal district.

That there is a plan under way to consolidate additional coal-land holdings in the Emery County zone and to create an extensive system of coal mines under one head is shown by pending negotiations for further purchases. Foremost among the interests named as the possible purchasers of the properties involved, are the United States Smelting, Refining & Mining Co. and the Davis coal combination of West Virginia. Mr. Sharp has been at work on the transaction since the first of February and has been assisted by Thomas Davis, who is at the head of the Davis coal interests.

The details of the transaction which have thus far come to light are as follows: Stock in the Castle Valley Coal Co. to the amount of $750,000 has been taken over by Mr. Sharp. The entire issue of Black Hawk coal mine stock, at a price said to be $600,000, has been transferred to him, and an option on Consolidated Fuel stock to the extent of $1,200,000 is arranged. In addition to these purchases, Mr. Sharp is assuming responsibility for outstanding bonds as follows: Castle Valley Coal Co., $1,200,000; Consolidated Fuel Co., $80,000. The estimated cost of the Utah Coal R.R., from Provo to Mohrland, is placed at $5,000,000, thus bringing the total amount involved up to $9,550,000. Stock is still outstanding as follows: Consolidated Fuel Co., $1,050,000; Castle Valley Coal Co., $800,000; making a total of $1,850,000.

The Utah Coal R.R.

The route of the Utah Coal R.R. will follow the main line of the Denver & Rio Grande south to Thistle. Then it will parallel the branch line running to Marysvale until it reaches Hilltop, here turning east and south to Mohrland. The maximum grade to Hilltop will be 1 per cent. and from Hilltop to Mohrland the grade will not exceed 2 per cent. The line will be 90 miles long. The outcroppings of the great coal measures are first encountered on the trip down from Hilltop, at an altitude of 8000 ft. The seams can be traced along their exposed outcroppings for a distance of 175 miles within the state of Utah. In fact, the same measures have been followed with comparatively slight breaks all the way down into Mexico. The beds along the line of the proposed railroad are anywhere from 18 to 32 ft. in thickness and as many as five are exposed in most places.

The new railroad will connect with the Castle Valley R.R. at Mohrland, making a continuous line through the coal region to Price. At present, the mines at Hiawatha and Mohrland and those along the route of the Castle Valley R.R. ship their coal to Price by this line and from there, it is carried to distributing points by the Denver & Rio Grande. Heretofore the great drawback complained of has been the inability of the Denver & Rio Grande to supply sufficient transportation facilities.

Thousands of acres of coal lands are available to the big interests that have entered this field. Aside from the properties that have been taken over and are being negotiated for by Mr. Sharp, large tracts are held by former United States Senator William H. Clark, P. J. Quealey, J. H. Mays and W. S. McCormick.

Current Coal Literature

The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Nitroglycerin

A bulletin of the Bureau of Mines, written by Walter O. Snelling and C. G. Storm, makes the following statements among others:

"Nitroglycerin begins to decompose at temperatures as low as 122 deg. or 140 deg. F. At a temperature of 158 deg. F., the commercial article evolves enough nitrous fumes to give a decided test with potassium-iodide-starch paper at the expiration of 15 to 30 min. Moreover, nitroglycerin even at very low temperatures tends to be somewhat volatile, and it is a well known fact that even at ordinary room temperatures it loses slowly in weight through volatilization. At somewhat higher temperatures, both its decomposition and evaporation increase.

Boiling Nitroglycerin

At a temperature of about 275 deg. F., the decomposition of nitroglycerin is so rapid that it causes the liquid to become of a strongly reddish color, owing to the absorption of the nitrous fumes resulting the decomposition of the liquid; and at a temperature of about 293 deg. F. the evolution of decomposition products is so rapid that at atmospheric pressure ebullition begins and the liquid "boils" strongly. This "boiling" is due in part to the evolution of decomposition products (mainly oxides of nitrogen and water vapor) and in part to the actual volatilization of nitrogen itself.

The decomposition is accompanied by the evolution of much heat, and as soon as ebullition has begun, enough heat is generated by the liquid to raise the temperature of the mass rapidly, unless some means is provided for conducting away the heat which is evolved. At temperatures between 293 and 419 deg. F., the ebullition of nitroglycerin becomes more and more violent; at higher temperatures the amount of heat produced by the decomposing liquid becomes proportionately greater, and at about 424.4 deg. F. nitroglycerin explodes.

Decomposition

When nitroglycerin is maintained at a temperature between 293 and 410 deg. F., its decomposition goes on rapidly, accompanied by much volatilization, and under these conditions nitroglycerin may be readily distilled. The distillate consists of nitroglycerin, nitric acid, water and other decomposition products. The residue which remains after heating nitroglycerin for some time under such conditions probably consists mainly of glycerin, with small amounts of dinitroglycerin, mononitroglycerin and other decomposition products. These substances are far less explosive than ordinary nitroglycerin, and accordingly by heating nitroglycerin slowly it can be caused to "boil" away, until the residue consists of products that are practically nonexplosive. In a number of experiments, nitroglycerin was thus heated, and a copious residue was obtained. By carefully raising the temperature, this residue could be made to char without explosion.

Departures from Standard

The temperature at which ebullition of nitroglycerin begins at normal atmospheric pressure was found to be 293 deg. F. This result is correct within four degrees, although different samples of nitroglycerin naturally have somewhat different ebullition points, depending upon acidity, length of time of storage, etc. The temperature at which explosion is brought about (424.4 deg. F.) should be accurate within about nine degrees, differences being due, not to the method of testing, but to the individual variations of different samples of nitroglycerin.

Rotting Mine Timbers

G. B. McDonald, in the "Iowa Engineer," makes the following comment on the action of fungi and bacteria in destroying mine timber. Decay in wood is an organic process caused by low forms of plant life, either bacteria or fungi. The bacteria are microscopic in size, but the fungi become conspicuous when the fruiting bodies appear on the surface of the wood. The fungi consist of small vegetable threads which penetrate the wood structure, and these are the real cause of decay rather than the fruiting bodies commonly known as punks, or brackets. Under proper conditions the spores produced by the fungi gain access to the wood structure, and decay soon begins.

The spores of the rot-producing fungi may gain access to the timber either before or after the timber has been felled; however, it is generally the case with mine timbers that the disease is contracted after the timber has been placed in the mine, due to its proximity to other decaying timbers. A rough wood furnishes excellent places for the lodgment of spores, and also good conditions for holding moisture, thus hastening the process of decay. Although timbers may have been sufficiently treated externally with some good preservative, the spores often gain entrance to the interior of the stick through season-checks or cracks which are not thoroughly protected by the preservative fluid.

It is frequently the case that a fungus is growing in the timber before the tree is felled. If the fungus is subsisting on live wood, and is not able to survive on dead tissue, the felling of the timber causes the death of the fungus and avoids further decay from that source. If the fungus is developing in the heartwood of the tree, which is practically dead tissue, the rot may continue to develop after the tree has been cut down and worked up into mine timbers.

Wood is composed of small cells, which are made of cellulose; around these cells is a substance known as lignin. Some species of fungi attack only the cellulose of the wood, others only the lignin around the cells, and still others disintegrate both lignin and cellulose, causing a complete breaking down of the wood structure. After the wood is first attacked by a fungus, discoloration takes place, and later the wood fibers are changed to such an extent as to make the wood soft, brittle and practically worthless for any purpose.

Any fungus must have for its proper development a supply of moisture, heat, air and food. Without any one of these the fungi cannot develop. In places where the timbers are constantly dry there is no danger of rot-producing fungi doing damage. The conditions which hasten the rotting of timber are those where the wood is constantly subjected to alternate wetting and drying. A good circulation of air is also an important factor in preserving timber in a mine, in that it tends to reduce the amount of moisture present. Shafts where ventilation is poor and where there is an abundance of moisture and heat are the most favorable for the development of fungus diseases. Although the loss of mine timbers can never be wholly prevented, yet their life can be very materially increased through proper methods of seasoning and preservative treatment.

For all classes of round timber, either posts, piles, or mine props, it is thoroughly understood that the removal of

the bark prevents decay to a certain extent. This is due to the fact that while the bark is on, the wood adjoining the inner bark is kept constantly moist, and the conditions are ideal for the development of fungus. The peeling is effective inasmuch as it hastens the seasoning process. The cost of peeling is an item which must necessarily be considered.

However, we are told by the Forest Service that it costs only from 20c. to 50c. per ton to peel mine timbers. It is no doubt true that many times this amount is saved by the increased length of life of the timbers. The simplest means of materially increasing the life of wood is by proper seasoning. It is well known that the amount of moisture in any piece of green timber depends upon the part of the tree from which the timber has been cut. The outer zone of a tree, or the sap-wood, contains a much greater amount of moisture than the heart-wood. On this account, and for the reason that the outer zone is more exposed to fungus spores, the sap-wood is more subject to decay than the heart-wood.

On the other hand, the sap-wood portion of a tree will season more rapidly than the heart-wood portion. By piling the timber in such manner as to permit a free circulation of air the seasoning process can be accomplished quite rapidly. The time required for the seasoning depends to a large extent on the climate. By kiln drying the moisture content of the timbers can be reduced to a smaller per cent. than by the mere process of seasoning; however, this will add a considerable item of expense.

It is well known that by reducing the moisture content the strength of the wood is materially increased, provided that an excessive amount of moisture is not driven off so that the wood structure is affected. A piece of timber well saturated with moisture is generally considered about one-half as strong as a properly seasoned stick.

Compensation

The first country to adopt a comprehensive system of accident compensation on a national scale was Germany in 1884; Austria followed in 1887, and since then practically all industrial foreign countries have adopted this plan, with greater or less modifications. Disregarding acts affecting only selected groups of workmen, the following list shows the order in which the various countries passed laws providing national systems of accident compensation: Germany, 1884; Austria, 1887; Norway, 1894; Finland, 1895; Great Britain, 1897; Denmark, 1898; Italy, 1898; France, 1898; Spain, 1900; New Zealand, 1900; South Australia, 1900; Netherlands, 1901; Greece, 1901; Sweden, 1901; Western Australia, 1902; Luxemburg, 1902; British Columbia, 1902; Russia, 1903; Belgium, 1903; Cape of Good Hope, 1905; Queensland, 1905; Hungary, 1907; Transvaal, 1907; Alberta, 1908; Quebec, 1909. The State of New York also passed a compensation law in 1910.

Canadian Fuel Production in 1911

By John McLeish*

The long continued strike which took place in the coal mines of southern Alberta and eastern British Columbia, was responsible for a considerable falling off in the coal production of Canada, in 1911.

The total production during the past year, comprising sales and shipments, colliery consumption and coal used in making coke is estimated at 11,291,553 short tons, valued at $26,378,477. This is a decrease of 1,617,599 tons or nearly 12.53 per cent. from the production of 1910, which was 12,909,152 tons, valued at $30,909,779.

There was an increase of 562,978 tons in the Nova Scotia production; that of New Brunswick remained practically stationary while an increase of about 23,097 tons is shown in Saskatchewan.

In Alberta, the decrease was about 1,396,412 tons or 48 per cent. and British Columbia also shows a falling off of 794,243 tons or nearly 24 per cent.

The production by provinces was approximately as follows:

Province	1910 Tons	1911 Tons
Nova Scotia	6,431,142	6,994,120
British Columbia ...	3,330,745	2,536,502
Alberta	2,894,469	1,498,057
Saskatchewan	181,156	204,253
New Brunswick ...	55,455	55,781
Yukon Territory ...	16,185	.2,840
Totals	12,909,152	11,291,553

The exports of coal in 1911 were 1,500,639 tons, valued at $4,357,074 as compared with exports of 2,377,049 tons in 1910, valued at $6,077,350, a decrease in exports of 876,410 tons.

Imports of coal during the year include bituminous 8,905,815 tons valued at $18,407,603; slack 1,632,500 tons, valued at $2,090,796 and anthracite 4,020,577, valued at $18,794,192, or a total of 14,588,892 tons valued at $39,292,591. The imports of coal in 1910 were, bituminous 5,966,466 tons; slack 1,365,281 tons and anthracite 3,266,235 tons, or a total of 9,872,924.

The total production of oven coke in 1911 was 847,402 tons valued at $2,340,674 as compared with the production of 902,715 tons valued at $3,462,872 in 1910. The total quantity of coal charged to ovens was 1,228,700 short tons.

By provinces the production was, Nova Scotia, 469,305 tons; Ontario 259,554 tons (made from imported coal); Alberta 36,216 tons and British Columbia 82,327 tons. All the coke produced was used in Canada with the exception of 9290 tons sold for export to the United States.

The quantity of coke imported during the calendar year was 751,389 tons, valued at $1,843,248 as compared with imports of 737,088 tons, valued at $1,908,725 in 1910.

*Chief of the Bureau of Statistics, Mines Department of Canada, Ottawa.

Note—Abstract from the Preliminary Report on the Mineral Production of Canada.

Promising Coal Fields in Arizona

Although Arizona has produced no coal on a commercial scale, it contains promising fields, which may be profitably exploited when transportation is afforded and when population and manufactures have reached a point which will provide a market for the output. The more important of these fields are the Black Mesa coal fields, in the Hopi and Navajo Indian reservations, which are included within Coconino, Navajo, and Apache counties, and the Deer Creek field, in the extreme eastern end of Pinal County.

The U. S. Geological Survey estimates that the coal land in the Black Mesa fields covers 5920 square miles, and that the fields contain 14,082,000,000 short tons, of which 8,000,000,000 tons are recoverable, the rest being under very heavy cover. The Deer Creek coal field includes an area of 30 square miles in the middle of the copper-producing region of Arizona, and, estimating that 24 in. of coal extends through the 30 square miles, the coal beds contain about 60,000,000 short tons.

In these fields there are two grades of coal—one a hard black coal, well adapted for transportation and for commercial uses and also possessing some coking quality; the other a soft, badly crushed coal, which carries a high percentage of ash and could probably not be marketed except locally. It is believed, however, that as this lower grade of coal is high in volatile matter it could be used for the manufacture of gas, to be piped to the places of consumption or used in the development of electrical power.

For the regenerative-flame arc lamp, the following advantages are claimed: 1. It is the only lamp combining the high efficiency of flame lamps with the long life of the inclosed lamp. 2. Long burning hours, 70 to 100 hours on one pair of carbons. 3. Low cost of carbons, 10 hr. for 2c. 4. High candle-power, 4000 candle-power maximum at 15 deg. from horizontal. 5. It is the most efficient method of lighting, replacing four to eight of the ordinary type of electric arc lamps. For colliery and shaft-head lighting a gas, fume, and waterproof case is provided.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

The coal industry is full of champions. We have champion drillers, champion loaders, champion rescuers, champion transitmen, and some men are champion salary grabbers. In the matter of figuring out things Frank Haas, consulting engineer of the Consolidation Coal Co., Fairmont, W. Va., has the longest head and is captain of all the specialists in his line.

When it comes to exploding theories, Frank can slip up, ignite your pet idea, and get away before you know the durn thing is aflame. And, talk about "being from Missouri," well, Sir! the fellow who coined that expression meant Dayton, Ohio, and was looking straight at "F. H." when he uttered the words. Mr. Haas is the proverbial and original "show me," for every scheme that is presented for his approval not only has to be properly introduced, but has to eat, sleep and hold hands with him before anything resembling an "O.K." label is attached.

"Research" is his first name; "analytical" his middle appellation. With him a thought commences as an impression, strengthens to an idea, grows to a purpose, and culminates in action. He believes that the only way you can slowly master the whole is to dwell carefully on the details. Things invincible in their collective capacity, and in a state of union, gradually may be overcome when they are separated, and it is this habit of going to the bottom that has placed "F. H." at the top of his profession.

Born at Dayton, Ohio, in 1873, Frank Haas was educated at the common and high schools of his native town. Later he entered the Ohio State University, and in 1895 received the degree C. E. The following year was spent in post-graduate work, for which he received an E. M. degree.

In 1897, Mr. Haas was appointed chief chemist for the National Steel Co., Sharon, Penn. He remained at Sharon until 1899, when he was made superintendent of the Southern Coal & Transportation Co., Berryburg, W. Va. Leaving this latter position in 1900, he accepted a place as chemist and superintendent of Watts Furnaces, Virginia Iron, Coal & Coke Co., Middlesborough, Ky.

In 1901, "F. H." allied himself with the Fairmont Coal Co., Fairmont, W. Va., serving in the capacity of chief chemist. This was before the Fairmont people had perfected the great consolidation of companies that now exists and operates

FRANK HAAS

in four different states. The present big, fine building that houses the operating officials and engineering departments of the Consolidation Co., in Fairmont, had not been erected, and Mr. Haas' modest business abode was located in the basement of the old building. "Times do change," and he and his associates now are fixed so comfortably in their new headquarters, that a mere look at the elegance of their surroundings causes the average coal man to turn green with envy.

In 1905, Mr. Haas was made assistant general manager of the big corporation, then created and known as the Consolidation Coal Co. The new concern included not only the Fairmont mines, but also took in the biggest operations in the Georges Creek, Md., field, and mines located in the vicinity of Somerset, Penn. Recently the Consolidation company extended its sphere of activities into Kentucky, and within the next year, it is probable that this corporation will be producing more Kentucky coal than any other concern mining in that state.

In 1907, when there was a shift in the makeup of the official staff of the Consolidation company, Frank Haas was appointed consulting engineer, and since that time has actually been the head of the technical work of the company. A great part of his time during the past two years has been spent in the development of the new acreage in Kentucky.

The rapid rise of Mr. Haas to his present important position has been due almost entirely to his own earnest and efficient work. If, however, any one person had a hand in shaping his career and affording him needed opportunities, that person was the late Lee Malone, peer of mine managers, and one of the biggest, best men who ever engaged in mining coal. Mr. Malone started as a miner in the Fairmont field, and having only what education he gathered from the school of experience and hard knocks, he recognized in Mr. Haas the qualities and advantages he himself most lacked, and it is possible the "going" for Frank was made a bit smoother by Mr. Malone's early recognition of his unusual and valuable ability.

Frank Haas has not confined himself merely to the practical development and application of other people's ideas to his own work, but has made any number of original investigations along new lines. It is probable that the first work on coal calorimeters in this country was done by him, in association with the late Prof. N. W. Lord. In the matter of "High Humidity for Mine Ventilation," Mr. Haas is somewhat of a pioneer, and his ideas on this subject are based on actual practice at the mines under his control. He believes that the saturation of a mine atmosphere with steam is not for the purpose of furnishing the water for wetting the mine, but is done to prevent evaporation of water naturally in the workings. He says: "Theoretically, a place in a mine once thoroughly wetted and ventilated with a saturated atmosphere will remain wet indefinitely. This then is the condition which should be attained." He claims that in our shallow mines high humidity does not injure the men.

Concerning mine laws, "F. H." believes that all legislative measures should be short and concise and their enforcement rigid. Facts that are contained in volumes of matter are rarely discovered. He is also of the opinion that in our endeavors to supply the miner with plenty of air we have reached a point where the excess should be regulated. He believes over-ventilation is becoming a danger to the men.

During the past year, Mr. Haas has served as president of the West Virginia Coal Mining Institute, and the work of this body has increased in scope and efficiency under his régime.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

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COAL AGE

Snap Judgment vs. Facts

The battle between truth and patriotism is still waging. Some value patriotism more than truth, some esteem truth more than patriotism, and then there are some who eschew both truth and patriotism and cover themselves with the *toga candida*, and seek office.

Under the government frank, bearing the eagle, laurel leaves and printing press of the Government Printing Office, circulates a little pamphlet in a paper cover entitled "A Federal Mining Commission, Address of John Randolph Haynes, M. D., Special Commissioner on Mine Accidents, State of California." It was read before the joint session of the American Economic Association and the Association for Labor Legislation at Washington, D. C., Dec. 30. 1911.

Dr. Haynes calls for our diatribes by stating that "some day we may come to regard fatalities which can be readily foreseen and so easily prevented as little better than murders." His remarks specifically refer to three-quarters of our fatalities, that being the number declared to be unnecessary. We by no means accept the statement that accidents can be reduced by prevision to one-fourth of their present frequency.

But even then, preventable, foreseeable accidents do not necessarily involve criminal carelessness and if they do, the charge will lie equally against miners and management. If the operator, who is unfortunate enough to lose a man by accidental death, is a murderer then by parity of reasoning, the man who is killed, as a result of lack of foresight is a dishonored suicide. To narrow our statement; most of the accidents are from roof falls. All such, if unnecessary, involve the contributory or sole negligence of the man killed.

Let it be remembered that the laws have been extremely stringent, compelling the operator to hire men to inspect the acts of the employee. It is severe and unjust to conclude that having gone to the full length of the legal requirements, and having moreover engaged rib bosses and timbermen for the workmen's further protection, the operator is still to receive the condemnation for all misadventures, both when the employee himself is alone blamable, and when the stigma, greater or smaller, cannot be rightly laid on anyone. Two deaths are said to have added to the glory of the Federal service, but if such deaths had occurred in the mining industry, there would have been some unpleasant insinuations at the inquiry. It would have been necessary to defend the training of the men, their apparatus and the quality of the oxygen supplied.

To prove his point, Mr. Haynes fairly wallows in statistics. He says: "From three to five thousand coal miners are annually killed outright in the United States." We cannot find that anyone of authority has ventured to give any such figures, and we think the estimates so far compiled are reasonably exact. True, authorities differ several hundred lives in a single year, but that is because some try to work with an exact calendar, and others mix the calendar year used by a state like Pennsylvania with the fiscal year of a state like Illinois.

The highest death rate, according to J. A. Holmes' computation, was 3127, and according to Frederick L. Hoffman, 2992. The latter statistician gives the average for the five years preceding 1910 as 2404. We do not know where J. R. Haynes got his data. Certainly not from high authority, though sometimes he follows such authority all too closely and flagrantly, by laying great stress on the death rate of 1907, when Monongah, Darr and Naomi swelled the number of dead inordinately.

He calmly compares the average rate of death in European countries with the black letter year in American annals. Every country has its years of evil import. England has the year of the "Hulton" disaster; France has that of Courrières, and it is not fair to balance years of misfortune in one country with the average years of another.

This special commissioner—special

forsooth, because no commissioner was really needed—has spent much time far over the mountains from his state. He could not learn much about mining at home because only about 0.003 per cent. of the coal mined in the United States would then be subject to his supervision. In fact, single mines without railroad facilities might easily be found mining 37 tons per day, which is as much coal as is extracted daily between San Diego and Crescent City.

He makes the statement that "of all American industries, mining is the most hazardous." This is perhaps true, in a manner, because nearly every person in that industry is exposed to its full hazard. About 70 per cent. of the mine workers labor underground, whereas in railroad work barely 20 per cent. of the workers are trainmen. Hence, a bare fifth of the men face the real hazards of railroading; the rest are more likely to die of nervous diseases, of diabetes, rheumatism and dyspepsia, than of an accident.

If, however, the coal workers as a body below and above ground are compared with the trainmen on the railroads of the United States, then the former have a distinct advantage, and even if underground coal workers alone are compared with trainmen, the latter have still a far larger death rate. In 1909 the death rate among trainmen was 4.87 per thousand, the year before it was 6.66, in 1907 it was 8 per thousand, and in the year preceding 8.07.

Mr. Haynes says that American conditions are safer than European. It may be so, but it will take a large amount of careful analysis to prove it. We are unwilling to accept it on his snap judgment. How much he may be relied on is shown by his statement that "up to the present time, Americans are not operating in the very deep levels of 4000 ft. or lower, not uncommon in Europe." A book published by no less a press than that of Cambridge, not more than a year ago, says: "In England we read that several collieries are 3000 ft. deep, and in Belgium two are nearly 4000 ft." How does this statement agree with that of Mr. Haynes?

It is well known that mines over 4000 ft. deep are regarded as doubtful problems for the future, and that the British Geological Survey has excluded deposits over 4000 ft. deep from its economic estimate of coal available. Many European mines are still less than 1000 ft. below the surface.

We know that this does not answer Mr. Haynes' comparison of home and alien mines, nor do we now desire to meet his statements in this editorial. But it may be permissible to say that experience in America has shown that where the greatest dangers are faced, the greatest death rate occurs. The anthracite regions and Colorado have distressingly high death rates, and yet these regions lead in preventive and corrective methods.

We doubt whether the eulogies of European countries are deserved. In 1909 in sixteen counties of Pennsylvania 1.45 lives were lost per thousand men employed. Looking over the list of "honor" we find counties recorded where safety is least considered, but where natural conditions assure the safety of the mines.

But Mr. Haynes has the Watteyne-Meissner-Desborough report to fall back on. The only report made by these three European experts to the United States makes none of the statements with which Mr. Haynes has credited them, and if it did, the case would not be proved. The casual observations of a stranger are interesting, naïve and oftentimes provoking, but they are rarely in all points just. The honorable commission did not, however, find in their report that American conditions were far better than in Belgium or France; they did not announce that an unbelievable state of carelessness, negligence and ignorance prevailed in the United States.

To show the dangers of snap judgments, we cite the fact that German mines have been badly infected by the hookworm. The German miner's span of life has been reduced thereby and his vitality impaired. In America the worm has not been a part of our disagreeable experience. Let it, therefore, be said that an unbelievable state of carelessness, negligence and ignorance prevails in the German Empire. We naturally hesitate to lay claims of this sort against Germany, or even Belgium, England, France or Hungary, though also infected.

Truth has the better of our ardent patriotism. Just as in those countries certain unfavorable hygienic conditions exist, not duplicated in American coal mines, so in our mines certain menaces to safety occur more markedly than in England. As a matter of fact, coal dust conditions in America are as different from those in Europe, as the mountain mine conditions in Colorado are different from those in the lower hill country mines of Pennsylvania. The roof risk is also a problem not altogether personal.

This active commissioner of labor has discovered that in 1869 there was a disaster at Avondale in Luzerne Co., Penn. "Many a miner since then has lost his life from the burning of wooden shaft structures erected since the Avondale disaster." We only recall the burning of the shaft timbers in one working mine of America since that time, and the fire did not start in the shaft but in the mine. We recall, however, that last year the Threslington colliery buildings, West Cornforth, England, burnt down and "lumps of burning timber" fell down both shafts, the "pithead being a mass of flames."

To return to our pamphlet, we are told by Mr. Haynes that the Briceville, Tenn., accident is one of many cases where a "second opening to the mine would have saved hundreds of lives." We cannot see how any more men could have been saved than were in the mine, nor even how more men could have been saved than were actually killed. We cannot understand how the commissioner can conclude there was but one opening when there were at least three. So here again the argument lags.

Mr. Haynes desires the formation of a Federal Commission of five members, three of whom are scientific men, selected for their special eminence in the subject of coal mining. Let it be duly noted that John Randolph Haynes cannot meet such onerous requirements. The voters should mark him well, and if his name is proposed, see that he be not appointed; for, to judge by his remarks, he could not pass a mine foreman's examination.

And lest some should think we are too severe, we quote some of the further gems of thought from this work: "In Europe a situation where a mine foreman could not read would not be understood. In America almost anybody is considered good enough to be a mine foreman." "The coal miner is prone by his occupation to tuberculosis and other diseases." And here, that we may not weary the Court, we rest our case.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

British Columbia Examinations for First Class Certificates — Ventilation

Ques.—Describe one system of ventilation and general management you would adopt in a gaseous mine in order to keep the mine in a safe condition, both as to explosion and other causes.

Ans.—To avoid as far as possible the ignition of gas by the drivers' lamps, the main haulage road should be made the intake air course for the mine. To do this and to avoid the necessity of doors on the main haulage roads, the mine must be ventilated on the exhaust system. The general plan of the mine and the arrangement of the main entries will depend largely on the size of the proposition. The main roads should be driven on the double- or the triple-entry system, preferably the latter. In the triple-entry system the middle entry is the intake and haulage road, the two flank entries should be the return air courses for their respective sides of the mine. The mine should be equipped with a good type of centrifugal fan so arranged that the air current in the mine can be reversed in case of need. The fan should be set back a short distance from the top of the air shaft and explosion doors provided to prevent, as far as possible, the destruction of the fan in case of an explosion occurring in the mine. All doors and other equipments at the shaft bottom and elsewhere in the mine should be constructed of incombustible material. Double doors should be used at all main points in the air courses, and emergency doors should be provided wherever the short circuiting of the air, in case of an explosion destroying the doors, would cut off the escape of the men. As far as practicable, these emergency doors should be so arranged as to close automatically in the event of an explosion. A strict discipline should be maintained throughout the mine in regard to the use of lamps, oils, powder and other material.

Ques.—Describe the principle on which a mine fan operates and does its work. How should the outlet to an exhaust fan be arranged so as to allow the air from the mine to be discharged freely? The area of the discharge opening of a fan is 5 ft. by 5 ft. and the quantity of air passing through the fan 50,000 cu.ft. per min.; what theoretical effect will be produced by building on this opening a chimney that will gradually expand until the dimension of the discharge will be 10 ft. by 10 ft.?

Ans.—With respect to their principle of operation there are two types of mine fans: (1) The disk fan, which acts by propelling the air by means of the rotation of its inclined blades. The principle is the reverse of that of the propeller of a ship. The rotation of the propeller drives the ship forward, owing to the resistance of the water. The rotation of the disk fan drives the air forward, the fan remaining in place.

(2) The centrifugal fan acts on a different principle from that just described. The rotation of this fan develops a certain centrifugal force determined by the weight of air revolved in the fan and the velocity of its rotation. The centrifugal force developed is exerted radially outward, causing the air to flow from the center toward the circumference of the fan. The air enters the center of the fan and is discharged at its circumference.

The action of the fan creates a difference of pressure between the intake and discharge openings. The amount of this pressure, however, is determined by the resistance of the mine. Cut out or reduce the mine resistance and the pressure falls. The greater the pressure established by the mine or the greater the mine resistance the less the quantity of air circulated by the same power.

(b) The area of the discharge opening, 5x5 ft., is 25 sq.ft., which for a volume of air of 50,000 cu.ft. per min. gives a velocity of $50,000 \div 25 = 2000$ ft. per min. The theoretical effect produced by enlarging the area of discharge by building an expanding chimney, so that the area at the point of discharge will be $10 \times 10 = 100$ sq.ft., will be to reduce the velocity of discharge in the same ratio in which the area is increased, making it $\frac{1}{4}$ of the original velocity, or in this case 500 ft. per min. The head due to the velocity of discharge varies as the square of the velocity. In this case, therefore, the theoretical effect is to reduce the head due to the velocity of discharge, or to reduce the loss of head, in the ratio $(\frac{1}{4})^2 = \frac{1}{16}$. In other words, the loss of head due to the velocity of discharge is $\frac{1}{16}$ of what it was before the chimney was built.

Ques.—How will a current of 100,000 cu.ft. per min., passing in the main airway of a mine, divide between the following three splits?

Split A, 6 ft. x 6 ft., 2000 ft. long.
Split B, 6 ft. x 6 ft., 4000 ft. long
Split C, 6 ft. x 6 ft., 6000 ft. long.

Find the quantity of air that will pass in each split, supposing the pressure on all the splits to be the same.*

Ans.—Since all the splits have the same cross-section; namely, 6 ft. x 6 ft., the area and the perimeter, in each split, are the same; and, for the same pressure per sq.ft. at the mouth of each split, the quantity of air in circulation is inversely proportional to the square root of the length of the split. It is necessary, first, to find the value of the split potential, in each case, which becomes here, the area and perimeter being constant $\frac{1}{\sqrt{l}}$. In this method, the work is much simplified by reducing the lengths, 2000, 4000, 6000 to the lower related values 2, 4, 6, and substituting these for l in the above expression; thus,

Split A,

$$\frac{1}{\sqrt{l}} = \frac{1}{\sqrt{2}} = 0.707$$

Split B,

$$\frac{1}{\sqrt{l}} = \frac{1}{\sqrt{4}} = 0.500$$

Split C,

$$\frac{1}{\sqrt{l}} = \frac{1}{\sqrt{6}} = 0.408$$

Total 1.615

Since the quantity of air passing in each split is proportional to the split potential, the several quantities of air passing are found for each split; thus,

Split A,

$$\frac{0.707}{1.615} \times 100,000 = 43,777 \textit{ cu.ft. per min.}$$

Split B,

$$\frac{0.500}{1.615} \times 100,000 = 30,960 \textit{ cu.ft. per min.}$$

Split C,

$$\frac{0.408}{1.615} \times 100,000 = 25,263 \textit{ cu.ft. per min.}$$

Total 100,000

*Note—The reading in the above question has been slightly changed from the original so as to make the statement of the question harmonious. The original question states, "the current (100,000 cu.ft.) passes through an airway 6x5 ft., 10,000 ft. long, which is divided into three splits," giving the splits as above. This statement is at variance with itself. Since the areas of the airways in all the splits is 6x6 ft. and the total length of the splits is 12,000 ft. instead of 10,000 ft.—Editor.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Booster and Tandem Fans

Letter No. 1—Concerning the discussion of the use of a "booster" fan to assist the regular fan, in the ventilation of a mine; and the use of "tandem" fans, or two fans operating on the same air current, the one blowing and the other exhausting, I am glad to offer the following remarks:

The so called "booster" fan will, undoubtedly, often permit the working of places where the air would otherwise be insufficient for the requirements, owing to leaky doors, stoppings, etc. We know that all mine ventilation depends on the principle that the moving force or the force creating ventilation is the difference between two pressures namely, the pressures on the air at the intake and return openings, respectively. With the same pressure at both ends of an airway, no current will be created.

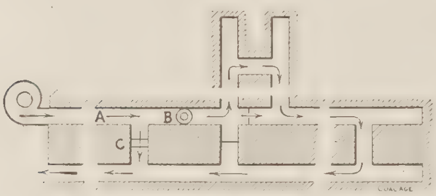


Fig. 1. Showing Location of "Booster" To Overcome Effect of Leaky Stopping etc.

It is this condition that gives rise to bad-air periods, in mines dependent on natural ventilation alone. This condition occurs frequently in the spring and fall seasons, when the outside and inside temperatures are alike. The same condition may also occur in the inner sections of a mine, owing to the leakage of air through poorly constructed stoppings and doors. When this is the case, there is practically no circulation of air in that section of the mine, which is thus cut off from the main air current.

To overcome this difficulty, it is common to install a "booster" fan within the mine, at the mouth of the affected section. This booster fan at once, by its action, creates a difference of pressure, increasing the pressure on the intake of the section over that on the return. The installation of this "booster" does not materially affect the total quantity of air entering or leaving the mine; but overcomes the tendency of the air to pass through the leaky stoppings and doors by creating a depression in that portion of the airway and throwing the air forward into the inner section of the mine.

I have indicated, in a brief way, in the accompanying sketch (Fig. 1), the location of the "booster" fan *B*, with respect to the pitch headings adjacent where the circulation of air was deficient. At the point marked *A*, within the mine, the effective pressure of the principal fan is *nil*. The last bit of air is leaking through the brattice marked *C*. The "booster" fan installed at *B* is very effective in forcing air to the face of the pitch headings. It is under these conditions that the so called "booster" will assist, so to speak, the principal fan and permit men to work in places where they could not work previously, owing to the foul air.

The advocate of the "booster" fan was, therefore, right when he said "It would permit him to work his men in places where he could not work them without this fan." The other superintendent was, also, perfectly justified in saying that the second fan erected over the upcast shaft to assist the blowing fan at the downcast shaft would not "draw." Naturally, the second fan acted as an impediment or obstruction to the air current and decreased the efficiency of the first fan, since the air current created by the first fan must pass through the second, which offers a certain resistance to its passage. This resistance of the second fan to the passage of air is due to the friction of the air against its surfaces and the deflection it meets in passing through the fan. Two fans will always offer twice the resistance of one fan to the same air current.

The Action of Twin Fans

In Figs. 2, I have shown two arrangements employing two fans in each. In the first arrangement, Fig. 2, (*a*), the fans are arranged in tandem, the one blowing and the other exhausting. The blowing fan is placed at the intake opening of the mine and the exhaust fan at the discharge opening. In this case, all of the air created by the first fan must pass through the second. In the second arrangement (*b*), both fans are placed either at the intake or the discharge opening of the mine. The fans work side by side, each taking its own portion of air. In this case, it is often supposed that the two fans will produce twice the quantity of air that would be produced in the same airway by one fan working alone; but this is not the case.

The operation of the two fans will necessitate an increase of power and produce also an increase in the circulation. If no change is made in the course of the air through the mine, any desired increase of quantity will require an increase of power in proportion to the cube of the ratio in which it is required to increase the quantity. Thus, to double the quantity will require eight times the power. Two fans operated side by side would produce, assuming the power on the air was doubled, an increase of quantity in proportion to the cube root of 2. Thus, $\sqrt[3]{2} = 1.26$. If each of these fans, working alone, would produce a current of 20,000 cu.ft. per min. in this airway; when working together, they would produce $20{,}000 \times 1.26 = 25{,}200$ cu.ft. per min. It is important to remember, however, that since one-half of this volume of air is passing through each fan, the

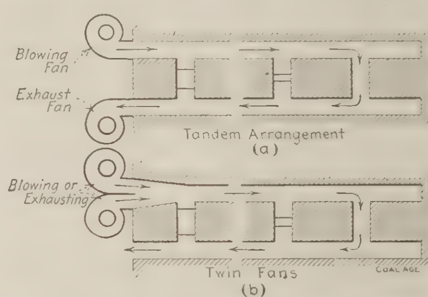


Fig. 2. Showing Right (a) and Wrong (b) Ways of Installing Two Fans On a Single Current

work lost in each fan will be proportionately less; and, as a result, the two fans will produce a slightly larger quantity of air than that above named. In other words, the circulation with two fans running side by side will have a higher efficiency than can be realized in the operation of a single fan capable of producing the same quantity of air.

R. Z. Virgin.

Johnstown, Penn.

Letter No. 2—Referring to the question in regard to the practicability of installing a "booster" fan to assist the main fan; contained in your Foreword of May 25, I wish to say that "booster" fans are of advantage in mines where the air travel is very long, where air courses are of insufficient size to keep down the water gage, or where the coal pitches. I can think of no disadvantage due to the use of "booster" fans under any circumstances. In all instances they will prevent loss of air by leakage due to great pressure where only one fan is

used. The principal expense is the cost of the fan itself and the power for running it, which generally is electricity, which means the carrying of power for a long distance with the cost of copper and transmission losses.

CARL SCHOLZ.
Vice-Pres. and Gen. Mgr.
Consolidated Indiana Coal Co.,
Chicago, Ill.

Letter No. 3—"Is a booster or tandem fan practical, and will it increase the quantity of air, when both are operating on the same air current?" I say, yes; it is practical and will increase the volume of air in proporion to the size and speed of the second fan.

The Consolidated Indiana Coal Co., at its No. 25 mine, located in Sullivan County, Ind., installed a 6-ft. booster, electric-driven fan, in the intake airway, on one side of the mine, 1000 ft. from the foot of the downcast shaft. At the top of this shaft there is a 12-ft. steam-driven Crawford-McCrimmon fan, running about 115 r.p.m. With the latter fan running alone, the ventilation on this side of the mine was poor and not sufficient for the number of employees in that section. Something had to be done and it was decided to install the booster.

This booster is a disk fan, similar in construction to the Stine disk fan; and is geared to a mining-machine motor. The fan is running at 350 r.p.m., and since it has been in operation the quantity of air in that air course is increased nearly threefold, as shown by measuring the air before and after the installation was made. These facts can be verified by anyone who desires to come and measure the air when the fan is not running and, again, when it is running. The booster only runs during working hours, and when first installed was run at 550 r.p.m. This speed, however, had to be reduced as the booster took too much current to drive it, and at that speed made air enough to blow open the mine doors on the inside, which were hung so as to open both ways. If we give mine ventilation any study, and reason for a minute we will see the practicability of a booster fan when properly arranged.

In passing air through the air courses of any mine, friction must be overcome; and as the air courses increase in length or contract in area the quantity of air decreases unless the speed of the fan can be raised so as to keep pace with the increase of friction, which is not always practicable. But, when the fan has reached its limit, if we place another fan on the same air current, either midway in the air course or at the outlet, it will have the same effect as if we cut the length of the airway in two. Let us not make the mistake, however, that some have made, by placing two fans on the top of the same air shaft, and expect results, for the fans so arranged, will often work against each other, and the ventilation will become worse than before the erection of the second fan.

Shelburn, Ind. R. J. PICKETT.

Letter No. 4—As to whether it is possible to run a "booster" fan to assist another fan to ventilate a mine, will say: If a blowing fan is forcing the air into a mine, but, on account of leaky doors and stoppings, a part of the inner workings or a certain section of the mine is not getting sufficient air, the intake entry of this section being, as we say, "dead," there is no doubt but that a "booster" can be installed at this point, which would take off enough air from the main air current and circulate the same through this section and back to the main current. The "booster" fan would thus assist the main fan to properly ventilate the mine, providing, however, the main fan is producing a sufficient volume of air for the entire mine.

I am inclined, also, to believe that when the main fan, working on a continuous current, there being no air splits, does not produce sufficient air for the mine, a "booster" fan, installed near the head of the mine within the workings, would greatly assist the circulation of the air. This condition will often occur in the development of a mine, the mine resistance becoming too great for the power of the fan, owing to the increase of friction and pressure. When the main fan, on this account, fails to produce the necessary velocity in the workings, it seems to me that a "booster" at the head of the mine, if of sufficient capacity, will pick up the air delivered to it by the main fan and drive it out of the mine.

But, as for running two fans tandem, that is to say, one at the top of the downcast shaft, forcing the air into the mine, and the other at the top of the upcast shaft, exhausting the air from the mine, I do not believe this plan would improve the ventilation of the mine, for the following reasons:

(1) If there were leaky stoppings, cutting the air off from some section of the mine, the exhaust fan would only pull the air through the leaky stoppings into the return current, and still leave the unventilated section of the mine in the same condition as before.

(2) Again, in case all of the stoppings are in good condition, it does not seem to me that tandem fans would even then increase the volume of air in circulation, because, the forcing fan can only produce a given volume of air, and the exhaust fan cannot get any more air than the first fan delivers. In this case, therefore, it seems to me that both fans would be working on the same volume of air that one of these fans could produce alone. I do not claim to be familiar with this subject wholly, but these are my ideas, and I shall watch this discussion, by others, with much pleasure.

Gatliff, Ky. J. C. BABB.

Letter No. 5—Replying to the Foreword, COAL AGE, May 25, in which you ask for a full and free discussion as to the possibility of operating a "booster" fan to assist the principal fan in ventilating a mine, I beg to advise that, in my opinion, it is possible. This opinion is supported by the fact that I have done this very thing. I do not, however, believe it to be good mining practice. Lack of money to purchase a more efficient fan was the chief reason, in this case, for the installation of the "booster."

I consider the "booster" a "make shift," its use in most cases being forced on the operator by lack of money or time to procure a better facility.

It is unnecessary to say that there should be no leaky stoppings; or the air courses should not be cheked by falls and other obstructions in the airways. It is, however, easier to say this than to do it; or to remedy the trouble from leaky stoppings. This is especially true in a mine giving off little or no gas.

When a coal company is managed by a man who has had no experience in mining but whose experience lies in dividend getting in other lines of business, the ventilation of the mine is apt to be regarded as an unnecessary expense. It takes a strong showing to convince such a one of the benefits to be derived from the expenditure of a sum sufficient to install a ventilating apparatus having the proper efficiency. Hence the installation of the "booster" or some other make shift.

I know of other cases than my own where "boosters" have been installed; and there seems to be no doubt as to the possibility of getting some results thereby; but there is some doubt as to the practicability of adopting this plan. Unless forced to do so by circumstances as first related, I would not install a "booster."

G. M. SHOEMAKER, MANAGER,
THE VIRGINIA-LEE COMPANY, INC.
Pennington Gap, Va.

[Further discussion relative to the use of "Booster" fans will be printed next week. All readers are invited to contribute.—EDITOR.]

Young Mine Foremen

On reading the article of Sim and W. H. Reynolds, in the issue of May 25, on "The Dangers of the Pittsburgh Coal," I was most forcibly struck by the keen language which so ably delineated the old man's attitude at the Pittsburgh demonstration. Shakespeare's Shylock is no more in evidence in my mind than is Reynolds' old-time mine boss.

In the presentation they have given us, we see the embodiment of ignorance,

doubt and denial. The old man's mien, his language, the envelope and the dust he holds in his shaking hand, all bring him vividly before us. We can watch him as he notes that the scientific know-alls failed to blow the mine up. Finally the deed is done, and the workings of the old man's brain are not depicted by Brother Reynolds, but he says enough when he records the fact, "that the old mine boss changed his opinion."

We are all heartily glad to hear that he did so, and it is one of the desired ends of such meetings that such men should be convinced. If fossils like the one described can be brought to light by such Sinaitic thunderings, then there is hope that the masses may fully realize the tremendous fact that dust will explode.

But this was not the passage in the article which took away my breath. I do not believe that the writer intended a "solar plexus" blow to us old men, but such a construction could well be put on the passage which follows and loose inferences could be drawn from what is said. Some might conclude that most old men belong to the same school, what old school is not designated, and by parity of reasoning it might be concluded that younger men belong to quite a different school. To give the quotation: "As he ambled about, he convinced us that there still existed, if not among the younger men, at least among many of the old school of mine officials, who are equally charged by the state with the care of many human lives, such a narrowness of mind and viewpoint, as is apt at some time or another to be the cause of a disaster." Now, I must confess I cannot grasp the distinction between the schools, as far as age limits are concerned, nor as far as my observations extend. Of course, I take mining life to be a great school. In fact all life itself is only a school, and a man with an open, progressive mind, watching events, learning facts, and keeping in touch with the spirit of the age is always young to me. The spirit never grows old. And I have seen, and so have you, and so has Brother Reynolds, sulky, dull, pig-headed and very dogmatic young men and very progressive so called old men. In fact, youth is generally a period when "they know it all." There comes a time when one does not know too much, and then again —well—we mumble out something like this: "There are more things in heaven and earth than are dreamt of in our philosophy."

In closing I would say, keep the dust and gas out of your mine, keep your mine damp and your air moist and use the best tested explosives, never failing to keep up with this age of ideas and then human suffering and loss of life, if not eliminated, will be brought down to a figure worthy of our united efforts.

Eccles, W. Va. George Scott.

A Cave-in Proposition

I have read with interest Mr. Sutton's proposition for dealing with a cave, published in Coal Age, May 18, p. 1050. There is no doubt that Mr. Sutton's method would give good results, under certain conditions I would suggest, however, modifying his method whenever the rooms are connected by cut-throughs. The chief objection to Mr. Sutton's method is the number of curtains required on the entry or haulage road. As the life of curtains is necessarily short when all the coal from a heading must be hauled through them, their use on a haulage road should be avoided, as far as possible.

I submit herewith a diagram (Fig. 1) of the plan I would adopt in the present case. This figure shows the brattices carried up from the last cut-through to

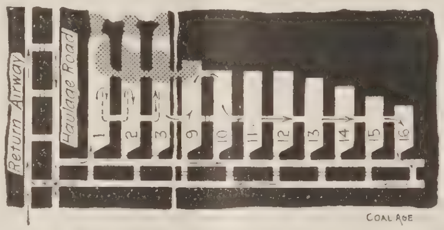


Fig. 1. Showing Arrangement of Brattices To Ventilate Caved Rooms

the edge of the fall at the face of each room. A curtain is then placed on the heading between rooms 1 and 2, and another curtain on the heading between rooms 9 and 10; a curtain is also hung in the mouth of each intervening room. As shown in the sketch, the brattice is attached to the outby rib of the cut-through, in each case; and, except in room 1, they are erected on the straight-rib side of the room, so that the fresh air travels behind the brattice. Care should be taken that the area behind the brattice is sufficient to conduct an ample volume of air without increasing too much the velocity of the current and the mine resistance. Since the fall has not closed the second cut-through between rooms 9 and 10, a stopping is shown placed in the first cut-through between these rooms, to deflect the air to the face of the room.

Johnstown, Penn. Benj. Hartill.

Haynes and Briceville

In regard to the statement of John Randolph Haynes, in his address to the American Economic Association, Dec. 30, 1911, we beg to advise that we have three openings at our Cross Mountain mines, all of which are or can be used as traveling ways. The mine law of the state of Tennessee requires two openings not closer than 150 ft. apart, and we more than complied with that requirement. I might also add that our air shaft which is located 3100 ft. from the mouth of our mine can be used as an outlet, and had there been any men alive in our mines in that vicinity, they could have been rescued.

I may also state that within 30 minutes after the explosion, we had men at the bottom of the air shaft, these men having traveled 3000 ft. along the main entry. When the men reached the bottom of the shaft, we had ropes let down from above by which supplies were furnished so that we could commence to build brattices where needed.

I might say in connection with the comments made by John Randolph Haynes, that we have 2500 ft. of cover over our mine and other companies have leases on either side of our workings. Consequently openings could not be arranged close up to the working places of the mine. However, the following exits were available for travel: The main opening, the haulage road and a manhole. If necessary we could have removed men by the air shaft of which mention has been made above.

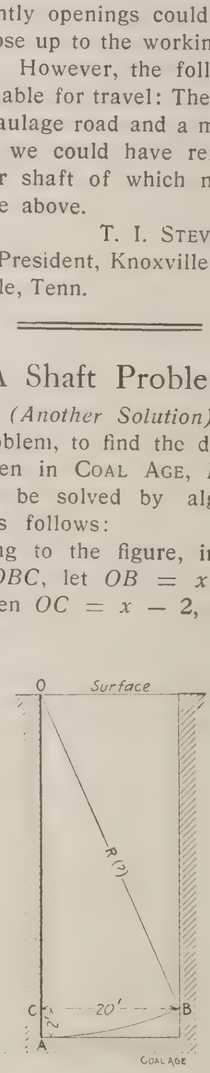
T. I. Stevenson,
President, Knoxville Iron Co.
Knoxville, Tenn.

A Shaft Problem

(Another Solution)

The problem, to find the depth of the shaft, given in Coal Age, May 25, p. 1086, can be solved by algebra very simply, as follows:

Referring to the figure, in the right triangle OBC, let $OB = x$ (depth of shaft), then $OC = x - 2$, and $BC = 20$ ft.



Showing Cross-section of Shaft

But, the triangle OBC being right angled at C,

$$(OB)^2 = (OC)^2 + (BC)^2$$

Or, substituting the values given above,

$$x^2 = (x - 2)^2 + 20^2$$
$$x^2 = x^2 - 4x + 4 + 400$$

Transposing and reducing,

$$4x = 404$$
$$x = 101 \text{ ft.}$$

John T. Fuller,
Consulting Engineer.
Honesdale, Penn.

Sociological Department

For the Betterment of Living Conditions in Mining Communities

Law Breaking and Mine Discipline

By Sim Reynolds* and W. H. Reynolds

To many men, officials as well as miners, certain provisions of our present laws seem unnecessarily strenuous and uncalled for. These men fail to realize the positive necessity for laws applying equally to all men and all mines. They cannot or will not make distinctions themselves, yet they would have the mining code do so. Witness, for instance, the stir some time ago, created by the attempted application on the part of the Pennsylvania Department of Mines for a wise and necessary act regulating shotfiring and the use of tested powders. The attempt to carry this act into execution for the benefit of a certain class of miners met with a stubborn resistance of the very men, one would naturally have expected to welcome it. The fact that the department's desire to safeguard the lives of these thousands of men seemed likely to take a few pennies from the pay of the men to be benefited, caused a strike which need not be dilated upon, since every reader of this journal is doubtless familiar with the matter. When the men themselves prove unwilling to pay a few cents a day to remove only one of several elements of extreme danger, should we wonder if we find employers indifferent?

The miners of the Pittsburg district were self-blinded to the fact that to be of any service a regulation of that sort must of necessity cover the entire field wherever need of such legislative action existed, that if A's mine was fortunately such that wholly or in part it could operate safely without this safeguard, yet to make a distinction in favor of A's men would obviously call for the same favor elsewhere, and with real or imaginary changing of cause and effect between one mine and another, the whole structure built for the safety of the region would sooner or later topple on the heads of those who made it.

The Laws Cannot Be Framed for Every Individual Circumstance

It seems not to occur to some men that there are few laws—be they framed for the betterment of social, business or industrial conditions—which do not inevitably work hardship at some point or other. Even the imprisonment of a criminal makes others beside himself suffer. These hardships in the enforcement of laws will always exist, so long as no two mines have characteristics exactly alike. Some little that is bad will have to be endured for the greater good which is conferred

The best that can be done for imperfect human beings is to endeavor to give the greatest possible measure of good to the greatest possible number. Yet, failing to fully realize this philosophy, men singly and collectively set about breaking these laws by fitting them to their individual needs and circumstances. And it is because of this fact that we need more and still more education along our own lines. It is this attitude which calls into being stringent laws, and gives us an inflexible determination to enforce discipline and carry out what laws we have.

Everybody Does His Part to Make the Mines Unsafe

Nor is the miner alone in this respect. At this moment there come flooding upon our memories a full score of cases which take in every one connected with the industry. The careless trapper boy leaves a door but partly shut, trusting or pretending to trust to the backward kick he gives at it as he swings onto the tail end of an ingoing or outbound trip. Perhaps he gets back an hour later to shut it if someone hasn't happened to go through ahead of him. Thus the ventilation of a gaseous section is left to the operation of an uncertain chance.

There is the manager, who, at some time or other, breaks every section of the code, as each in turn stands between him and a constant and large output, and the corps of engineers which enters an abandoned part of a gaseous mine which has not been previously examined for gas. The imputation of carelessness covers them all, and if death happen to pass over the first offense, they will be found doing the same thing over again just as did an offender who recently came under our notice.

Experience Does Not Teach

This latter instance resulted in our bringing up for punishment an old man, who ought to have known better than to be caught with smoking materials and matches on his person in a mine where such luxuries were strictly forbidden during working hours. The same man had, but a short time before, been removed from a mine which had like characteristics to the one he was entering, and which had blown up and killed every living being in it except himself. When he was asked regarding his carelessness, he replied simply that he "didn't think there was any danger." Another miner who worked beside us in a mine in northwestern Pennsylvania thought the same regarding his powder keg. He would persist in opening the steel canister by some method other than the sane way, which consists in removing the cap, but one day the steel pick point went in among the black grains with a few friction-engendered sparks, and Paddy left his wife and "childer" to hustle thereafter for themselves. Still another miner we knew, when removing old lamp wicks to put in new ones, had fostered the habit of placing them on the edge of his powder keg, instead of on a flat rock, many of which lay near by. In the end this man also left his family to the tender mercies of a far from tender world, because a lamp wick, obviously being slippery with grease, slipped into the "kagg."

Discipline Is for the Other Fellow

But, "lest we forget," we must ever keep in mind the fact that these men of lowly station, who "tak a whiff" when the bosses aren't near, or, like those mentioned, deliberately disobey the law with regard to the handling of powder, are not one whit worse, nor more deserving of severe punishment than the foreman or manager of a dusty mine who persists in ignoring the dangers of dust alone, and who in a spirit of narrowmindedness professes to hold nothing but contempt for the men, governmental or local, who would have them acknowledge that the innocent-looking coal dust is an element of great danger.

*Pittsburg-Buffalo Coal Co., Marianna, Penn.

Safety Warnings

On the statements given to the miners at the Pine Hill Colliery, near Minersville, Schulykill County, Penn., safety warnings have been printed. These lay stress on the fact that men are frequently killed, because the prudent men are afraid to "butt in" and warn the imprudent of the dangers to which they are exposing themselves. The mine foreman is not the only man who should have safety in his mind. If everybody warned his neighbor of the imprudence of tempting death, there would be less loss of life. The practice of the Pine Hill authorities is commended as likely to do much good.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The Interstate Commerce Commission has rendered its opinion in regard to the investigation and suspension of advances in rates by carriers for the transportation of soft coal from Illinois mines to stations on the St. Louis & Hannibal Ry. It now fixes through rates and joint through rates for the transportation of the coal over the road in question to Missouri points. The Commission says in part:

> Formerly the joint through rate from Panama to Hannibal, taking the latter as a typical point of destination, was 75c. a ton. Under the tariff of joint rates, which it is now proposed to cancel, the rate between those points is 82c. a ton. If this rate is withdrawn there will be available to shippers only the combination of local rates under which it is clear the traffic could not move. This result apparently was contemplated by the St. Louis & Hannibal in withdrawing its concurrence in the joint rates. As the withdrawal of the through rates, leaving in operation the lowest combination of local rates, would increase the charges on coal moving over that route, the defendants were under the burden of justifying their course and of showing that the resulting charges would be just and reasonable. But the record made at the hearing does not meet this requirement. In fact no effort was made to show that the combination of locals would be a reasonable charge on this traffic, nor was any substantial reason given for the cancellation of the joint through rates. We therefore find that rates in excess of those now in effect would be unjust and unreasonable.

Bureau of Mines Bill

After a lengthy debate on the Bureau of Mines bill offered by Representative Tooker on Wednesday May 29, the House of Representatives finally laid the measure on the table without passing it. The understanding is that the bill will be shortly taken up again and will then be passed. It is undoubtedly true that the opposition encountered by the bill is due to a fear that the measure would largely broaden the scope of the bureau's activity, and enable it to engage in mining operations on the public lands. Section 2 of the bill, which excited the greatest opposition and difficulty has, however, now been disposed of.

In advocating the measure, Representative Palmer of Pennsylvania probably expressed as well as any who spoke during the debate, the views of the advocates of the measure. Mr. Palmer said in part: "I want to say that so far as my observation has gone, and so far as I have learned from the people interested in coal mining especially, the work of this bureau, under the efficient and able management of its chief, Dr Holmes, has fully justified its creation. And although the time of its operation has been comparatively short, the work which it has done has fully come up to the expectations of those who devised the plan that resulted in the creation of this bureau. But, there are, as I intimated, other mining industries besides the coal-mining industry which are in need of the kind of service that this bureau has been giving in the coal-mining regions, and the present bill, as I understand it, is intended, in the creation of a new organic act for this bureau, to widen its jurisdiction and enlarge the scope of its work in order to include metal mining and quarrying."

Representative Fitzgerald took quite a different point of view, saying in part:

> Some three or four years ago the Frick Coal Co., of Pittsburgh, conducted a number of very important investigations to determine a number of matters of vital interest to the company in the conduct of its operations. It does so no longer. It permits the Bureau of Mines, at the expense of the Federal Treasury, to relieve it of the burden which formerly belonged to it.
>
> The primary object of the Bureau of Mines, one which should be kept in mind and from which we should not permit it to be diverted, is the protection of the men engaged in the mining industry, and by investigations to determine the causes of mine accidents, to outline methods by which accidents can be prevented, not only by the use of explosives that will not be hazardous to handle, but in proper shoring and working in the mines. But to investigate the economic conditions of these industries is to go much further.

The prospect now is that the Bureau of Mines bill will be passed in very much the form in which it was originally reported by the committee after amendment subsequent to its introduction.

Alabama

Birmingham—At a meeting of the preferred and common stockholders of the Alabama Consolidated Coal & Iron Co., held in Baltimore, May 31, announcement was made by Joseph H. Hoadley, former president of the company, but now chairman of the corporation, that Charles M. Schwab, president of the Bethlehem Steel Co., had promised to become financially interested in the Alabama Consolidated and to reorganize the company, provided the merger with the Southern Iron & Steel Co. should not go through. Facts also developed at the meeting which tend to prove that the efforts of the committee appointed about a year ago to merge the Alabama Consolidated Coal & Iron Co. and the Southern Iron & Steel Co. have proved fruitless, and the entire plan will likely be dropped.

Illinois

Mount Vernon — Prospectors working south of Mount Vernon have struck a 7-ft. seam of coal at a depth of 500 ft. A test has shown the coal to be of superior quality and it is understood that the field will be developed before long.

Chicago—Coal shippers along the Illinois Central lines as far south as New Orleans have protested against the new car apportionment plan put into effect by the railroad. This plan gages the supply of cars by the amount supplied by the road during the previous year. While the shippers claim that the new plan is radical and unjust the railroad officials declare that it was put into effect only after it had been found to be the most favorable to all.

Mt. Carmel—The Harrisburg mines, some of which have resumed operations since the recent shut-down, are reported to be shipping at the rate of 125 cars per day, and it is expected that this amount will be doubled in a very short time. This will be far short of a full output, but it is not anticipated that the business will be large until next fall.

Springfield—A recent meeting of the traffic managers of various railroads entering Springfield is expected to result in a reduction of 7 per cent in the freight rates to Eastern points. An urgent need of the coal men is an equitable rate to Chicago, it being claimed that Springfield is at a disadvantage of from 10c. to 20c. a ton as compared with points in Indiana. Relief in this latter particular, however, is not expected to be taken up until next month.

Bloomington—The first of a series of 52 damage suits against the St. Paul Coal Co. by widows and children of miners who lost their lives in the Cherry mine disaster of 1910 is being tried by the Bureau County circuit court. The aggregate of damages to be demanded is $400,000. The first case is that of Miles McFadden. This will be the test case, and it is estimated that it will require six weeks to complete it. The fate of the others probably will rest on the outcome of the McFadden suit.

Indiana

Terre Haute—The referendum vote taken recently by district No. 11, United Mine Workers, favored the acceptance of the proposed wage-scale contract by a substantial majority. The issue was in considerable doubt as there was evident a strong sentiment in favor of holding out for a weekly pay. The new contract provides for a semi-monthly pay, such as has been in force heretofore, and unofficial returns show that the vote stood 8007 in favor of accepting this provision and returning to work as against 3553 opposed to its acceptance. The new contract was signed May 31, and it was arranged that the men would return to work Monday, June 3.

Brazil—An effort is being made to organize the men employed at the stripping operations in this vicinity. A local union was recently established for two pits in the vicinity of Patricksburg and has become allied with the United Mine Workers.

Iowa

Des Moines—The mine workers of District No. 13 have ratified the agreement proposed at the recent joint conference of miners and operators. Despite the fact that the miner's convention declined to endorse the agreement, the referendum vote disclosed a large majority in favor of its acceptance. The mines are resuming work.

Kentucky

Maysville—The business of the Big Hill Coal Co. has been placed in the hands of John C. Chenault of Richmond, Kentucky, as receiver. The receivership is the result of a suit brought by John H. Jones to inforce mortgage claims against the property of the company in Lee and Bell counties. The suit is for $87,300. A restraining order was asked to prevent the State Bank and Trust Co., trustee; the New Straight Creek Coal Co., the Louisville and Atlantic Coal Co. and others from taking possession of the property.

Louisville—The newly organized Dean Coal Co., of Barbourville, has purchased the holdings of the Gibson-Carr Co., in the Brush Creek district of Knox County. The purchase includes over 1000 acres of coal lands and a recently installed mining plant. The company will begin operations at once.

The Interstate Coal Co., which recently purchased the holdings of the Cumberland Coal Co., now has investments of more than $1,000,000 in Knox county coal fields. Recently the company took over the holdings of the Bennett Coal Co. in the Brush Creek district, and it now owns all the mining operations in the Brush Creek field with two exceptions. Some time ago the Interstate Coal Co. purchased the Lunsford-Lawson-Detherage interests for $100,000.

Providence—A sale of the Fairmont Coal Mining Co.'s property was held here recently to dispose of the assets of the company which is in bankruptcy. The receiver rejected the bids which were offered on the ground that they were too low, and a private sale will probably be held instead.

Michigan

Bay City—An announcement was made, May 23, that the Michigan United Mine Workers and the operators had settled their differences and that the miners would return to work within a week.

Missouri

Kansas City—Coal operators and miners of the Southwestern district, after holding conferences in Kansas City for the last 60 days, have reached an agreement and a contract covering a period of two years has been signed. The agreement provides for a slight increase in wages. Miners and operators throughout Missouri, Kansas, Oklahoma and Texas are affected. The signing of the contract means that there will be no suspension in the coal fields of District No. 21 for two years unless something unforeseen develops. Had the agreement remained unsigned after May 31, a suspension would have followed. The contract expired Apr. 1 but provided for 60 days additional for negotiations.

Ohio

St. Clairsville—Fully 1300 miners were recently on strike in Belmont County. Six hundred men, employed by the Provident Coal Co., were out on account of trouble over a check-weighman; 450 at the mines of the Troll Coal Co. were out because they believed a member of the union was unjustly discharged, and at the Moore's Run mine of the Hutchinson Coal Co., at Bridgeport, 250 men were striking because they desired to ride to and from work on the motor trips.

The 600 men employed at the Provident mine, returned to work, June 3, as the company agreed to permit the employee selected by the men to go on the tipple. Three checkweighmen put on the tipple inside of three weeks by the company have been scared out of town by red flags and warnings that they would be killed.

Columbus—The U. S. Supreme Court, on May 27, reversed the Ohio railway commission and sustained the Wheeling & Lake Erie Ry. Co., in protesting against the establishing by the commission of a rate of 70c. a ton on what is called "lake cargo" coal, transported from the eastern Ohio coal field to Cleveland, Lorain and Huron. In sustaining the railway the supreme court affirmed the decision of the United States circuit court of appeals and settled one of the most important rate cases since the creation of the Ohio railway commission. The court ruled that transportation of "lake cargo" coal must be interstate commerce, saying: "The so called 'lake cargo coal' is necessarily shipped beyond Cleveland or Huron. If it stops there, another and higher rate applies."

Cincinnati—The Southern Retail Coal Merchants' Association will hold its annual convention in Cinciniati on June 12, and the Michigan, Ohio and Indiana Coal Operators' Association will meet June 12 and 13. The Kokoals will hold their national pow-wow at the same time.

Cambridge—The miners and operators in the Cambridge district have signed the scale for the coming two years and arrangements are being made to put the mines in full operation. Many are already being worked.

St. Clairsville—The Virginia Hill Coal Co., of Belmont County, has been placed in the hands of J. D. Jordan as receiver, as the result of a friendly suit instituted by the W. H. Pattison Supply Co. The company's affairs have been involved for some time and this method was taken to straighten them out. The authorized capital stock of the corporation is $700,000.

Pennsylvania

Bituminous

Irwin—The store and warehouse of the Berwind-White Coal Mining Co., at Herminie, a mining town near here, were destroyed by fire, May 29. The plant is a total loss and the whole town, which consists of miners' dwellings, was swept by the flames. Aid was asked from other towns.

Kaylor—There has been some trouble here, and more is expected on account of the eviction of striking mine workers from houses which belong to the Great Lakes Coal Co. The men have been out on strike since Apr. 1, demanding a wage scale in accordance with the Cleveland agreement.

Charleroi—Officials of the miners' organization are hopeful that the strike at the mine of the Clyde company, near Fredericktown, which has been in progress since Apr. 1, will be settled shortly. The men struck there for the scale agreed upon at the Cleveland convention, and the mine has been idle ever since. For the past four years the mine has been operated nonunion. The operators have made some concessions, but the men are standing out for the scale as paid elsewhere in the district.

Dubois—Kelly brothers, who recently purchased the holdings of the Richmond Coal Co., and are now busy at work get-

ting the plant at Savan in shape for active operations, a few days ago purchased 100 acres of land adjoining their property on the southeast. The price paid was reported as $70 per acre.

Johnstown—The Blue Bird shaft, of the Portage Coal Mining Co., was completely flooded as the result of the bursting of a water main, May 27, and over 250 miners were thrown out of work. It was announced that work would not likely be resumed for several days.

Although the coal market is a trifle dull, the Greenwich Coal & Coke Co.'s operations, in Somerset County, have been running steadily every day and the contracts are of such a nature that the company assures the men that very little, if any, idle time may be expected during the coming summer. New men are being employed every day. Mine No. 8, near Shankstown, which had been shut down for about two years, was reopened, May 20.

About 200 new dwellings are being erected by the Consolidation Coal Co., at Acosta. The company has an extensive coal field in this section and has a large opening in operation at present, with an output of about 1500 tons daily.

Connellsville—Freight rates on coke from this district shipped to Youngstown and other sections were attacked as too high before the Interstate Commerce Commission, May 27, in hearings on complaints of the Youngstown Sheet & Tube Co. and others against the Pittsburgh & Lake Erie R.R., and the Connellsville Coke Producers' Association against the Baltimore & Ohio, the Pennsylvania and other railroads. That the independent iron and steel producers of the Youngstown district of Ohio and western Pennsylvania will be compelled to build a railroad from the Connellsville coke district through several of the iron and steel districts with a terminal on Lake Erie, unless there is a reduction in the rate on coke, was a statement made by James A. Campbell, president of the Youngstown Sheet & Tube Company.

Anthracite

Scranton—Allegations that certain of the union leaders at the Oxford colliery of the People's Coal Co., at Scranton, have not been reinstated in their positions because of their activity in connection with the union, may lead to a strike. There was no union at the colliery until the recent suspension, during which the mine worked but little, although it ran at full blast during the 1902 strike. The company maintains that it has merely refused to discharge men who worked during the suspension in order to employ others who did not.

About 400 men and boys employed at the Fernwood slope of the Hillside Coal & Iron Co., struck recently and refused to return to work until certain grievances were adjusted. The men are employed under the supervision of two contractors and are paid by them. The miners demanded that the contractors be removed, as they claimed they could make more money working directly for the company.

The organization of the committee which is to investigate the advance in prices of domestic anthracite under the auspices of the New York Merchants' Association has been completed and it is expected that the investigations will be commenced at an early date.

Wilkes-Barre—A gas explosion in the Pettibone mine of the Delaware, Lackawanna & Western Co., early, May 28, injured four men. Two were thought to be dying when taken out. With the aid of the local rescue corps, 60 other miners made their escape without injury.

It has been announced that all the large anthracite coal companies will make a flat 10 per cent. increase in the wages of their hoisting engineers, thus bringing their rate on a par with the other mine workers. Indications were that some of the companies would grant only a 5 per cent. increase while others did not seem disposed to grant any and no little disappointment was felt in consequence.

Hazleton—At the offices of the United Mine Workers here, it was given out that the wages of all carpenters employed about the coal mines will benefit by the 10 per cent. increase recently granted the other men. Most of the carpenters were members of the union of that trade in this city and were surprised to learn that they will share in the advance. In doing so, however, they become subject to the union jurisdiction of the miners and are being asked to joint that organization.

Resumption of work at the mines has been marked in this as well as in other regions by a number of local strikes, chiefly with the object of bringing non-union workmen into the organization. Strikes of this nature took place recently at Coleraine and at the Hazleton Shaft colliery of the Lehigh Valley Coal Co.

Utah

Provo—The railroad from Helper to the coal lands in Carbon County, owned by the Knight interests, is now assured, and it is given out by the engineers in charge that the road will be in operation by next fall. A fully equipped coal-mining camp will be established and in readiness to ship coal by the time the road is finished. The road is to be run from Helper, on the main line of the Denver & Rio Grande, to the coal beds, a distance of 4½ miles, and will cost upward of $250,000, aside from the rolling stock. Right-of-ways have been secured and everything is now in readiness to begin the building of the road, and the contract for its construction is to be let at an early date.

Washington

Spokane—A. B. Ward has announced that he will form a company to develop his coal property at Peone prairie. Work will be started this summer. Mr. Ward states that he is confident that coal will be found in large quantities.

West Virginia

Charleston—Striking miners of the Paint Creek Colliery Co., at Mucklow, Md., attempted to massacre a dozen Baldwin mine guards, May 31. One hundred shots were fired at the unarmed detectives *enroute* from their sleeping house at the mines to their boarding house for breakfast. All escaped but one, who was wounded in the side. The injury was not fatal. The miners at Paint Creek are the only ones in the state on strike, having refused to accept the scale agreed upon.

A big coal development will be started by the Berwind-White interests in Fayette County within the next few weeks. The land to be developed lies between Pack's Branch and Paint Creek, in the Fayetteville district. The tract contains 6000 acres, and was purchased by the Berwind-White interests from the McKinley Land Co. This development has been under contemplation for two years or more. Already a number of houses are being constructed, some of which will be completed within the 30 or 40 days.

Wheeling—The joint conference scale committee of the miners and operators of eastern Ohio reported to the general conference, May 31, that they were unable to reach an agreement. Differences must be adjusted by the conference itself.

Williamson—The United Thacker Coal Co. has increased its holdings in West Virginia from 8,000 to 65,000 acres. Under the West Virginia law a corporation can hold up to 10,000 acres without paying a special tax. The United Thacker Coal Co. now pays a special tax on 55,000 acres in this state.

Wyoming

Kemmerer—Work on the new mine of the United States Coal Co., at Adaville, is progressing favorably. The name of the camp has been changed to Conroy. A new steel tipple has been ordered and will be installed as soon as the railroad is completed, work on which will begin early next month, the track being laid over the old grade from Moyer. It is expected that the shipment of coal will commence about the first of September.

Canada

Edmonton, Alberta—All the buildings belonging to the Western Coal Co., at its mine in the Clover Bar mining district, were destroyed by fire, May 26. Loss, $75,000.

Personals

John F. Chilcott, superintendent of construction for the Allegheny River Mining Co. Kittanning, Penn., has resigned, effective June 5.

Eli T. Conner, consulting mining engineer, of Philadelphia, Penn., is making a business trip to Newfoundland where he will remain for a week or ten days.

G. W. Seiler, formerly with Pattison & Bowns, at No. 1 Broadway, New York, is now in charge of the anthracite department of the A. W. Hillebrand Co., at the same address.

C. V. Gould, general manager of the United States Coal Co. recently spent several weeks at Adaville, Wyo., looking after the development of the company's new mine at that point.

W. R. Crane, dean of the School of Mines, Pennsylvania State College, will leave for Alaska about June 15, and will spend the coming year studying the mineral resources of that country.

Henry L. Badham, of Birmingham, Ala., president of the Bessemer Coal, Iron & Land Co., is spending a few weeks traveling in Europe. William S. Lovell, vice-president, is looking after Mr. Badham's duties during his absence.

P. W. Turner, mine foreman for the state of Alabama, at the Banner mine of the Pratt Consolidated Coal Co., which is operated with convict labor, by the state, has been appointed by Gov. O'Neal, superintendent of the mine, effective at once. Mr. Turner succeeds William L. Martin, whose resignation was announced a short time ago.

S. D. Warriner, vice-president of the Lehigh Valley Coal Co.; W. J. Richards, vice-president of the Philadelphia and Reading Coal Co. and W. L. Connell, of Scranton, an independent operator, have been reëlected as representatives of the anthracite operators on the board of conciliation provided for by the anthracite strike commission of 1902.

Effective June 1, 1912, the following changes have been made in the operating department of the Lehigh Valley Coal Co., Wilkes-Barre, Penn.: J. M. Humphrey, formerly division superintendent of the Mahanoy and Shamokin division, with headquarters at Centralia, has been appointed mining engineer, with headquarters at Wilkes-Barre, vice A. B. Jessup, who recently resigned to become general manager of the G. B. Markle & Co. properties at Jeddo. H. J. Heffner, formerly division engineer of the Mahanoy and Shamokin division, has been appointed superintendent of that division, vice J. M. Humphrey, transferred. G. P. Troutman, formerly division engineer of the Lackawanna division, Pittston, Penn., is appointed assistant superintendent and engineer of that division.

Obituary

Frank E. Lukens, secretary of the Illinois and Wisconsin Retail Coal Dealers' Association, committed suicide in the Best Hotel, Chicago, May 27. Threatened governmental investigation of retail fuel associations, which had resulted in the withdrawal of a number of members from the one in which Mr. Lukens was interested, is said to have been the cause of his act, although the organization of this association thoroughly conforms with the law. Mr. Lukens was exceptionally well known in retail coal circles.

Construction News

Marion, Ill.—The Big Muddy Fuel Co. is receiving bids for a washer of from 300 to 500 tons capacity, to be built at their mine north of here.

Big Stone Gap, Va.—C. B. Slemp and others of this section are considering the development of coal property near Hazard, Ky. Among those interested is John C. C. Mayo, of Paintsville, Ky.

Pineville, Ky.—The Moss Coal Co. has leased a tract in Letcher County, near Whitesburg, and will open a mine at once. The mine will be located on the extension of the Lexington & Eastern R.R., which is now being completed.

New London, Conn.—Bids will be received until June 15, by Capt. F. T. Arnold, for constructing, at Fort Terry, N. Y., a coal-handling and storage plant, consisting of frame building with concrete floor and footings, industrial railway, motors, etc.

Whitesburg—The Mineral Development Co., of Philadelphia, has announced plans for the construction of coking plants near the head waters of the Kentucky River, in Letcher County. The plant will be reached by the extension of the Lexington & Eastern R.R.

Brownsville, Penn.—The contract for new construction work at the plant of the Lilley Coal & Coke Co., has been awarded to the Dravo Contracting Co., of Pittsburgh. This contract was erroneously reported as awarded to the Drake & Straton Co., of Pittsburgh.

Birmingham, Ala.—The Central Coal Co. has announced that it will expend about $100,000 in improving its property in the Warrior coal field. The work will include a modern tipple, new electrical equipment, coal-cutting machinery and a system of haulage in the mines. B. F. Roden, Birmingham, is president.

The Woodward Iron Co. has awarded a contract for the construction of a coke bin of about 500 tons capacity.

Chattanooga, Tenn.—The Durham Coal & Iron Co. is negotiating for the purchase of a large body of mineral and timber land in Sequatchie Valley, on the Southern R.R., and will expend $5,000,000 in developing the property and increasing facilities. The land is rich in iron ore, coal and timber. This company plans to erect a large steel mill, several blast furnaces, coke ovens and byproduct plants. The principal industrial plants of the company will be located at Moccasin Bend, all of which land the company recently acquired.

The Chattanooga Coal & Iron Co. contemplates installing a battery of 60 Koppers byproduct coke ovens.

Publications Received

JOURNAL OF THE WESTERN SOCIETY OF ENGINEERS, May, 1912. 95 pp., 6x9 in., illus. 50c. Office of the Society, Chicago.

SUPERHEATED STEAM IN LOCOMOTIVE SERVICE. By W. F. M. Goss. Bulletin No. 57, University of Illinois. 66 pp., 6x9 in., illus. 40c.

The bulletin presents in abridged form information which originally appeared as Bulletin No. 127 of the Carnegie Institute of Washington.

THE USE OF PERMISSIBLE EXPLOSIVES. By J. J. Rutledge and Clarence Hall. Bulletin No. 10, U. S. Bureau of Mines. 34 pp., 6x9 in., illus. Government Printing Office, Washington.

Investigation has shown that one of the commonest causes of disastrous explosions in the coal mines in this country has been blown-out shots of black blasting powder or dynamite. The dangers that attend the use of these explosives were perceived several years ago, and in consequence the attention of powder manufacturers was directed to the production of explosives that would be less liable to ignite inflammable gas or dust. The manufacturers have been so successful in their efforts that it is now possible to obtain explosives which yield much shorter and quicker flames than black blasting powder or dynamite, and hence are much less dangerous to use in fiery or dusty coal mines. An explosive is termed a permissible explosive when it is similar in all respects to a sample that has passed certain tests by the Federal Bureau of Mines.

The bulletin describes the proper methods of using these explosixes with some notes on electric shot firing, undercutting and drilling. The characteristics and advantages of the permissible forms are explained and it is noted that the cost of blasting per ton of coal is only slightly increased by their use if indeed there is any increase at all.

Trade Catalogs

Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y. Booklet. Private Telephone Systems. 24 pp., 3½x6¼ in., illus.

Electric Weighing Co., New York. Bulletin No. 4. Modern Weighing on Conveyors—The Electric Weigher. 20 pp., 6x9 in., illus.

Hyatt Roller Bearing Co., Newark, N. J. Bulletin No. 604E, Hyatt Roller Bearings as Applied to Mine and Industrial Cars. 24 pp, 7x10 in., illus.

Link-Belt Co., Philadelphia and Chicago. Book No. 121. The Ewart Friction Clutch. 16 pp., 6x9, illus. Pamphlet. Link-Belt Locomotive Cranes. 32 pp., 6x9 in., illus.

E. I. Dupont de Nemours Powder Co., Wilmington, Del. Blasting Supplies, pamphlet, 120 pp., 6x9 in., illus. Thawing Dynamite, pamphlet, 24 pp., 6x9 in., illus. Storage for Explosives, pamphlet, 27 pp., 6x9 in., illus. High Explosives, pamphlet, 136 pp., 6x9 in., illus. These publications, in addition to describing and listing the products of the Du Pont company, contain much interesting and valuable information relative to explosives, handling, storing and using the same.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

During the past week the anthracite trade has continued the predominating feature in coal circles. The advance in prices on domestic grades has resulted in much bitter opposition on the part of the consumers, who at some points are forming associations for the purpose of investigating the hard-coal companies, with a view to restraining them from the new increase.

As we predicted, the anthracite advance was confined almost entirely to the domestic grades, it being impossible to increase the steam sizes because of the competition in this trade with the soft-coals. Since it was thus feasible to advance quotations on only a portion of the product, it was necessary to make this unusually heavy, which has excited much unfavorable comment.

In the Eastern market there is considerable soft-coal coming forward, which is being offered at liberal discounts from the nominal prices. Spot business generally is dull, although probably about normal for this period of the year, and the market promises to be slow and heavy for the next two months. The Pittsburgh district reports a heavier demand now than at any time since the suspension; stocks appear to be about worked off, and some operators are producing up to nearly full capacity, the demand from the Lakes being particularly heavy.

In Ohio the Lake demand is the best feature of the trade, and there is some evidence of improvement in the steam sizes, although prices still continue low. Business has eased off in West Virginia, but there has been a heavy movement to the Lakes and the West, and operators are holding firm on prices. Railroad congestions, due to the flood in the Mississippi Valley, has interfered with the movement from Alabama and resulted in a slowing down in production there.

The Middle Western market continues slow and heavy, except Indiana. An agreement between the miners and operators has finally been effected there, which will probably result in at least a temporary heavy production until the district catches up on its orders.

Boston, Mass.

The stand taken by certain of the New River interests in sticking to $2.70, f.o.b. loading port, be the tonnage large or small, is a favorable sign. Until all take this attitude, however, not much improvement can be expected in the price situation. An amount of coal is still coming forward on a liberal discount off the nominal price, and no change is in sight, in that respect. The prediction that June and July were likely to be dull in bituminous need not be changed.

On the Pennsylvania grades it develops that there will still be anthracite transportation available for this market. Hard-coal is coming down so slowly that the roads with floating equipment are bound to be in the soft-coal freighting business to a certain extent, and this will keep outlet open to coals from the Pennsylvania districts and Georges Creek that would ordinarily be served from Hampton Roads.

Anthracite shipments began from Philadelphia the week of May 27, but only in small volume. Some of the collieries are up to but 50 to 60% of normal efficiency. Taking this, together with the reported withdrawal from the tide market of certain of the anthracite companies, and their general inactivity at this time, the Eastern dealer is going to have difficulty in getting his coal.

Wholesale prices are about as follows:

Clearfields, f.o.b. mine	\$1.10 @\$1.35
Somersets, f.o.b mine	1.20 @ 1.35
Clearfield and Somersets, f.o.b. Philadelphia	2.35 @ 2.60
Georges Creek, f.o.b. Baltimore	2.77 @ 2.87
Pocahontas, New River, f.o.b. Hampton Roads	2.70
Pocahontas, New River, f.o.b. cars Providence	3.40 @ 3.50
Pocahontas, New River, f.o.b. cars, Boston	3.40 @ 3.60

New York

Anthracite—Arrivals of hard coal continue to come in slow, and the mines are reported to be working only about 50 to 60 per cent. capacity. No orders are being accepted by the large companies for stove except for July deliveries, and the Nos. 2 and 3 steam grades are short in supply, although there is plenty of the No. 1 available.

Consumers are not buying to the extent that was expected, due probably to the hope that the investigation now being conducted by the merchants' association will result in a reduction in prices on the domestic sizes. The larger companies, however, report an active demand from the dealers, and it is evident that the latter are replenishing their depleted stocks as rapidly as possible in anticipation of an active demand during the fall and winter.

The following are the wholesale f.o.b. quotation, those for the Lackawanna and Wyoming being at the upper ports and the Lehigh and Schuylkill for the lower:

	L.&W.	L.&S.
Broken	\$4.70	\$4.65
Egg and stove	4.95	4.90
Chenstnut	5.20	5.15
Pea	3.50	3.45
Buckwheat	2.75	2.45
Rice	2.25	1.95
Barley	1.75	1.70

Bituminous—Last week is said to have been one of dullest in the history of the soft-coal market here; this is not, however, unusual for this period of the year. On the whole, the trade is holding up as well as could be expected at this time, and indications are for an active business this fall. Supplies are being worked down some and tonnages will probably show some improvement soon, although it is doubtful if there will be any advance in prices. Stocks on hand at South Amboy are quite large, and there are rumors of embargoes being declared there. Same contracts are being closed at an advance over last year's figures.

We continue to quote prevailing wholesale prices as follows, although there is some shading from these:

West Virginia, steam	\$2.35
Ordinary grades, Pennsylvania	2.45
Fair grades, Pennsylvania	2.55@2.65
Good grades, Pennsylvania	2.70@2.80
Best Miller, Pennsylvania	3.00
Georges Creek	3.15

Pittsburgh, Penn.

Bituminous—Manufacturing demand has improved, and is better than at any time since before the suspension of mining. The stocks seem to have been practically all worked off. Shipments in the Lake trade are now very heavy, with a good supply of vessels. Operations in the Pittsburgh district on an average are much heavier than a fortnight ago, having been steadily increasing; the Pittsburgh Coal Co. reports that it is operating up to its capacity. Prices are quoted on the regular season basis, though they are occasionally shaded, particularly on slack: Mine-run and nut, \$1.22½; ¾-in., \$1.32½; 1¼-in., \$1.47½; slack, 82½c. per ton at mine, Pittsburgh district.

Connellsville Coke—Active negotiations continue for furnace coke for second-half delivery, and prices are firm. None of the sellers are asking less than \$2.50, and some more. In exceptional cases, where the buyer is certain of taking deliveries under unfavorable market conditions, the \$2.50 price might be

shaded a trifle. Thus far between 40,000 and 50,000 tons a month have been placed under contract for the second half, at from $2.35 to $2.50, and there remains to be covered probably about 100,000 tons a month. Sales of about 35,000 tons of furnace coke for June delivery have been made at from $2.25 to $2.35, but occasionally $2.25 is shaded for prompt shipment. Foundry coke is somewhat stiffer, particularly on contract. We quote: Prompt furnace, $2.20@2.30; contract furnace, $2.40@2.50; prompt foundry, $2.35@2.50; contract foundry, $2.40@2.75.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending May 18 at 394,316 tons, a decrease of 4640 tons, and shipments at 4194 cars to Pittsburgh, 6467 cars to points west and 1132 cars to points east, a total of 11,793 cars, or a decrease of 149.

Philadelphia, Penn.

Taking the coal trade as a whole, the last week has not been altogether propitious in this locality. It is true that some coal is moving off, notably stove, chestnut and pea sizes, but as for an actual, insistent demand, which, as a rule, characterizes the month in which the lowest prices are announced, it is not present. There is considerable space in the papers devoted to articles about investigations into the advance in prices, and the attendant agitation which it brings about has its effect in causing householders and others to delay making purchases, but it would seem that this is altogether unnecessary, as the raise in prices is only what was to be expected.

The wholesale market is good, particularly at tidewater. It is understood that the companies are well supplied with orders for Eastern and Southern ports, and are only hampered in shipment by the lack of vessel facilities.

Bituminous conditions have not in the least improved, and compare with the very serious setback this branch suffered during last summer. The determination of the anthracite miners to resume work destroyed any hope that may have been felt that conditions would improve, and until stocks of coal, accumulated earlier in the year, are disposed of, there is little to look forward to.

Baltimore, Md.

Although one or two of the larger companies are reporting an active demand, the smaller operators claim that the Baltimore market, so far as they were concerned, is dull. There is only a fair demand for the product, and low prices prevail. Many Baltimore companies depend largely on spot orders, because there is more profit in such sales, and this business has been conspicuous by its absence and with no indications of improving.

Of course, coal is moving under existing contracts, which were placed some time back by companies that consume fuel steadily month in and month out, and it is safe to say that nearly all of the coal in which the local trade is concerned, is moving under contract.

The Consolidation Coal Co. is now operating seven of its new mines opened in the Elkhorn Valley of Kentucky, and the product is being stored to be shipped when the railroad now under construction is completed, which will be in August.

Buffalo, N. Y.

There is no improvement in the demand for bituminous and none is looked for right away, as there is still too much coal in the consumers' hands, bought before or during the early part of the suspension. There are a few consumers getting to the end of their supply, but there are mines starting up and quite likely turning out more coal than the increased consumption demands.

Sometimes there is such a demand for slack at this period of the year that it insures a fair profit for everything, but such is not the case now; the slack market is not nearly as good as during the past two summers. Consumption is at least fair, but there is too much coal; all effort to restrict the production of bituminous fails and there is now no further talk of this.

The price of bituminous coal is weak at former bottom quotations, $2.57½ for Pittsburgh three-quarter, $2.47½ for mine-run and $2.10 for slack, with Allegheny Valley 15 to 25c. lower. Coke is very quiet at former figures, based on $4.25 for best Connellsville foundry.

The movement of anthracite began about May 27, when water tonnage for the upper lakes was first loaded this season. There is complaint that miners are scarce, but 54,000 tons being loaded in four days and this chiefly by a single company. That branch of the business will be very active for the rest of the season and efforts will be made to wipe out the lead of 600,000 tons which last season has over the present one.

Cleveland, Ohio

There has not been any improvement during the past week in the coal business, and only a small amount has been shipped to this market on consignment, which it has been found very difficult to dispose of. Coal has remained on track for a week or more with car service accruing and without any chance of disposing of same. There still seems to be considerable left over from purchases made prior to the strike, and general business in the manufacturing line does not seem to improve to any extent.

There is a very small amount of coal coming forward for the Lake trade. Buyers seem to be holding off in placing contracts, and the few fortunate ones that have made contracts cannot run their mines to full capacity on account of the lack of men.

Columbus, Ohio

The coal trade in Ohio during the past week was rather active, despite the fact that a holiday broke in and curtailed production to a certain extent. With the exception of domestic grades, there was a considerable production in most of the Ohio fields and the outlook for the future is considered good. While prices are still low and will probably remain so for some time, improvement in that direction can be expected toward the latter part of the summer.

There is some activity in steam grades, due to the fact that certain manufacturing establishments still have a surplus interfering with new orders. Business generally is fair and the requirements for steam purposes are good, although the movement is not large. There is some renewing of steam contracts at the price prevailing last season, plus the added cost of mining.

Considerable interest has been directed toward certain railroad contracts which will be awarded within the next week or 10 days. A number of the larger producers are strong after these contracts, which are among the largest in this section. Among the contracts to be let are the New York Central, the Ann Arbor and the Piere Marquette.

Prices which prevail in Ohio are as follows:

Hocking Valley	
Domestic lump	$1.50
¾-in	1.35
Nut	1.15
Mine-run	1.15
Nut, pea and slack	0.75
Coarse slack	0.65
Pittsburgh No. 8	
Mine-run	1.10
¾-in	1.20
Coarse slack	0.70
Pomeroy Bend	
Domestic lump	$1.50
¾-in	1.35
Nut	1.20
Mine-run	1.15
Nut, pea and slack	0.75
Coarse slack	0.50
Kanawha	
Domestic lump	1.50
¾-in	1.30
Nut	1.15
Mine-run	1.10
Nut, pea and slack	0.75
Coarse slack	0.65

Hampton Roads, Va.

There has been little activity at Hampton Roads during the past week. Shipments from the mines have been light, thus keeping down the stock of coal at the three piers; a heavy tonnage has been moving West and to the Lakes.

Some interest was aroused by the arrival of the German fleet, Thursday morning, the interest reaching an acute stage when it was learned that the coal for the

three vessels constituting the fleet would not be furnished by local shippers. No better steamship fuel can be obtained at any port in the country than that furnished by the Hampton Roads shippers, who were confidently relying on bunkering the German fleet.

Dumping figures for the month of May do not show up as well as the previous month; in fact, this could not be hoped for. The Norfolk & Western piers again lead with 523,071 tons (over two million tons having been loaded on that line during May, the highest figure ever reached by them); Chesapeake & Ohio Ry., 370,055; and the Virginian Ry., 189,689, the later piers dumping some thirty odd thousand tons more than in April in spite of the general decrease in dumping.

Charleston, W. Va.

Conditions remain good in West Virginia, especially in the southern and central districts. As yet there has been no letup in the supply of cars, but operators fear a change in this respect. More mines are in operation this week than there were last week. A number of the operations owned by the Paint Creek Collieries Co., employing about 1500 men, which have been idle since shortly after the first of April, are now in operation, but only a small number of men are at work. The mines are being operated by nonunion men.

Lake shipments, while heavy, are giving the shippers some concern, owing to the congested conditions both at the Lakes and along the Hocking Valley road, extending into the mining region in the Kanawha district. Lake shipments have moved with considerable speed, due to the abundant motive power.

Prices have been fair, the expected falling off, usual at this time of year, having not materialized and no drop is anticipated in the immediate future.

Birmingham, Ala.

The past week has developed a dull market for Alabama coal and the prospects are not considered so bright as they appeared some days ago. Coal operators have failed to show a firm front and as much as 10c. off per ton has been quoted during the week.

The extremely warm weather which has prevailed during the past week is considered an important factor. It is also probable that the shutting off of shipments to Mississippi River points and the West by the flood resulted in a temporary congestion and surplus, which, it is hoped, will be overcome as normal conditions return.

All of the mines are operating full time with the exception of a few of the smaller ones, which have lost a day or two during the past week. Some of the operators are even complaining of a difficulty in getting sufficient mine labor. The iron-furnace companies that engage in coal mining are demanding labor more than others. The coke market is feeling the dull period but prices are maintaining a fair front.

Nashville, Tenn.

We are having our usual period of summer dullness in this field. In fact, it is duller than usual, which is strange in view of the fact that the Indiana miners have not returned to work, and the union fields of western Kentucky have only been at work two weeks. This clearly indicates what has been felt for some time—that there is a vast over-production of coal in our section.

Though there is no business at any price, and some of the operators have gone down to their usual cost of production quotations, the majority are not trying to create a demand. They know that it does not exist at low prices and are using their best efforts to keep quotations up so as to enable them to obtain better prices for their product after Aug. 1. It remains to be seen whether or not this can be accomplished.

There is no demand for lump at any price and mine-run is being offered from 75@85c., nut $1.10@1.25, and 1⅛-in. screenings 40@50 cents.

Indianapolis, Ind.

The resumption of coal mining in Indiana, after a suspension of two months, during which time numerous meetings and conferences were held without avail, is hailed with delight by the miners, operators and the country in general.

The Indiana mines all resumed work Monday, June 3, under a new wage scale with a slight advance, and it is believed there will be work enough for every miner in the state. Orders have been piling up at the mines, and if the railroads handle the product, some large outputs will be made.

There is a difference of opinion among the retail dealers relative to an advance of 25c. a ton on coal. Some of the dealers say it would be an outrage at a time of general unrest and discontent, due largely to the cost of living and the unprecedented long and cold winter.

Chicago

The price of anthracite advanced 25c. a ton June 1. No open antagonism has been shown, so far as the increase is concerned, but the buyers believe it a wise policy to await the outcome of the fight begun by Eastern retailers against the advance.

With the opening of the Indiana mines, Illinois operators are now preparing to fix the price on several large contracts, which will have an exceptionally important bearing on bituminous prices generally. Screenings are scarce, current prices ranging all the way from $1 at the mines to $1.10 for spot coal. Smokeless coal has not been abundant on the spot market and prices are firm.

Prevailing prices at Chicago are:

Sullivan County	
4-in. lump	$2.47
Egg	2.37
Steam lump	2.99½
Screenings	1.87@1.97
Springfield	
Domestic lump	$2.32
Steam lump	2.07
Mine-run	1.97
Screenings	1.97
Clinton	
Domestic lump	$2.27
Steam lump	2.12
Mine-run	1.92
Screenings	1.77@1.87
Pocahontas and New River	
Mine-run	$3.15
Lump and egg	3.55

Coke—Prices asked for coke are: Connellsville and Wise County, $4.75; byproduct, egg and stove, $4.65; byproduct, nut, $4.55; gas-house, $4.75.

Minneapolis—St. Paul

The coal trade in the Twin Cities has shown very little activity during the past 10 days. Coal men cannot figure out why the market is not stronger than it now is with Indiana not working, and only about 50 per cent. of Illinois mines in operation. Coal is coming up to the head of Lakes slower than usual and with these conditions there should be a better market.

Should but 75 per cent. of the crop prospects materialize it will create a condition with which the transportation companies will find it a physical impossibility to cope with. A number of railroads in this territory are already beginning to call in their rolling stock.

Coal men report some steam business but say that contracts are being closed at extremely low prices, a number being let at $3.25 for Youghiogheny, and it is rumored the price is as low as $3 at the head of the Lakes. Prices are out for June 1 on hard-coal on the basis of $7 for nut; $6.75 for stove and egg, and $5.75 for pea sizes.

St. Louis, Mo.

The market in St. Louis is intensely dull. There is no demand for coal and the only business in sight is the few contracts that are being let.

There is one order in St. Louis that calls for 200 tons of mine-run coal per day. Destination weights govern settlement, and in the past it is understood this contract brought $1.05 on a mine basis for a mine-run coal. The contract has not been awarded as yet, but some of the bidders have quoted as low as $1.02½ it is rumored; yet they claim that it costs them from 12c. to 15c. per ton more to produce coal this year than last.

The storage stocks around St. Louis are being cleaned up, and it is likely that there will be a small demand for steam coal about June 15. Illinois mines are

gradually resuming, but all the operators claim they are working at a loss. The prevailing prices are:

Carterville	
Lump and egg	$1.25@1.35
Nut	1.20@1.30
Mine-run	1.05@1.15
Screenings	1.05@1.10

Franklin county coal prices rule about 10c. higher than the above.

Mount Olive	
2-in. lump	$1.25
2-in. screenings	1.05
Standard	
2-in. lump	$0.85@0.90
2-in. screenings	0.85@0.94
1x2 nut	0.85@0.90
Mine-run	0.85@0.94

A heavy tonnage of anthracite orders was placed the past week, stove leading the others. The market for June, St. Louis, is: Chestnut, $7.15; egg and stove, $6.90; grate, $6.65. There is very little coke moving forward.

Portland, Ore.

There is absolutely no change in the coal situation here; the market is dull and little is expected till people begin putting in supplies for next winter. This movement will probably begin next month. The Consumers' Coal Co. is a new concern doing business here, selling wholesale and retail, and it deals principally in Wellington coal.

Freights from Australia are very high this year, and it is doubtful if there will be much coal imported early in the season from that source unless charter rates show a material reduction. This is not considered likely, however, unless ship owners find very remunerative business out of the Northwest when the wheat begins to move.

Production and Transportation Statistics

The Virginian Ry.

Total shipments of coal over this road for April of the current year amounted to 280,995 short tons.

The Car Situation

The ending of the strike among the miners in the anthracite district brought about a sharp reduction in the number of idle cars reported by the American Railway Association as of May 23. The total net surplus on that date was 116,-201, as compared with 130,008 reported two weeks earlier.

The following table shows the surplus and shortages of cars on 163 roads on May 23 last:

	Surplus	Short	Net Surplus
Box	23,298	2,918	20,380
Flat	4,053	1,618	2,435
Coal, gond. and hopper	71,068	2,649	68,419
Other kinds	25,264	297	24,967
Total	123,683	7,482	116,201

Pennsylvania Railroad

Statement of coal and coke carried on the P. R.R. Co.'s lines east of Pittsburgh and Erie during April and the first four months with the increase or decrease over the same period last year, in short tons:

	April	4 mos.	Difference
Anthracite	290,865	3,579,602	— 587,210
Bituminous	3,291,985	15,461,920	+2,157,985
Coke	1,079,046	4,190,832	+ 550,958
Total	4,661,896	23,232,354	+2,121,733

Baltimore & Ohio R.R.

The following is a statement of the coal and coke tonnage moved over the B. & O. and affiliated lines during the month of April, 1912, as compared with the corresponding month of the previous year:

	1911	1912
Coal	2,053,085	2,122,285
Coke	337,183	390,228
Total	2,390,268	2,512,513

Coal Exports

According to figures just issued by the Department of Commerce and Labor, Bureau of Statistics, our coal exports rank eighth in importance, for the ten months ending with April of this year. The following is the value of our export trade in millions of dollars:

Raw cotton	585
Iron and steel manufacture	260
Meat and dairy products	160
Breadstuffs	135
Copper	110
Mineral oil	100
Lumber, etc	90
Coal	50

Norfolk & Western Ry.

The following is a comparative statement of the coal and coke shipments over the lines of the N. & W. Ry. for the months of April, 1911-12, in short tons:

Destination	1911	1912
Coal		
Tidewater, foreign	90,562	223,220
Tidewater, coastwise	212,279	313,076
Domestic	1,063,887	1,325,259
Coke		
Tidewater, foreign	8,132	7,744
Domestic	138,997	108,601
Total	1,513,857	1,979,900

Foreign Markets

Great Britain

A better inquiry has set in, and the market shows signs of improvement for June shipments. Prices are approximately as follows:

Best Welsh steam coal	$4.38
Seconds	4.20
Thirds	3.90
Best dry coals	4.26
Best Monmouthshire	3.84
Seconds	3.66
Best Cardiff small coal	2.42
Seconds	2.38

The prices for Cardiff coals are f.o.b. Cardiff, Penarth, or Barry, while those for Monmouthshire descriptions are f.o.b. Newport; both exclusive of wharfage, and for cash in 30 days, less 2½ per cent.

Spanish Imports

Spanish imports for the three months ended March 31, chiefly from Great Britain were as follows in metric tons:

	1911	1912
Coal	473,539	614,593
Coke	83,156	108,669

The Chinese Market

There has been another quiet fortnight on this market and although a few small contracts have been concluded there is very little demand locally and only small inquiry: forward, there is, however, a better feeling among native dealers and banking facilities are now easier, but money is still very tight. Prices are steady but freights are ruling high and are likely to remain so for some time.

Manchurian Coal—Stocks continue to decrease owing to the scarcity of tonnage.

Kaiping Coal—The usual deliveries have been made under contracts but there is not much new business to export. Prices remain steady and firm.

Financial Notes

Consolidation Coal Co.—Operating expenses of this company for **1911** were $8,467,662, as compared with $9,186,013 for the year 1910. Plant depreciation for 1911 was $221,618, as compared with $251,410 for 1910.

American Coal Products Co.—The $1,250,000, 5% serial gold coupon notes of 1910 of this company have been called for redemption and will be paid by the Guaranty Trust Co., of New York, at par and interest on presentation on or before June 1.

The Delaware & Hudson Co.—From the sale of $7,000,000 additional first and refunding mortgage gold bonds mentioned in last year's report, this company realized $6,825,000; the discount of $175,-000 was charged to profit and loss. The floating debt was decreased $3,594,320 during 1911.

Colorado Fuel & Iron Co.—Earnings of this company for the first eight months of the present fiscal year are about $126,000 in excess of those for the corresponding period of 1911, and indications are that the surplus for the year ending June 30 will approximate $1,500,000. This will be a substantial improvement over last year's surplus of $1,260,000.

Alabama Consolidated Coal & Iron Co.—The interest on the $2,084,000 consolidated 5's due May 1 has been defaulted. President Hoagley explains that, after consultation with Harvey Fisk & Son, who are managers of the syndicate which will underwrite the new securities to be issued under the plan of merger with the Southern Iron & Steel Co., it has been decided to take advantage of the clause which gives the company 12 months in which to meet interest before foreclosure proceedings can be brought.

Woodward Iron Co.—On the basis of past years this new corporation should start by earning annually at least $1,000,-000, which will be sufficient to meet all charges of dividend requirements. A sinking fund, commencing 1917, is provided on the basis of 3c. for every ton of coal mined with a minimum for each year for ½ of 1% on the total principal amount of bonds outstanding. It is further provided that after 1939 the minimum shall be increased sufficiently to retire the remaining bonds at or before maturity.

Index of Coal Literature

Monthly list of the world's best articles on coal and coal mining

The following is a list of abbreviations used below:
A.E.G.-Ztg. = A.E.G.-Zeitung.
Am. Lab. Legis. Rev. = American Labor Legislation Revue.
Ann. Mines = Annales des Mines.
Ann. Mines Belgique = Annales des Mines de Belgique.
Austral. Min. Stand. = Australian Mining Standard.
Berg-Huttenmänn. Rdsch. = Berg- und Huttenmännische Rundschau.
Bull. Am. Inst. Min. Eng. = Bulletin American Institute of Mining Engineers.
Can. Eng. = Canadian Engineer.
Can. Min. Jl. = Canadian Mining Journal.
Chem. Eng. = Chemical Engineer.
Coll. Guard. = Colliery Guardian.
Comp.-Air Mag. = Compressed Air Magazine.
Compt. Rendus Acad. Sc. = Comptes Rendus de l'Académie des Sciences.
El. Eng. = Electrical Engineering.
El. Jl. = Electrical Journal.
El. Kraftbetr. = Electrische Kraftbetriebe und Bahnen.
Eng. Contract. = Engineering Contractor.
Eng. Min. Jl. = Engineering and Mining Journal.
Eng. News. = Engineering News.
Fördertechnik = Die Fördertechnik.
Geol. Mag. = Geological Magazine.
Handel und Ind. = Handel und Industrie.
Int. Mar. Eng. = International Marine Engineering.
Inst. Min. Metal. = Institute of Mining and Metallurgy.
Int. Volkswirt = Internationaler Volkswirt.
Iron Coal Trades Rev. = Iron and Coal Trades Review.
Jl. Soc. Chem. Ind. = Journal of the Society of Chemical Industry.
Jl. Ind. Engin. Chem. = Journal of Industrial and Engineering Chemistry.
Jl. Royal Soc. Arts = Journal of the Royal Society of Arts.
Jl. S. Afr. Inst. Eng. = Journal of the South African Institute of Engineers.
Kohle Erz = Kohle und Erz.
Lumière El. = Lumière Electrique.
Min. Eng. = Mining Engineer.
Mines Minerals = Mines and Minerals.
Min. Sc. Press = Mining and Scientific Press.
Min. World Eng. Rec. = Mining World and Engineering Record.
Mon. Ind. Gaz = Moniteur de l'Industrie du Gazet de l'Electricité.
Montan. Rdsch. = Montanistische Rundschau.
Oesterr. Z. Berg- Huttenwes. = Oesterreichische Zeitschrift fur Berg und Hüttenwesen.
Portefeuille Econ. Machines = Portefeuille économique des machines.
Proc. Acad. Pol. Sc. N. Y. = Proceedings of Academy of Political Science, New York.
Proc. Am. Inst. El. Eng. = Proceedings of American Institute of Electrical Engineers.
Proc. S. Wales Inst. Eng. = Proceedings of South Wales Institute of Engineers.
Rev. Noire = Revue Noire.
Rev. Univ. Mines = Revue Universelle des Mines.
Saarbrucker Berg. Kal. = Saarbrucker Bergmanns Kalendar.
S. Afr. Min. Jl. = South African Mining Journal.
Soz.-Technik = Sozial-Technik.
Stahl Eisen = Stahl und Eisen.
Stein-Braunkohle = Stein und Braunkohle.
Tech. Rdsch. = Technische Rundschau.
Techn. Wirtsch = Technik und Wirtschaft.
Tekn. Tidskrift = Teknisk Tidskrift.
Trans. Inst. Min. Eng. = Transactions Institute of Mining Engineers.
Trans. Min. Inst. Scot. = Transactions of Mining Institute of Scotland.
Trans. Inst. Min. Eng. = Transactions of the Institute of Mining Engineers.
Trans. Manchester Geol. Min. Soc. = Transactions of the Manchester Geological and Mining Society.
Ung. Mont. Ind. = Ungarische Montanindustrie und Handelszeitung.
Z. Dampfkessel-Betr = Zeitschrift für Dampfkessel und Maschinenbetrieb.
Z. El. Mach. = Zeitschrift fur Elektrotechnik und Maschinenbau.

Note: We shall be glad to obtain for readers, where possible, copies of the papers referred to.

I—GENERAL

Coal Prices and Cost of Haulage. (Kohlenpreise und Foerderkosten.) Seidl, Techn. Wirtsch., 1912, 1, pp. 47-58, 3 tab. (Research into the causes of the doubling of coal prices in all German districts between 1880 and 1909.)

The World's Coal Supplies and Consumption. Economist, 1912, pp. 111-2.

The World's Coal Production in 1911. (Kohlenproduktion der Welt im Jahre 1911.) Nachr. Handel., 1912, 22, p. 4.

The Coal Resources of Great Britain. G. T. Beilby, Coll. Guard., Vol. 103, 2675, pp. 681-2.

The Coal Deposits of Germany. F. Frech, Engineering, Vol. 93, 2414, pp. 462-3.

Canadian Coal Fields. Coll. Guard., Vol. 103, Sp. Canad. Issue, April, 1912, pp. 1-34, 24 fig., 4 tab. (Canada is destined to become one of the most important coal producing countries in the world and the Canadian government has determined to intelligently husband these enormous resources.)

The Sheridan, Wyo., Coal Field. J. Simmons, Coal Age, Vol. 1, 27, pp. 866-8, 4 fig. (A description of one of the largest producing fields in the west. The coal is classed as sub-bituminous and there are numerous seams of more than ordinary thickness.)

The Sheridan, Wyo., Coal Field. J. Simmons, Coal Age, Vol. 1, 29, pp. 932-4, 4 fig. (The Carney Coal Co. has a mine with a capacity of 4,000 tons per 8-hr. shift. A detailed account of the plant is given with some notes on the Acme Coal Co's. properties.)

1911 Bituminous Mining Law of Pennsylvania. Mines Minerals, Vol. 32, 9, pp. 526-8. (Analysis of those portions of the law which will increase the cost of mining. The sections of the new law are taken up consecutively and compared with the corresponding provisions of the law of 1893.)

The popular Election of Mine Inspectors. J. T. Beard, Coal Age, Vol. 1, 28, pp. 903-5, 2 tab. (Conditions leading to the first coal mining laws enacted in the United States. The inspectors' election by popular vote law, its effect on inspectors; examinations for mine foremen; how the law affects the miners.)

Canadian Coal Mining Laws. Coll. Guard., Vol. 103, 2678, p. 835. (The Dominion and Provincial laws and regulations betray a confusing variety. A complete list is given as far as ascertainable.)

Mine Registration and Checking. A. W. Davidson, Coal Age, Vol. 1, 29, pp. 934-6. (At the Coleman mine of the International Coal and Coke Co.)

On the State of the Question of Renewing the Coal Syndicate. (Der Stand der Erneuerungsfrage des Kohlensyndikates.) Int. Volkswirt, Vol. 22, 2, pp. 17-8.

The Prussian Mining Administration and the Rhenish-Westphalian Coal Syndicate. (Der preussische Bergfiskus und das Rheinisch-Westfaelisch Kohlen Syndikat.) Handel u. Ind., Feb. 10, 1912, p. 147-8.

Mine Management Diagram. Edwin Ludlow, Mines Minerals, Vol. 32, 7, p. 411, 1 fig.

The National Insurance Act, 1911, as it affects employers and workmen. F. S. Foley, 8vo., 62 pp. Sherratt & H., London.

The National Insurance Act. O. Clarke, 1911, 8vo., $8\frac{3}{4}$x$5\frac{1}{2}$ in., 490 pp., Butterworth, London.

Insurance of Mine Officials in the Ruhr District and the Insurance Law for Employes. (Die Grubenbeamtenversicherung im Ruhrkohlenbergbau und das Versicherungsgesetz fuer Angestellte.) F. Bertrams, Glückauf, 1912, 9, pp. 358-63; 10, pp. 399-404.

Miner's Pension Fund. Proposed Legislation. (Les retraites des Mineurs. Proposition de loi.) Rev. Noire, Vol. 15, 1912, 381, pp. 78-9; 383, pp. 99-100. (National pension fund for miners.)

Workmen's Liability Insurance. C. O. Bartlett, Mines Minerals, Vol. 32, 7, p. 412. (The cost, and who shall pay it—relative dangers of the different industries.)

Utilizing Unmined Coal for the Production of Gas. A. G. Betts, Journal Gas Light, Vol. 118, 2552, pp. 95-6, 5 fig. (The article contains a full description of an American patent taken out in 1909 to utilize coal seams too thin or too poor to be worth working.)

The Valuation of Mineral Properties. T. A. Donahue, Coll. Guard., Vol. 103, 2670, pp. 423-4. (The valuation of deferred production of mineral estates and a consideration of the applicable rate of interest upon which to calculate.)

II—GEOLOGY

The Klip River Coal Field. Natal, S. Afr. Engin., Vol. 17, 1., pp 1-2, 2 profiles. (A general idea of the geological structure of the coal field, principally the results of surface observations.)

III—MINING TECHNOLOGY

A Hydro-Pneumatic Rock Drilling Machine. (En hydropneumatisk Bergborrmaskin.) G. E. Gjuke. Bihanf till Jernkontorets Ann., 1912, 2 pp., 112-23, 4 fig.

IV—WORKING OF MINERALS

The Roden Coal Co's. Plant in Alabama. C. A. Tupper, Coal Age, Vol. 1, 25, pp. 800-3, 3 fig. (A carefully designed and equipped plant in which no expense has been spared to bring the working costs to a minimum.)

The Dewar, Oklahoma, Coal Field. J. A. Garcia, Coal Age, Vol. 1, 28, pp. 898-9, 2 fig. (The Dewar field is an excellent example, on a small scale, of the benefits derived from consolidating the individual operators.)

Engineering Requirements in Bituminous Coal Mining. W. E. Fohl, Proc. Engin. Soc. West Penn., Vol. 27, 9, pp. 503-54, 1 fig. (Deals with engineering difficulties in the mine—mechanical, operative and human.)

Method of Mining Coal. William Griffith, Mines Minerals, Vol. 32, 7, pp. 402-3, 6 ill. (Filling rooms by blasting floor up and roof down to occupy the worked out spaces.)

Mining Methods in Illinois. M. F. Peltier, Coal Age, Vol. 1, 23, pp. 732-5, 2 fig., 1 map. (A general description of one of the most important fields in Illinois.)

The Coal Fields of British Columbia. R. R. Hedley, Can. Min. Jl., Vol. 33, 6, pp. 207-9.

Silesian Mining Methods. B. C. Gullachsen, Coal Age, Vol. 1, 26, pp. 844-5, 7 fig. (In northern Silesia, the coal of the thick seams is developed by narrow stall workings driven in the lower benches of the bed. Final recovery is affected by retreating panel methods, the whole bed being extracted.)

V—BORING, SHAFT SINKING AND TUNNELLING

Recent Practice in Diamond Drilling and Borehole Surveying. J. I. Hoffman, Inst. Min. Metall., Bull. 91, pp. 1-11, 6 fig., 1 pl., 3 folders.

Studies and Experiments on the Freezing Method. (Studien und Versuche über das Gefrierverfahren.) W. Walbrecker, Diss. Lex., 21. Essen Ruhr., W. Girardet, 1912.

The Rogers Drop Shaft, Iron River, Mich. P. B. McDonald, Min. Sci. Press., Vol. 103, 27, pp. 831-3, 9 fig. (Surface equipment and construction of a concrete drop shaft under compressed air to a depth of 140 ft.)

Shaft Bottom at the Arenberg Mine. Mines Minerals, Vol. 32, 7, pp. 413, 1 fig.

Sheet Steel Piling for Sinking Shafts. Coll. Guard., Vol. 103, 2676, pp. 734-5, 4 fig. (The installation at Hatfield Main Colliery is described and illustrated.)

Ferro-Concrete Work at Harrington Collieries. Iron Coal Rev., Vol. 84, 2302, pp. 572-3, 8 fig. (The work includes the creepers at the pit bottom, the cage framing, cages, headgear, slack conveyor, banking house and gantries.)

VI—BLASTING, EXPLOSIVES

Recent Developments in Explosives. A. E. Anderson, Eng. Min. Jl., Vol. 93, 5, pp. 270-3. (The recent development of mining explosives made from nitroglycerine, with or without nitrate of ammonia.)

Electricity in Connection with Explosives. K. Scott, Iron Coal Trades Review, Vol. 84, 2291, pp. 132-4. (Ammonium nitrate the basis of the safest explosives; nitrogen from the atmosphere, dicyandiamide as a reducer of temperature of explosions.)

Queensland Mine Regulations for Explosives. Austral. Min. Stand., Vol. 47, 1218, pp. 242. (The compulsory appointment of a qualified shot-firer with written credentials; detailed instructions as to shot-firing, and the handling and storing of explosives.)

VII—TIMBERING, PACKING, ETC.

Mine Timbering. R. B. Woodworth, Coal Age, Vol. 1, 25, pp. 809-11, 11 fig., 2 tab., 27, pp. 873-5, 3 fig. (The use of steel in the proper forms for certain classes of work, general methods of design, and cost of manufacture and installation.)

VIII—WINDING AND HAULAGE

Electric Haulages in Mines. W. C. Mountain, Iron Coal Trades Rev., Vol. 84, 2296, pp. 334-8, 11 fig. (An explanation of the different types of haulage used underground in collieries, given in a paper read before the N. Eng. Assoc., Min. El. Eng.)

Results of the Prussian Statistics of Winding Ropes for the Year 1910. (Ergebnisse der preussischen Statistiken der Schachtfoerderseile fuer das Jahr, 1910.) Fr. Herbst, Glückauf, 1912, 9, pp. 333-46; 10, pp. 424-7, 41 fig. (Protective effect of greasing and galvanizing. Influence of deflection. Tensile strength; results with strands of triangular section. Coefficient of safety.)

Large Winding Engines for South India. S. Afr. Min. Jl., Vol. 9, 2, pp. 727-8. (Engines to wind from a shaft 3700 ft. deep at 3000 ft. per min., an unbalanced load of 15.5 tons, developing 5,000 h.p.)

The Walker Overwinding-Prevention Gear. J. Paul, Trans. Min. Inst. Scot., Vol. 34, 2, pp. 56-60, 1 fold plate (An apparatus which first sounds an alarm bell and then automatically applies the brake, shuts off steam and centers the reversing gear, as fitted at the Mary Pit of the Lochgelly Iron & Coal Co., Ltd., on the cage winding gear.)

Prevention of Overwinding. Iron Coal Trades Rev., Vol. 84, 2302, pp. 561-4, 8 fig. (A description of the Visor controller and some practical experiences in its working.)

IX—LIGHTING

Portable Electric Lamps for Miners. Coal Age, Vol. 1, 26, pp. 836-7, 3 fig. (Electric lamps, worn by the mine worker, and giving a reliable light continuously for more than 12 hrs., are being introduced in a number of collieries.)

Miners' Safety Lamp Electrically Lighted. J. Prestwich, Iron Coal Trades Rev., Vol. 84, 2296, pp. 351, 3 fig.

The Safety Lamp: Its Use and Abuse. G. H. Winstanley, Min. Engin., Vol. 16, 214, pp. 32-3. (A lecture upon the scientific use of the safety lamp as an instrument for the detection of inflammable gases.)

Electrical Lighting of Mines. W. M. Thornton, Coll. Guard., Vol. 103, 2676, pp. 733-4. (The use and advantages of metallic filament lamps in mine service.)

X—VENTILATION

Overcasts with Light Walls. A. A. Steel, Mines Minerals, Vol. 32, 9, pp. 515-6, 2 fig., 1 tab.

Measuring Low Pressure Air. G. S. Weymouth, Min. Sci. Press., Vol. 104, 16, pp. 562-3, 2 fig. 1 tab. (A method for measuring small quantities of air at low pressure by means of a simple apparatus suitable for actual working conditions.)

XI—MINE GASES, TESTING

Testing for Firedamp and Blackdamp by Means of a Safety Lamp. H. Briggs, Trans. Inst. Min. Engin., Vol. 43, 1, pp. 64-79, 4 fig.

A Carbonic Oxide Detector. (Detektor na kyslicnik uhelnaty.) R. Nowicki, Hor. a hut. list, Vol. 12, 11, p. 161, 1 ill. (A small pocket apparatus with which the presence of carbon monoxide in the air down to 0.1 per cent may be detected, by means of a palladium chloride paper.)

XII—COAL DUST

Some phases of the Coal-Dust Question. W. Galloway, Proc. S. Wales Inst. Eng., Vol. 28, 1, pp. 6-35, 2 fig., 2 plates. (Early experiments and recent continental and American developments.)

Reduction, Control and Collection of Coal Dust in Mines. S. Mavor, Trans. Inst. Min. Eng., Vol. 42-3, pp. 496-556, 2 fig., 2 tab.

The prevention of Coal Dust Explosions. J. Hargar, Iron Coal Trades Rev., Vol. 84, 2296, pp. 332-3. (A discussion of the subject before the Manchester Geol. Min. Soc. mainly as to the advisability of reducing the oxygen in the ventilating air supply.)

Notes on Some Coal Dust Explosion Problems. J. Ashworth, S. Wales Inst. Eng., Vol. 27, 7, pp. 720-32, 1 fig., 4 plates. (Neither a stone-dust nor a watered zone restrains a detonative effect under experiment; there is therefore no known means of controlling the extent of an explosion.)

XIII—EXPLOSIONS

Causes and Prevention of Coal Mine Explosions. E. K. Judd, School Mines Qrtly., Vol. 33, 1, pp. 65-71. (A discussion of the most satisfactory method of robbing coal dust of its dangers.)

Bignall Hill Colliery Explosion. R. A. S. Redmayne, Coll. Guard., Vol. 103, 2679, pp. 881-4, 3 fig. (A report on the gob fire at Bignall Hill presented to the Home Department and dealing with the whole subject of gob fires in mines.)

The Susie, Wyoming, Explosion. C. S. Beach, Coal Age, Vol. 1, 28, pp. 908-9, 1 fig. (The article treats of the cause and effect of the explosion and ascribes the accident to the carelessness of some of the miners.)

Lessons from Recent Mine Disasters. J. A. Holmes, Mines Minerals, Vol. 32, 9, pp. 524-6. (A criticism of the destructive economic conditions which lead to loss of life and waste of resources in the United States.)

Cross Mountain Mine Explosion. Mines Minerals, Vol. 32, 7, pp. 393-7, 1 fig., 4 ill. (The mine, its ventilation plan, the effects of the explosion, and the recovery work.)

XIV—MINE FIRES

The Giroux Mine Fire. H. H. Sanderson, Mines Minerals, Vol. 32, 7, pp. 435-6, 1 fig (Facts in regard to its occurrence and the methods of recovering after the fire.)

Gob fires in the South Yorkshire Coal Fields. W H. Pickering, Min. Eng., Vol. 15, 212, pp. 303-4 (Their causes and remedies; methods of working the seams, gob fires most usual at the edge of shaft pillars, or where wall or timber is left in the goaf.)

Air Mattresses for Confining Mine Fires. C Scholz, Comp.-Air. Mag., Vol. 17, 4, pp 6495-6, 1 fig (A pneumatic curtain is described which is used in the Consolidated Indian coal mines, U. S. A. In some gaseous mines, square air mattresses, blown up by hand air pump, are utilized to make a first stopping of the air circulation; the fans then being reversed the smoke drawn back into the fire which is thereby quenched.)

XV—RESCUE AND AMBULANCE

Accidents in Anthracite Coal Mines F. L. Hoffman, Coal Age, Vol. 1, 29, pp. 940-2, 6 tab. (Tables are given showing the number of persons killed and injured and the nature of the accidents occurring in each inspection district of the Pennsylvania anthracite region from 1906-10.)

A Motor Car for Mine Rescue Work. F. C. Perkins, Mines Minerals, Vo.l 32, 9, p. 517, 1 fig.

XVI—DRAINAGE, PUMPING, ETC.

Mine Drainage. (Bergmaennische Wasserwirtschaft.) Kegel, 8vo, 9, 211 pp., 205 ill. Halle, W. Knapp, 1912.

Unwatering Tresavean Mine, Cornwall. C. Barckenbury, Mines Minerals, Vol. 32, 9, pp. 566-70, 4 fig. (The unwatering, after 150 years' abandonment, has been successfully accomplished by means of electric high-lift turbine pumps, down to below the 248 fathom level beneath adit.)

Water Purification for Collieries. Coal Age, Vol. 1, 25, pp. 804-6, 6 fig. (The article treats of water purifying processes and apparatus, necessitated by the increasing demand for colliery bathing facilities and larger central station power plants.)

XVII—PREPARATION

Coal Washing at Lahousoge. D. A. Willey, Mines Minerals, Vol. 32, 7, pp. 391-2, 1 ill.

XVIII—COKE OVENS

Device for Extinguishing, Drying and Storing Coke. (Dispositif pour l'extinction, le séchage, et l'emmagasinage du coke de la Société d'Eclairage, Chauffage et Force Motrice.) Rev. Noire., Vol. 15, 1912, 383, p. 102, 2 fig.

Coke Oven Tars of the United States. P. Hubbard, Chem. Engin., Vol. 15, 3, pp. 92-6, 3 tab. (An analytical study of the properties of coke oven tars of the United States; a list of analysis is given of the crude tar production of 26 manufacturers.)

The Jamison Coke Plants, Greensburg. R. D. Hall, Coal Age, Vol. 1, 29, pp. 936-9, 6 fig., 1 tab. (The plants described make only 72 and 96 hour coke. The ovens supply waste gas to two boiler plants. The coke made is superior to the ordinary beehive coke, being free from black butts and a trifle lower in sulphur.)

Extensive Use of Coke Oven Gas. C. A. Tupper, Coal Age, Vol. 1, 26, pp. 832-5, 5 fig. (The article is intended to give some idea of the extent to which coke oven gas is used in combustion engines for the generation of power, and the great number of plants so operated in Europe.)

Byproduct Coke Ovens in America. F. E. Lucas, Mines Minerals, Vol. 32, 9, pp. 530-1.

XIX—FUEL TESTING

Mount Mulligan Coal Deposits, Queensland, for Coke Making and Coal Supplies. C. F. V. Jackson, Austral. Min. Stand., Vol. 47, 1211, pp. 76-7. (The coke tests were carried out in a small beehive oven and the boiler tests in a water tube boiler.)

Experiments on the Conservation of Coal by Storing under Water. (Liegen Erfahrungen oder Versuchsergebnisse über Konservierung von Kohlen under Wasser vor.) Z. Dampfkessel-Betr., 1912, 5, pp. 49-53, 3 fig., 1 tab. (By storing in the open air for 12 months there resulted a small reduction of heating value. By storing under water there is no loss of heating value, nor is there any change in the quality of coal.)

Fuels, their Testing and Combustion. (Unsere Brennmaterialien, ihre Untersuchung und ihre Verbrennung.) H. Leefelder. 8vo., 3, 81 pp., 9 ill. (Techn. Volksbuecherei, Vol. 6), Berlin, Maritima, 1912.

Spontaneous Combustion of Coal. G. C. Porter and F. R. Ovitz, Gas World, Vol. 56, 1435, pp. 12-3. (Recommendations as to the storage of coal; submergence storage is an absolute preventive but entails firing wet coal.)

The Carbon Dioxide Recorder as a Factor in Fuel Economy. E. A. Uehling, Jl. Ind. Engin. Chem., Vol. 4, 2 pp., 123-4, 4 fig.

The Microscopical Examination of Coal. J. Lomax, Coll. Guard., Vol 103, 2677, pp 787-8. (A reply to the points raised in the discussion of a paper read upon this subject.)

Calculation of Heat Value of Coal. O L. Kowalke, Power, Vol. 35, 16, pp. 558 9, 2 fig. (A simple formula and chart are given for figuring the heat value from the proximate analysis.)

XX—STEAM ENGINES AND BOILERS

Locomotive Boilers at Collieries Coll. Guard., Vol. 103, 2676 pp 731 2, 6 fig (An explanation is offered of how some of the more common defects occur and means by which danger may be averted.)

XXI—ELECTRICITY

The New Rules on Installation and Use of Electricity in Mines. Coll Guard, Vol 103 2670, pp. 431-2.

Mining Electrical Rules. W. C. Mountain, Iron Coal Trades Rev, Vol. 84, 2289, pp. 60-1 (The concentric system, leakage indication, efficient insulation.)

Electric Power in Southeast Kent. El. Rev., Vol 70, 1786, pp. 261-6, 14 fig (The Tilmanstone power house and colliery equipment at the adjacent mines.)

Central Station Generation of Power at the Central Indiana Coal Fields. J. V Hunter, Proc. Am. Inst. El. Eng., Vol. 31, 3, pp. 277-82, 2 tab. (A discussion as to whether the conclusions derived from Indiana are applicable to Pennsylvania and other coal fields.)

Central Station Power in Coal Mines. W. H. Thomas, Proc. Am. Inst. El. Eng., Vol. 31, 3, pp. 245-58, 5 fig. (Discusses the advancing usefulness of electric power in mines with especial reference to the use of straight alternating current hoist motors up to 500 hp. capacity.)

Central Station for Colliery Service. E. B. Wagner, Coal Age., Vol. 1, 26, pp. 838-9, 5 fig. (The equipment of a small central station is described.)

Power Generation and Distribution in the Pit "von der Heydt." (Krafterzeugung u. Verteilung auf dem Steinkohlenbergwerk "von der Heydt.") El Kraftbetr., 1912, 8, pp. 153-6, 2 ill. (Data of the gas-engine power plant, the electric switch gear and distribution.)

Remote Control of Electrical Apparatus in Mines. Iron-Coal Trades Rev., Vol. 84, 2302, pp. 566-7, 2 fig.

Motor Starters for Mining Work. A. P. Drake, Iron Coal Trades Rev., Vol. 84, 2302, pp. 572-4, 2394, pp. 638-40, 2 fig. (A discussion upon the selection of suitable starting switches.)

Fault Location on Mining Cables. G. B. Burrows, Iron Coal Trades Rev., Vol. 84, 2305, pp. 695-6, 9 fig.

XXII—SURFACE TRANSPORTATION

Peckfield Colliery. Iron Coal Trades Rev., Vol. 84, 2296, pp 321-2, 1 fig. (A new installation of surface plant and relayout of sidings; the screens are designed to deal with 3000 tons per 10-hr. day.)

The Consolidated Fuel Co., Utah. B. Shubart, Coal Age, Vol. 1, 29, pp. 944-5, 3 fig. (The article describes a characteristic mountain coal operation with some of the difficulties encountered.)

Coal Bunkers of Reinforced Concrete. (Kohlenbunker aus Eisenbeton.) Kupfer, Kohle Erz, 1912, 10, pp. 223-6. (Advantages of reinforced concrete bunkers.)

Double Tipple for Colonial Coal Co. W. T. Griffith, Coal Age, Vol. 1, 28, pp. 906-7, 3 fig. (The construction of a double tipple to meet special conditions at Prestonsburg, Ky. The tipple and the local power plant are described.)

XXIII—SANITATION, DISEASES

Miner's Phthisis. Min. Jl., Vol. 96, 3991, pp. 159-62. (A complaint mainly due to modern conditions of operating; the neglect of preventive regulations; state and private control should co-operate.)

Miners Nystagmus. J. Court, Optician, Vol. 43, p. 1099, p. 87-8. (Conclusions from researches conducted over a number of coal fields and extended to metalliferous mines, on the connection between nystagmus and the bad light given by ordinary safety lamps and individual predisposition.)

Housing of Scottish Miners. Coal Age, Vol. 1, 28, pp. 921-2, 3 fig. (The average miner's house in Scotland is more substantial and better equipped than in the United States. It supplies, however, quarters too narrow to suit the average American working-man and the ventilation is inadequate.)

Disinfecting Miners' Dwellings. W. H. Ross and R. C. Benner, Min. Sci. Press., Vol. 103, 27, pp. 829-30. (The principal germ-destroying agents and methods of use.)

Miners' Baths. H. F. Bulman and W. B. Wilson, Trans. Inst. Min. Engin., Vol. 43, 1, pp. 92-110, 19 fig. (Data on the question gathered from Westphalia, Belgium, and the North of France.)

Miners' Baths and Bath Houses. G. B. Walker, Engineering Mag., Vol. 42, 3, pp. 371-85, ill. (Recent British and continental practice illustrated,)

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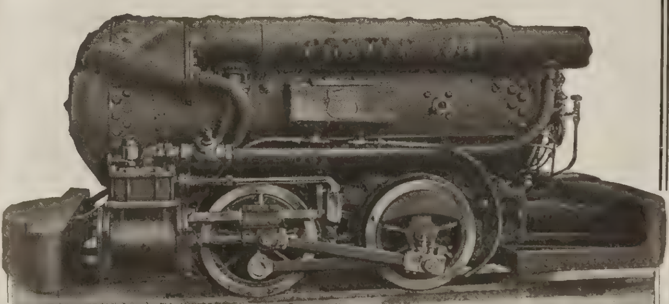

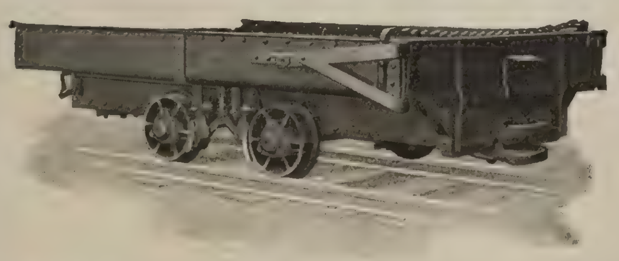

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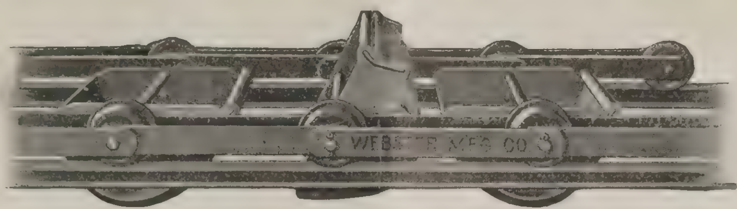

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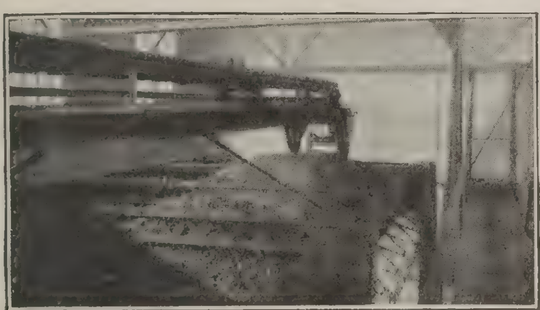

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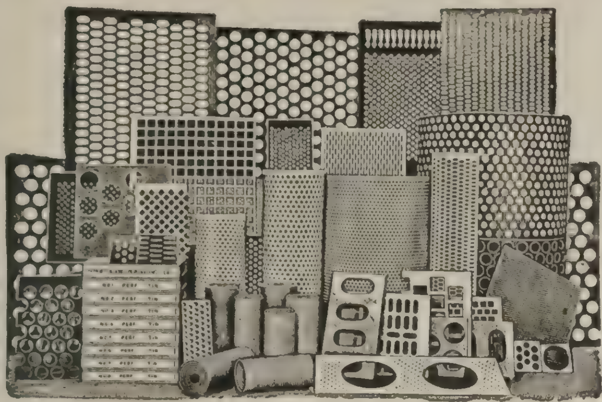

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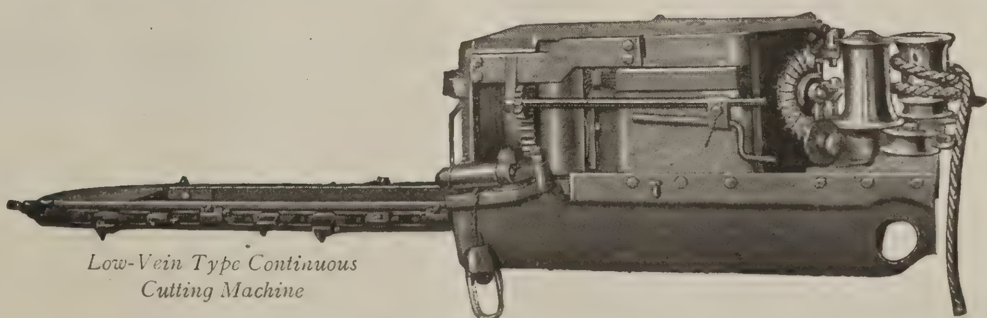

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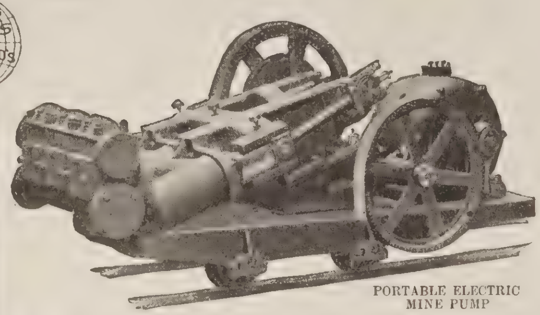

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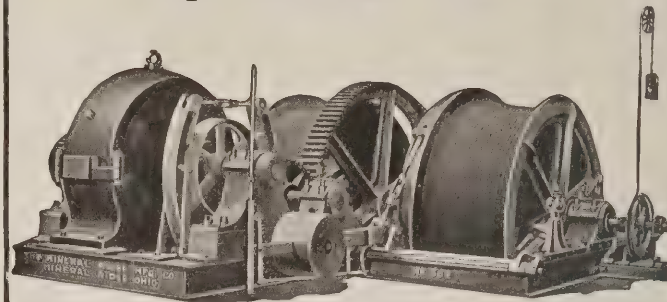

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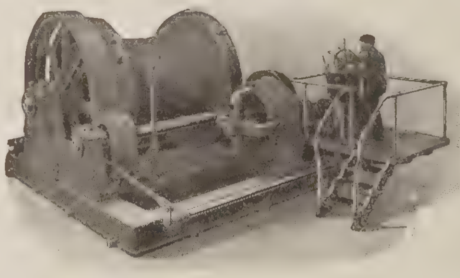

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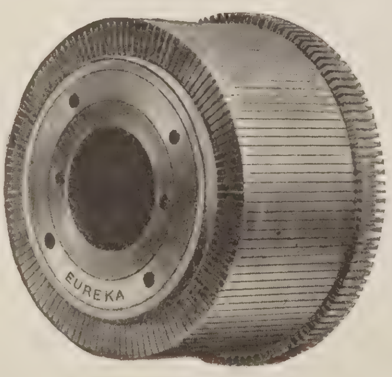

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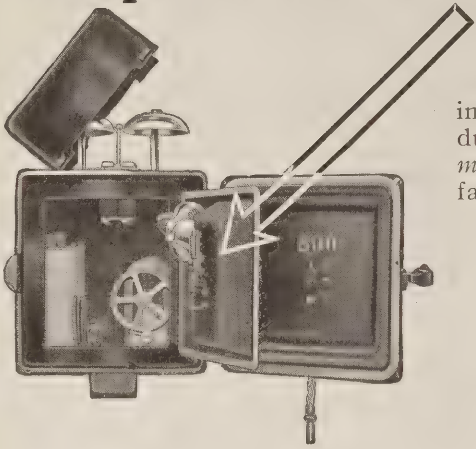

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Look where the arrow points—that inner door—perfectly insulating the mechanical chamber from any possible damp or dust—no chance for the mechanism to be affected. Made to *meet* mine conditions where a telephone *adapted* to them would fail hopelessly.

See how simple the MINE-A-PHONE is—see how easily accessible—how little chance for getting out of order—how *fool-proof*.

And the whole fabric of MINE-A-PHONE superiority is woven around that one point—*designed and made* to meet the hard conditions of mine use.

There are twenty-two exclusive features in every MINE-A-PHONE—every one of them a convincing argument why you need to have a MINE-A-PHONE help in your mine.

We've a Bulletin—No. 2600—telling all about the MINE-A-PHONE way. It's not prosey—quite the contrary. You'll be interested. *Send for it today.*

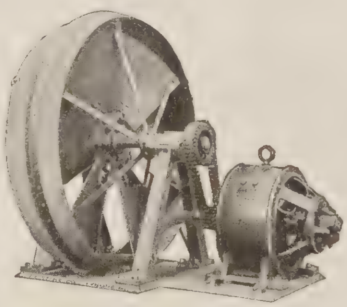
Stromberg-Carlson Telephone Mfg. Co.

Manufacturers of over 1,700,000 Telephones and 8,000 Telephone Exchanges

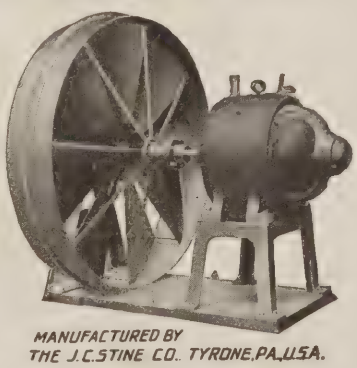
Rochester, New York, U. S. A.

CHICAGO, ILL. TORONTO, CAN. KANSAS CITY, MO.
Los Angeles, Cal. San Francisco, Cal. Seattle, Wash.

J. C. STINE Patented Disc Fans



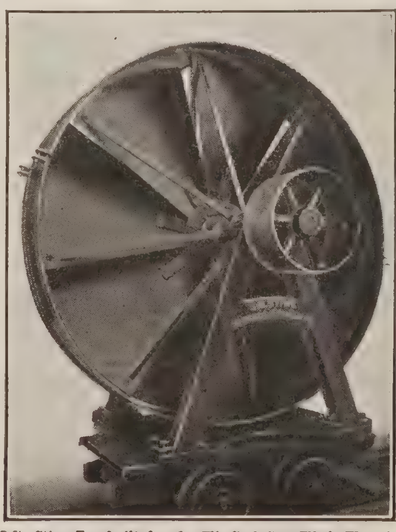
are made by people who know how. Actual tests show 85% mechanical efficiency, the highest efficiency of any fan made regardless of cost. Being equipped with specially designed self-starting, interpoled motor with fan and motor on the same bed-plate no attention is required beyond an occasional oiling. Ten sizes—3 ft. to 8 ft. in diam. Capacities 20,000 to 120,000 cu. ft. per minute. Prices surprisingly low. We guarantee highest efficiency, lowest upkeep and greatest durability.



The J. C. Stine Company, Tyrone, Penna.

Does Your Mine Need Air?

The Stine Disc Fan has been the standard of excellence for 35 years. Write for references in your vicinity.



8 ft. Stine Fan built for the Elk Coal Co., Elkol, Wyoming

One Company alone has 60 of our Disc Fans. Proof of excellent satisfaction.

A Letter From A User

LINCOLN COAL CO., LESSEES ELK COAL CO.

S. B. Stine, Elkol, Wyo.

Dear Sir:—In regard to the 8 ft. fan furnished this company by you some few years ago, can say that it has given entire satisfaction and is running as smoothly today as at the time it was installed. **It is the one piece of machinery around the place that has required no repairs.**

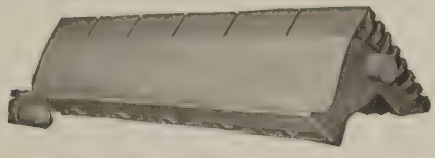
Yours very truly,
Walter B. Harris, Supt. (Signed)
Lincoln Coal Co. Lessees.

Ask for Bulletin 59.

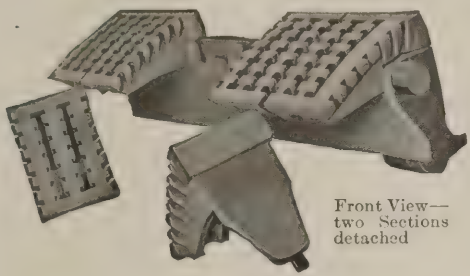
The service of our Engineering Dept. is at your service. Write or wire us.

S. B. Stine, Osceola Mills, Pa.

Designer and Builder of Complete Mining Equipment.

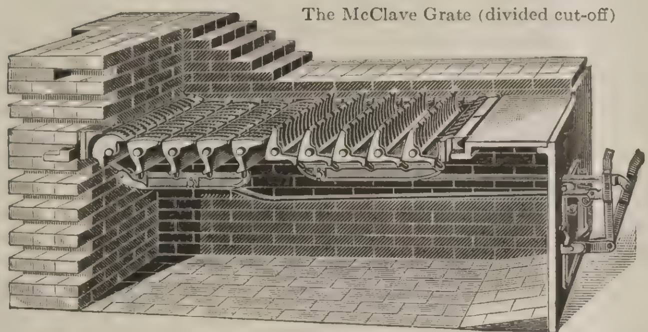


Back View of McClave Removable Sectional-Top Grate Bar No. 2.



Front View—two Sections detached

The McClave Grate (divided cut-off)



Better Grate Bars

The McClave Grate No. 2

The body portion of this bar is *below* the level of the fire (as shown), absolutely protected from heat action by the tops. These tops are removable in sections, fitting down firmly with a shank and socket arrangement.

In case of breakage or burning, repair costs are transferred from that for a whole bar, to that for a single section. Any section can be easily lifted out and a new one placed, while fire is burning.

The body section is *trussed* in design, stronger than any one-piece bar.

McClave Grates with Argand Blowers

Provide A Complete Steam-Making System For Cheap Fuels.

The cheaper fuels such as anthracite birdseye, buckwheat slack, rice, etc., are all used to excellent advantage.

No. 3 Buckwheat, for instance, has been burned with results practically identical with those with first grade coal, on regular grates.

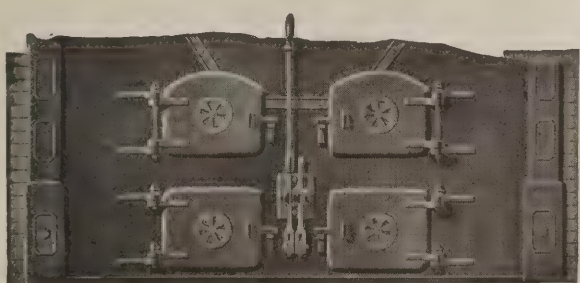
Ask for information about our new **Sectional Top Dumping Grate No. 4 A for small anthracites.**

Other details gladly furnished.
Catalog H on request.

McClave-Brooks Company

Scranton, Pa.

BRANCH OFICES: New York, 50 Church St., S. C. Smith, N. Y. Mgr. Pittsburg, 1007 Empire Bldg. Chas. N. Hays, Sales Agent. Chicago, 706 Fisher Bldg., F. G. Smith, Mgr.



Clean Your Fires With The Door Shut

The "Ajax" Self-Cleaning Rocking Grate does away entirely with the cleaning of fires by means of pokers and slice bars. The fireman has absolute control at all times. The illustration shows the manner of attaching double shaking levers to the boilers front and covers a two unit construction. *No change in boiler front is required except to cut a slot for the shaking lever to pass through.*

The AJAX

The grate stands on its own legs. We guarantee that the Ajax will give a clean fire and a full and regular supply of oxygen. 65 per cent air space is an "Ajax" feature. Why not take advantage of our 60 days' trial offer. We stand the risk, shoulder the expense, and take the grates back if they fail to satisfy Where others *claim* we make good. Write for details.

VALLEY IRON WORKS

Williamsport, Pa. U. S. A.

FANS

ORIGINAL FLEXIBLE BRACES

Builders since 1869. Plans for Fire-Proof housing. Our own engine direct drive or motor silent chain. Our fans in every Mining locality in North America. *Catalog.*

HOISTING ENGINES MINE PUMPS

Crawford & McCrimmon Co.

Brazil, Ind., U. S. A.

3

Colorado
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